



REUTERS/Andrew Winning

THE RESEARCH & INNOVATION PERFORMANCE OF THE G20

AND ITS IMPACT ON DECISIONS MADE BY THE WORLD'S MOST
INFLUENTIAL ECONOMIC LEADERS

MARCH 2014



THOMSON REUTERS™

“Today we recognize that scientific innovation is not always a linear process, and that it often involves interplay back-and-forth between basic, translational and applied research stages. This research interaction involves a diverse system of players and institutions that influence its progress and success. Together, these are often called a science innovation system. The players may come from companies, universities, government and civil society. Scientists play a key role, but so do other stakeholders, such as policy makers, banks and investors.”

***-Gordon Conway
Professor of International Development at Imperial College***

***-Jeff Waage
Director of the London International Development Centre (LIDC)***

“Innovation policy can be a key component of 21st century development strategies, even in poor countries with constraining economic environments. But to succeed, innovators must be supported by high-level central and local government policy makers who have the vision, pragmatism and ability to work creatively in institutional contexts.”

***-Jean-Eric Aubert
The World Bank Institute***

INTRODUCTION

The G20 is a group of respected world economic leaders from its 19 participating nations and the European Union. This elite team, officially known as the Group of Twenty Finance Ministers and Central Bank Governors, aims to address the world's biggest economic challenges through international cooperation. It prevents financial crises by creating sustainable and balanced global growth and reforming the architecture of global governance. The G20 is acknowledged for regulating financial markets and influencing global economic policy in the aftermath of the financial crises of the late 1990s and 2008 to 2009.

As scientific research and innovation activity are predictors of economic growth and prosperity, the IP and Science business of Thomson Reuters embarked on a project to identify the G20's impact in these areas. This report looks at trends across the G20, based on the analysis of each region's scholarly output and innovation capacity.

Which regions are leading and in what areas? Which countries are falling behind? Are there emerging pockets or areas of growth? What is in decline? What technology areas dominate? This report provides answers to these and other important questions, offering a unique perspective that informs policymakers of the changing landscape and dynamics influencing G20 decision making.

THE G20

Argentina
Australia
Brazil
Canada
China
European Union
France
Germany
Great Britain
India
Indonesia
Italy
Japan
Mexico
Russia
Saudi Arabia
South Africa
South Korea
Turkey
United States

FINDINGS

Increasing globalization is the most prominent feature of science and innovation in the early 21st century, as the data presented in this report reveals.

The number of papers recorded in Web of Science® for most G20 nations has been increasing during the last decade, as the world's research capacity has expanded. Some nations, however, have increased production faster than others, resulting in shifting world shares. For example, the world share for China has increased from 5.6% in 2003 to 14% in 2012, whereas that of the United States has fallen from 33% to 27.8% over the same period. In general, world shares for nations with mature scientific enterprises have declined and those of developing nations have risen.

Total citations recorded in Web of Science have naturally increased in tandem with greater world output, but so have citations per paper (citation impact) scores, owing to longer reference lists in publications. This has been called citation inflation.

Citation impact relative to the world average has likewise advanced for each of the G20 members (but very little for the United States). There are several explanations for this phenomenon. While world shares for many developing nations have risen, their output typically exhibits less-than-world citation impact, resulting in a dampening (but still growing) citations-per-paper benchmark for the world.

Nonetheless, many developing nations, such as China and India, are improving their performance and closing the citation impact gap between themselves and the traditional research leaders of Europe and North America. Many of these historical leaders, in turn, have

benefited to a degree from the larger share of relatively lower impact papers from developing nations that feed into the world average: by comparison to that average their scores also have improved. On the other hand, the United States, the world's largest producer, has had less ability to improve its already high standing than others because of its large output and only modest growth, which was only half that of the world as a whole, as represented in Web of Science, from 2003 to 2012 (26% vs. 50%).

This partially explains the almost uniform rise for the G20 in its production of highly cited papers (defined as those that rank in the top 1% by citations, taking into account their field and year of publication) as a percentage of output. Most developing nations still score below the expected 1% level in highly cited papers based on output but this indicator increased for all throughout the decade. Senior producers, such as Australia, France and especially Great Britain, to name a few, also recorded higher rates in their production of highly cited papers. Only the United States lost ground: from 1.9% of its production in 2002 to 1.8% in 2011.

This combination of measures demonstrates that the historical gap between the science "haves" and those that have had less or very little is closing. The world is no longer bipartite (Europe and North America) in terms of significant and even top level science. It is now at least tri-partite (Europe, North America and Asia), and perhaps more, as select nations in South America (Brazil), Africa (South Africa) and the Middle East (Saudi Arabia, Turkey and Iran, the last not a G20 member) increase their output, gain world share and advance in citation impact.

The global research landscape of the past decade has become so dynamic as to be described in terms of tectonic movements, most importantly for that of China. Continents – and countries – once distant from one another both physically and metaphorically are now appearing side-by-side, and still new landforms are emerging. In another decade, the geography of science is sure to be very different from that of today.

METHODOLOGY

All data in this Global Research Report are derived from the comprehensive proprietary databases of Thomson Reuters, including Web of Science and Derwent World Patents Index® (DWPISM).

Web of Science is deemed the world's most trusted source of bibliometrics and citation information. Derwent World Patents Index is a proprietary Thomson Reuters database acknowledged as the world's most trusted source of patent information covering 48 patent authorities and two literature sources.

The analysis uses whole counting—not fractional counting—for papers and citations. That is, any nation, institution or individual author listed on a given receives equal credit in terms of publication output and citation impact. The whole-counting method measures participation instead of contribution which in any case cannot be determined precisely because it is not revealed specifically in published research reports.

For the patents analysis, data from the Derwent World Patents Index within Thomson Innovation® was analyzed (except for Argentina, Saudi Arabia and Turkey, for which the bibliographic collection was used).

This Global Research Report attempts to contribute to an updated view of recent and significant developments of the G20. Thomson Reuters recommends that its bibliometric and patent indicators are best used to initiate fact-based discussions among members of the research community and science policy makers to assist both groups in developing and accelerating excellence in science and innovation globally.

In order to provide a consistent comparison between the G20 regions, the number of patent applications with national priority published from each national patent office (for example, Brazilian-published patent applications with Brazilian priority) was used to provide invention trends over the 10 years from 2003 to 2012 and counts of the number of inventions to resident companies given in the respective charts.

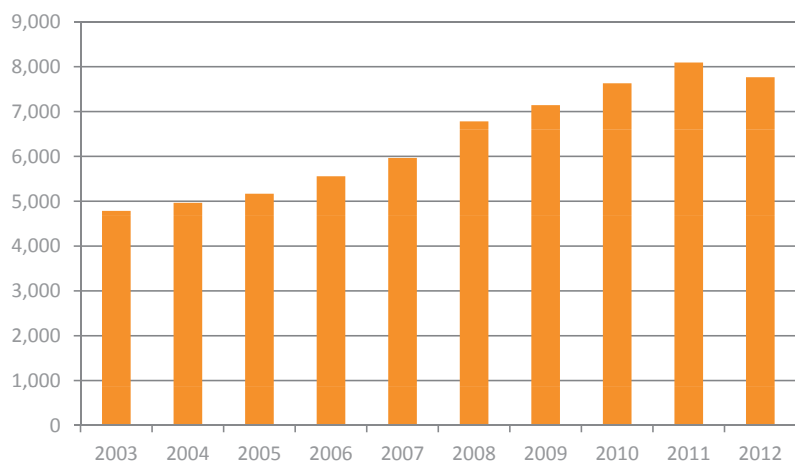
For the assessment of resident versus non-resident patenting, the total number of patent applications published by the national patent office for each year (2003 and 2012) was counted and the percentage of priority filings calculated to indicate the proportion of resident to non-resident patents. The total number of patent applications published from each national office in 2012 was also used to provide the listing of foreign and resident companies.

For the Share of Top 10 Global Technologies 2012 radar charts, the total number of basic patents (inventions) published from each national office was analyzed by Derwent class (a broad classification scheme used to classify the technology area of each invention) and the ratio of national basics to all basics globally calculated for the Top 10 technology classes globally in 2012. A similar analysis was performed to determine the major areas of innovation for each region in comparison to global innovation in 2012.

ARGENTINA

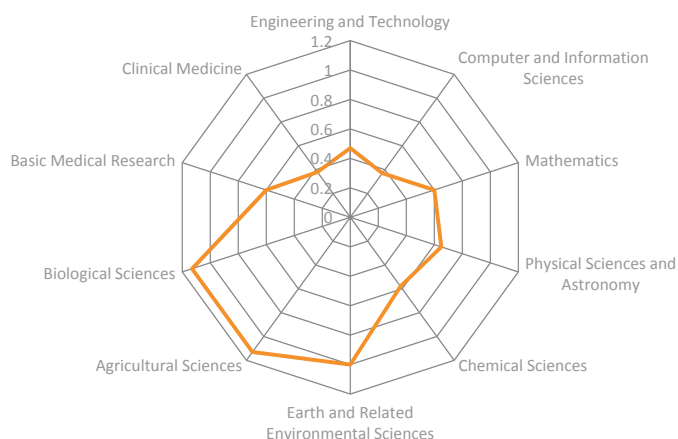
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

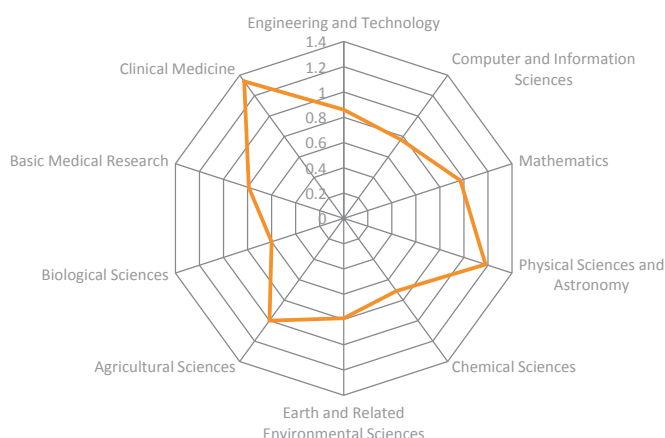


Population: 41.7 million (est. 2013, Instituto Nacional de Estadística y Censos)
 GDP (PPP): 743 billion \$ (est. 2012, International Monetary Fund)
 GERD (billion current PPP\$): 4.6 (2011, MSTI, OECD)
 GERD as % of GDP: .65 (2011, MSTI, OECD)
 BERD as % of GDP: .16 (2011, MSTI, OECD)
 Researchers (FTE) thousands: 69.7 (2011, MSTI, OECD)
 R&D personnel per thousand labor force: 3.74 (2011, MSTI, OECD)

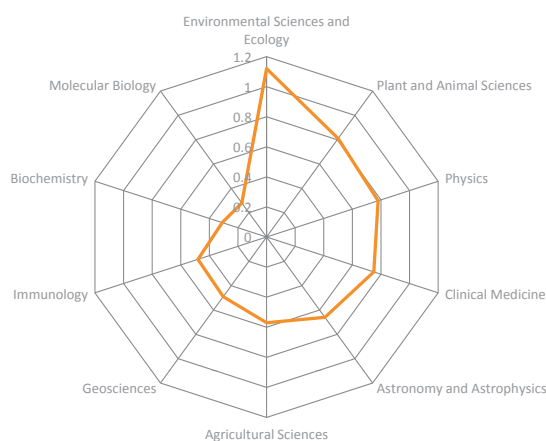
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



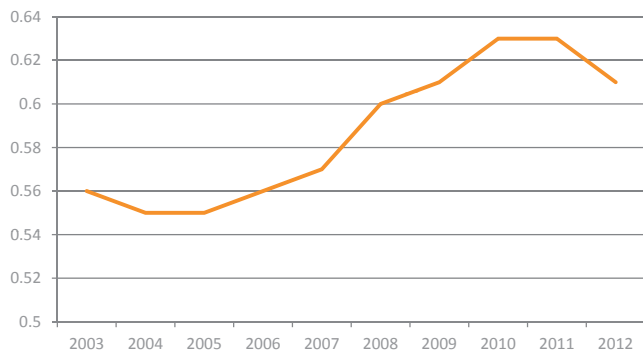
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



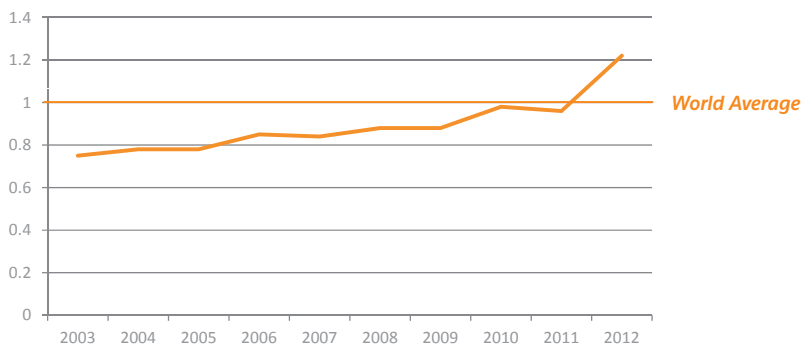
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



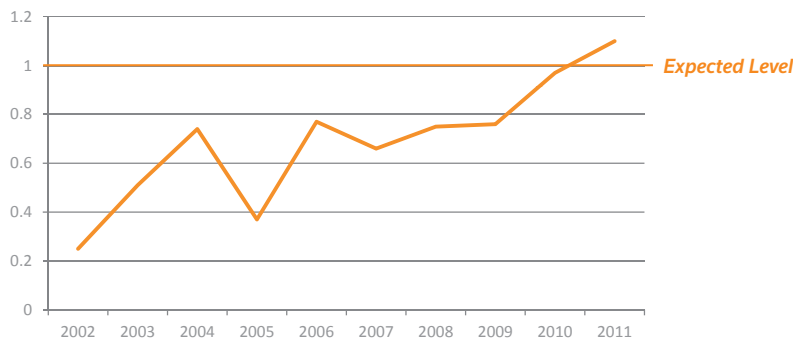
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)

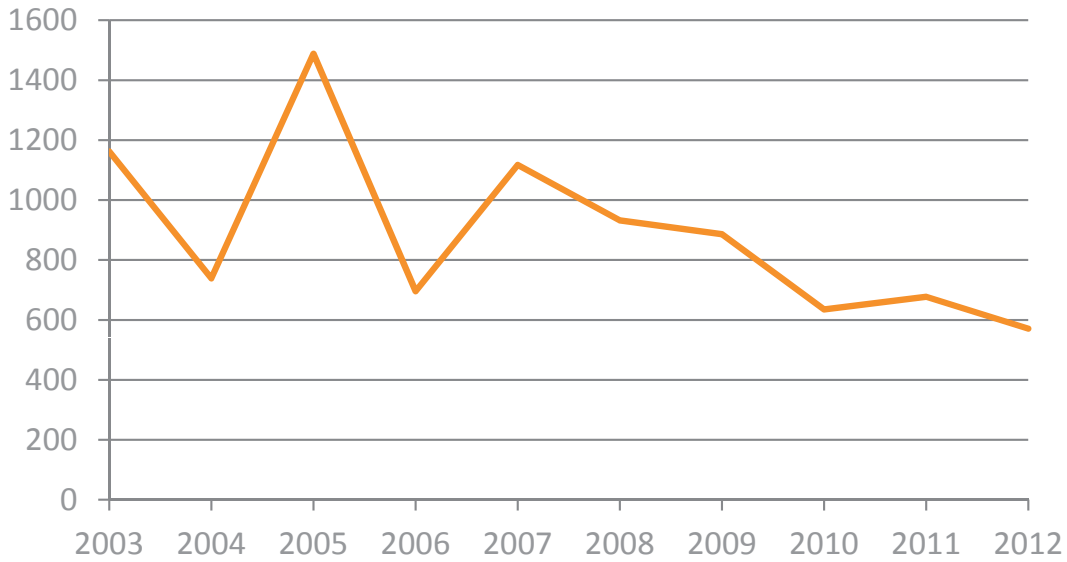


From 2003 to 2012 Argentina increased its output of Web of Science papers some 62%—slightly above the world’s increase of 50% over the period—but its world share of papers in the internationally influential journals and proceedings indexed by Thomson Reuters remained at about .6% throughout the decade. On the other hand, Argentina’s citation impact (citations per paper) improved from 25% below to 22% above the world average by 2012. According to the OECD classification scheme, agricultural and biological sciences were focus areas for Argentina during 2008 to 2012, but its highest relative citation impact in the last five years was achieved in clinical medicine and in physical sciences and astronomy. From a very low base of only 12 highly cited papers in 2002, Argentina managed a sevenfold increase by 2011 with 85 such papers amounting to 1.1% of production, thereby exceeding the expected 1% mark in terms of national output of highly cited papers. Environmental sciences and ecology and the related area of plant and animal sciences were the two Essential Science Indicators fields in which Argentina held its largest world share of highly cited papers, at 1.1% and .8%, respectively, for the period from 2002 to 2011.

ARGENTINA

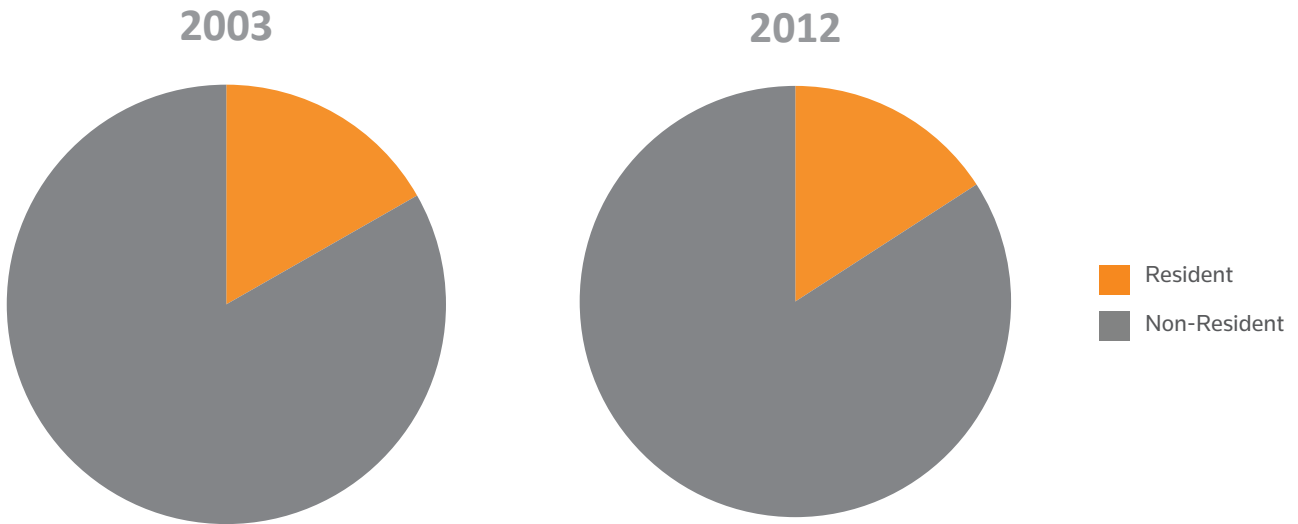
Intellectual Property Research

AR Patent Applications with AR Priority 2003-2012



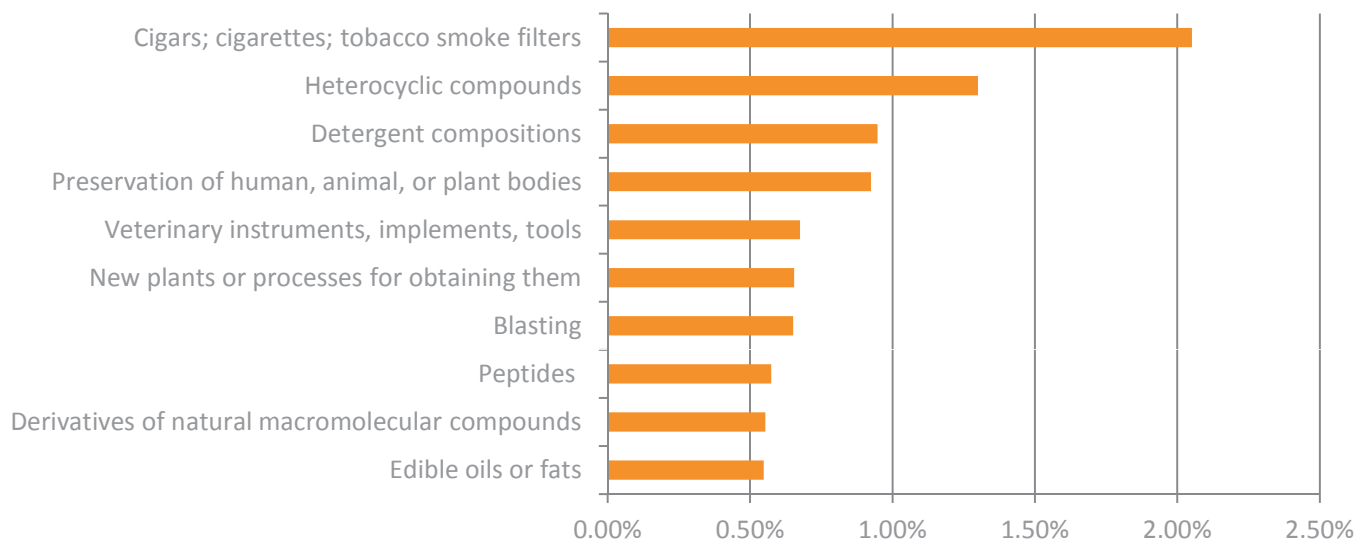
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL AR PATENTS 2012
HOFFMANN LA ROCHE	58
DOW AGROSCIENCES LLC	54
BAYER CROPSCIENCE AG	53
UNILEVER NV	52
BASF SE	52
SANOFI AVENTIS	51
SYNGENTA PARTICIPATIONS AG	50
TELEFONICA SA	47
COLGATE PALMOLIVE CO	44
PROCTER & GAMBLE	42

COMPANY - RESIDENT	AR PATENTS WITH AR PRIORITY 2012
CONSEJO NAC INVEST CIENT TEC	14
COMUNICACIONES Y CONSUMOS SA	5
UNIV NAC DEL LITORAL	5
COMISION NAC DE EN ATOMICA CNEA	4
GADOR SA	4
INST NAC DE TECNOLOGIA AGROPECUARIA	3
UNIV NAC DE CORDOBA UNC	3
A P H INGENIERIA QUIMICA SA	2
ACROPOLIS CABLES S A	2
ASCENSORES SERVAS S A	2

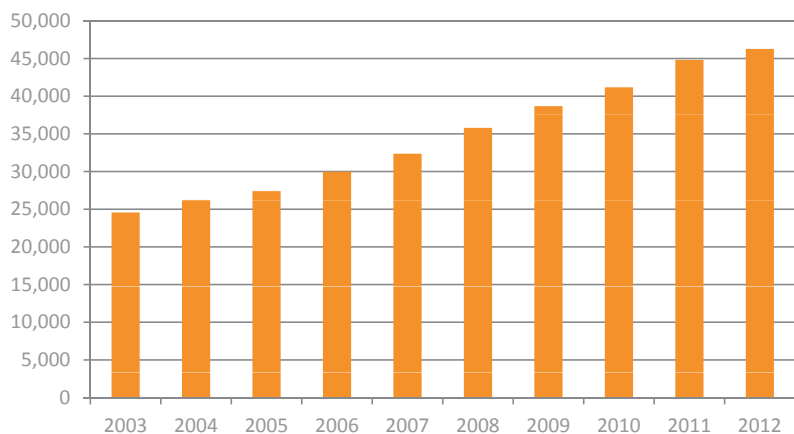
Over the decade from 2003 to 2012, inventions originating from Argentina have averaged less than 1,000 per annum (p.a.). In recent years this has dropped to just over 500. Although fluctuating over this time, the proportion of domestic applications has remained fairly steady at around 17%. This is reflected in the Top 10 patent applicants for 2012, all of which are foreign. This compares with the United States where around 55% of patent applications published in 2012 were from domestic concerns, and Japan where the ratio is much

higher at 81.2% in 2012. As shown in the table of Top 10 resident companies, much of the domestic innovation is being conducted by academic and government concerns. Since DWPI data is not available for Argentina, analysis of the Top 10 technologies as a share of global inventions is based on the WIPO's 35 technology field classifications. This shows the prominence of tobacco technology followed by chemistry (heterocyclic compounds), detergent compositions and preservation of human, animal or plant bodies.

AUSTRALIA

Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)



Population: 23.1 million (est. 2013, Australia Bureau of Statistics)

GDP (PPP): 971 billion \$ (est. 2012, International Monetary Fund)

GERD (billion current PPP\$): 20.6 (2010, MSTI, OECD)

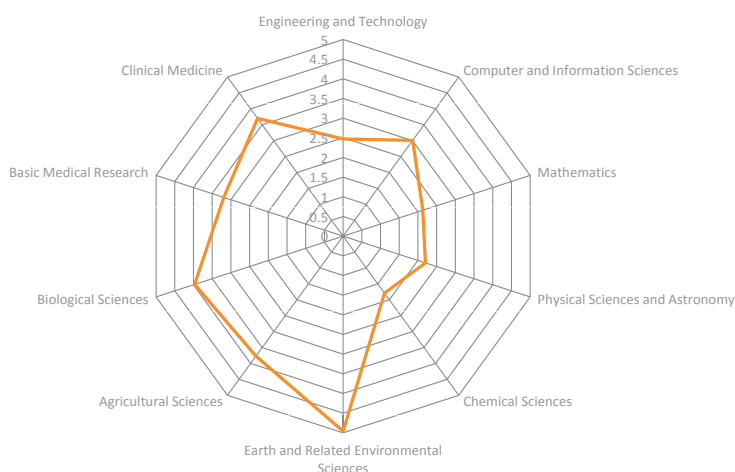
GERD as % of GDP: 2.20 (2010, MSTI, OECD)

BERD as % of GDP: 1.40 (2008, MSTI, OECD)

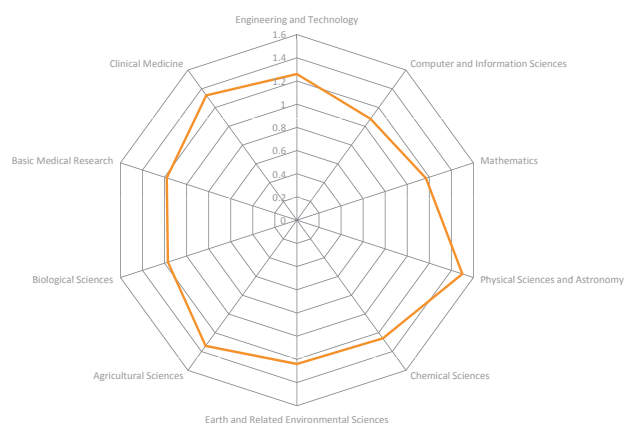
Researchers (FTE) thousands: 137.5 (2008, MSTI, OECD)

R&D personnel per thousand labor force: 8.12 (2008, MSTI, OECD)

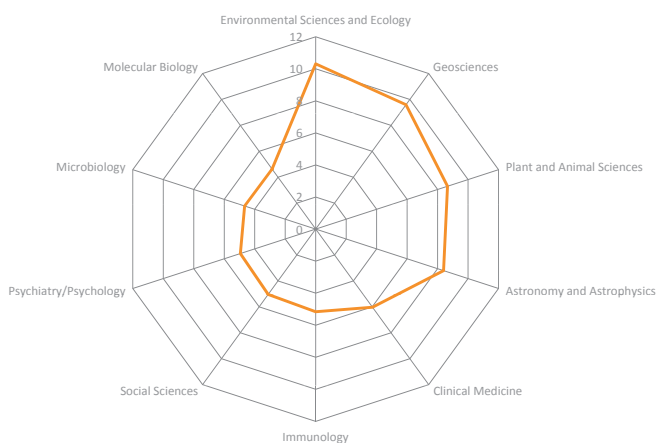
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



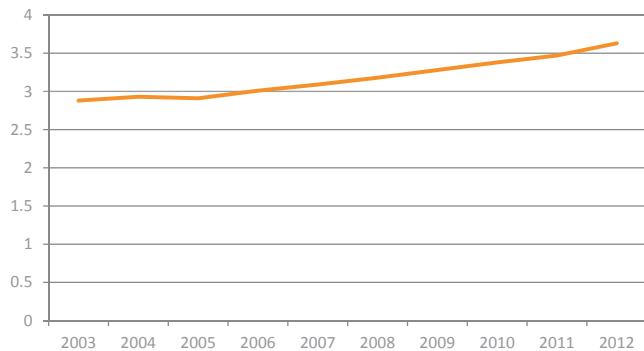
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



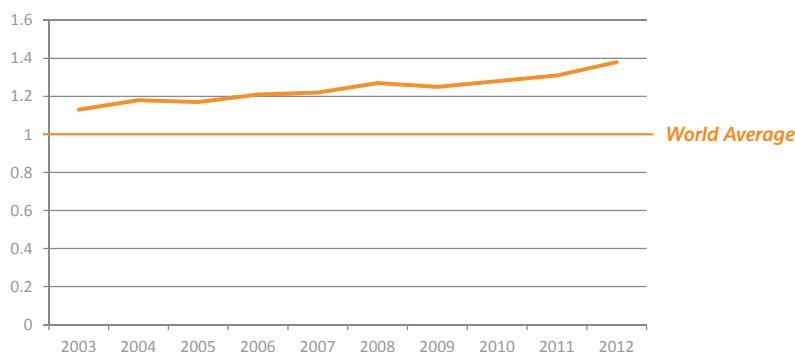
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



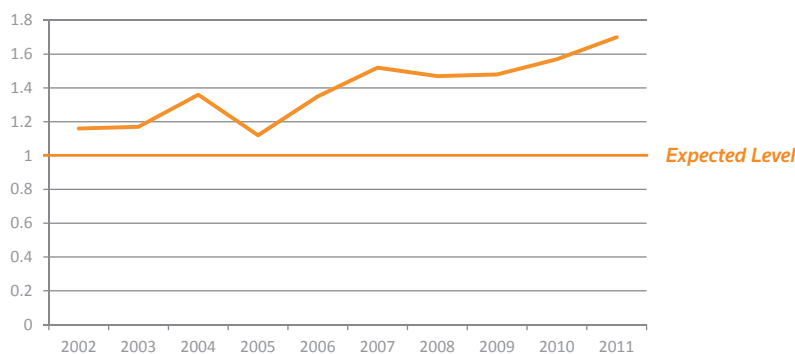
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)



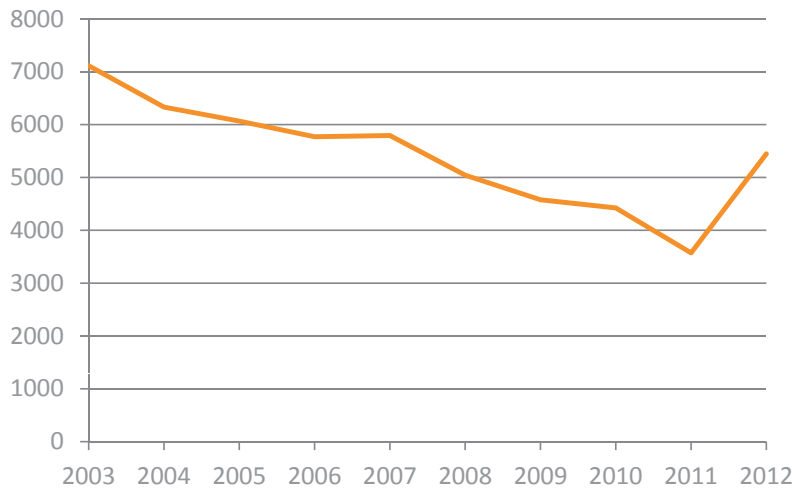
Despite its mature position compared with rapidly growing research producers such as China, India, South Korea and Saudi Arabia, Australia improved its world share from 2.9% in 2003 to 3.6% in 2012 on the strength of an 88% increase in paper output in Web of Science (24,568 to 46,271). Over the same time its citation impact rose from 13% to 28% above the world average. Even more impressive was Australia's large share of highly cited papers by 2011, some 1.7% of output, up from 1.1% in 2002. This increase in highly cited papers contributed strongly to the nation's overall increase in citation impact. Earth, environmental sciences and ecology have been robust research areas for Australia—in world share, citation impact and production of highly cited papers. Recently, a Thomson Reuters report highlighted the nation's leadership role in research on climate change, ocean acidification and coral reefs (C. King and D.A. Pendlebury, *Research Fronts 2013: 100 Top-Ranked Specialties in the Sciences and Social Sciences*, page 9). Australia also contributed more than twice its expected world share of highly cited papers in geosciences, plant and animal sciences, and in astronomy and astrophysics. While these research strengths are related to the nation's unique geography, geology, flora and fauna, Australian scientists seem to have made the most of their national 'laboratory' and its resources.

Also see: J. Adams, C. King, and B. Webster, Global Research Report: Australia and New Zealand, March 2010 <http://sciencewatch.com/sites/sw/files/sw-article/media/globalresearchreport-anz.pdf> and C. King and D.A. Pendlebury, *Research Fronts 2013: 100 Top-Ranked Specialties in the Sciences and Social Sciences*, April 2013 <http://sciencewatch.com/sites/sw/files/sw-article/media/research-fronts-2013.pdf>

AUSTRALIA

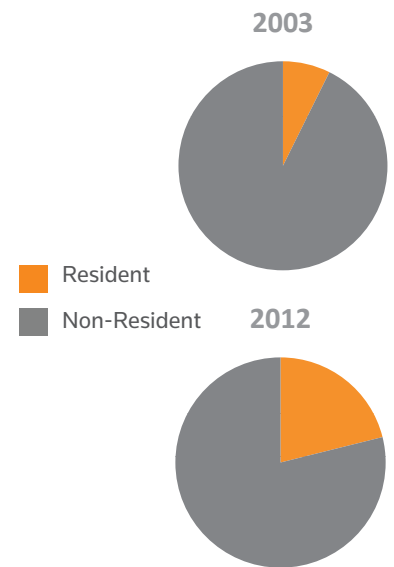
Intellectual Property Research

AU Patent Applications with AU Priority 2003-2012



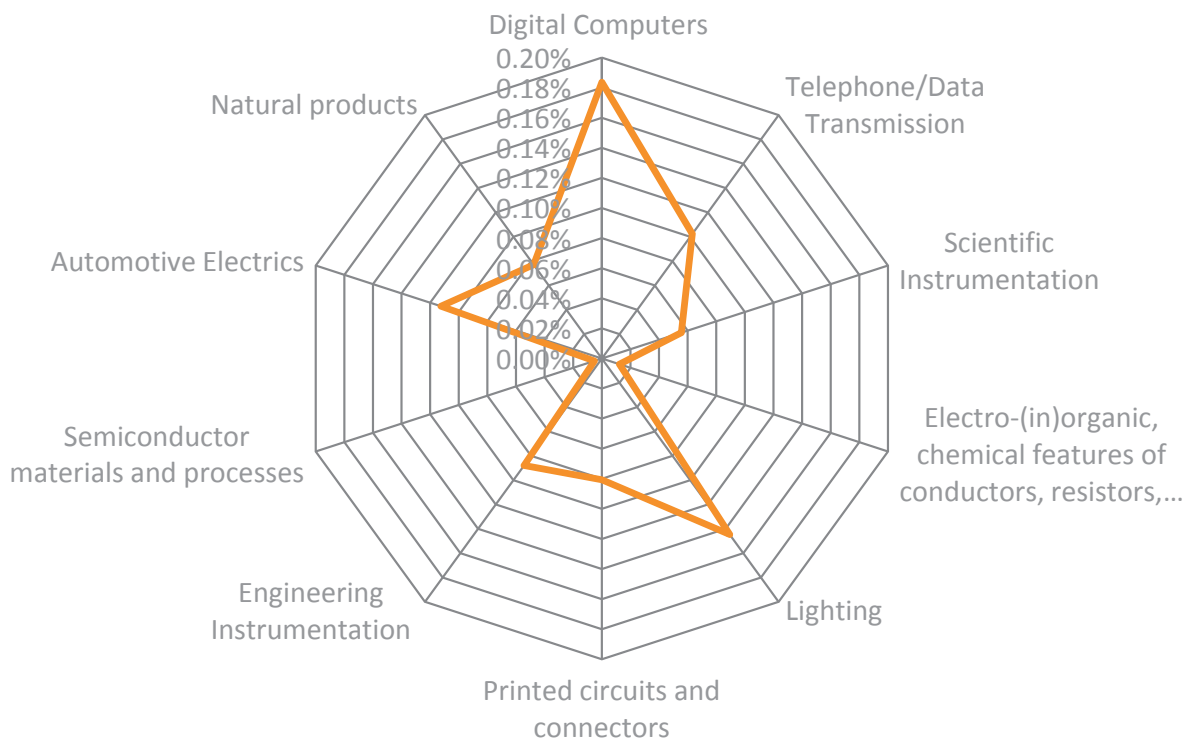
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



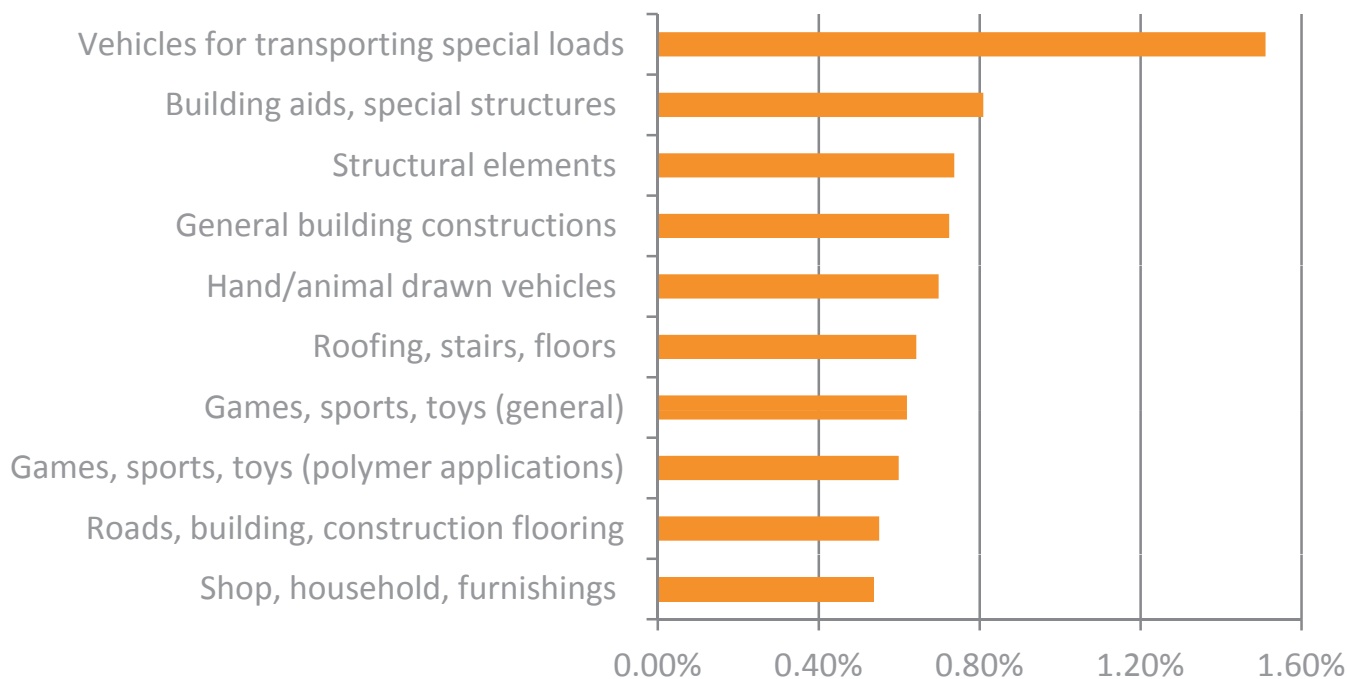
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL AU INVENTIONS 2012
HENGDIAN GROUP LINIX MOTOR CO LTD	94
ARISTOCRAT TECHNOLOGIES AUSTRALIA PTY LT	76
HEVAL HENGDIAN MACHINERY CO LTD CNNC	25
NINGBO SHI JIANGDONG QU DAKOU TRADING CO LTD	19
TAODA COMMODITY CO LTD	15
APPLE INC	13
GOOGLE INC	13
ILLINOIS TOOL WORKS INC	13
SECURENCY INT PTY LTD	12
CANON KK	11

COMPANY - RESIDENT	AU INVENTIONS WITH AU PRIORITY 2012
ARISTOCRAT TECHNOLOGIES AUSTRALIA PTY LT	76
SECURENCY INT PTY LTD	12
GERARD LIGHTING PTY LTD	9
HILLS HOLDINGS LTD	8
AUSTRALIAN STEEL CO OPERATIONS PTY LTD	6
COOK MEDICAL TECHNOLOGIES LLC	6
METECNO PTY LTD	6
ANGAS IND PTY LTD	5
AUSTRALIA GRT DARSO IND DEV	5
KING FURNITURE AUSTRALIA PTY LTD	5

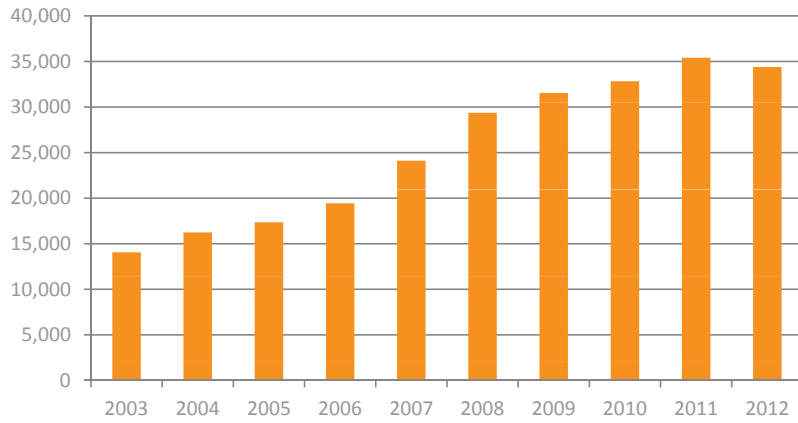
Homegrown innovation as measured by the number of Australian patent applications originating from Australia steadily declined from over 7,000 inventions in 2003 to just under 4,000 in 2011, but 2012 saw a recovery to just short of 6,000 inventions. Much of Australian patenting is however swamped by foreign companies applying for protection of their innovation in Australia. Over 79% of applications published in 2012 came from outside Australia. This indicates a high interest in Australian markets by foreign concerns and is reflected in the Top 10 company list for 2012 which includes Chinese, U.S. and Japanese companies. The Top

10 domestic concerns are spread across a range of technology areas. Looking at the Top 10 global patented technologies, Australia holds 0.18% of the world's patent applications in digital computing followed by 0.14% in lighting and around 0.10% in telephone/data transmission and automotive electrics. The overall balance of Australian technology compared to global patenting shows a focus on vehicles for transporting special loads and general construction technologies (building aids, special structures, structural elements and general building constructions).

BRAZIL

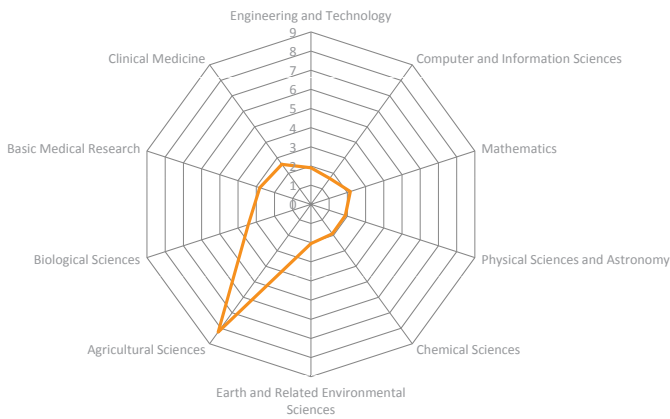
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

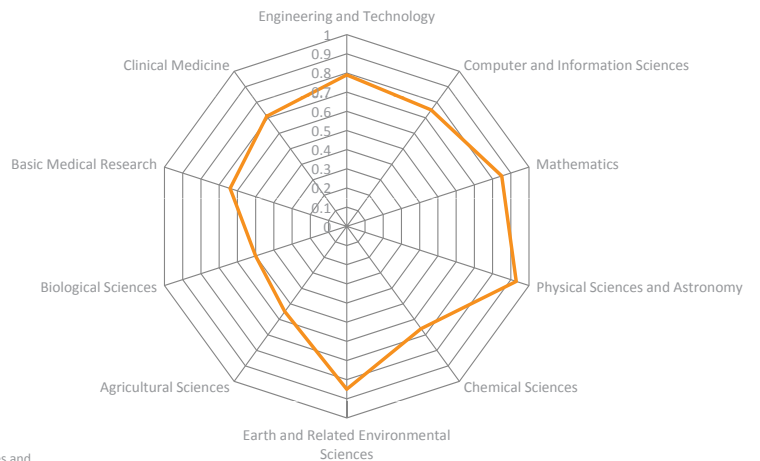


Population: 193.9 million (est. 2012, Instituto Brasileiro de Geografia e Estatística)
 GDP (PPP): 2,356 billion \$ (est. 2012, International Monetary Fund)

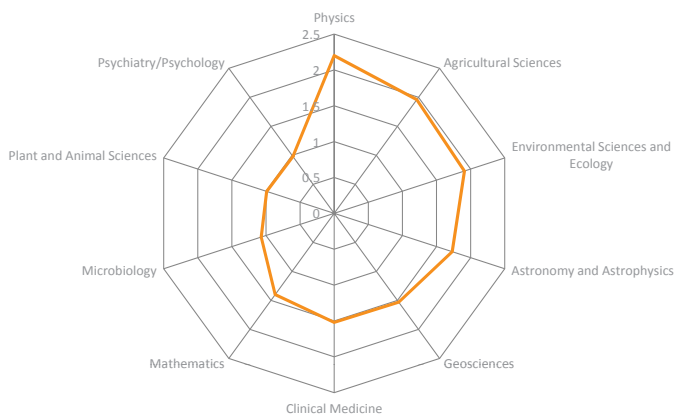
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



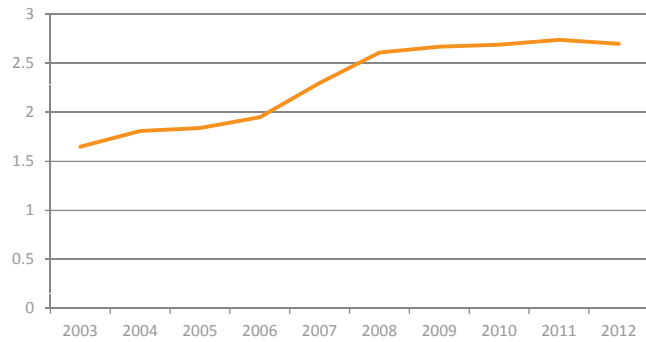
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



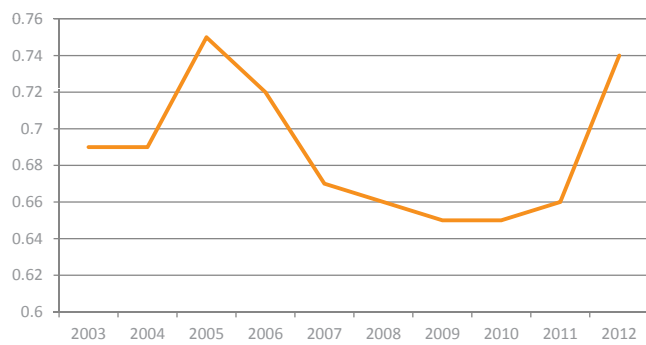
Top 10 ESI Fields by Percent of World Share of Highly Cited Papers (2002 - 2011)



Percent World Share of Papers in Web of Science (2003 - 2012)

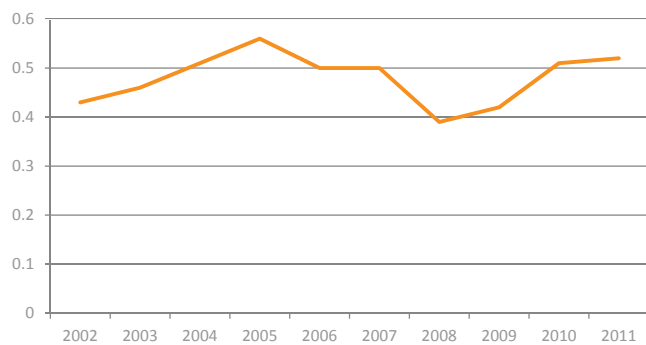


Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



World Average = 1

Percent of Highly Cited Papers Based on National Output (2002 - 2011)



Expected Level = 1

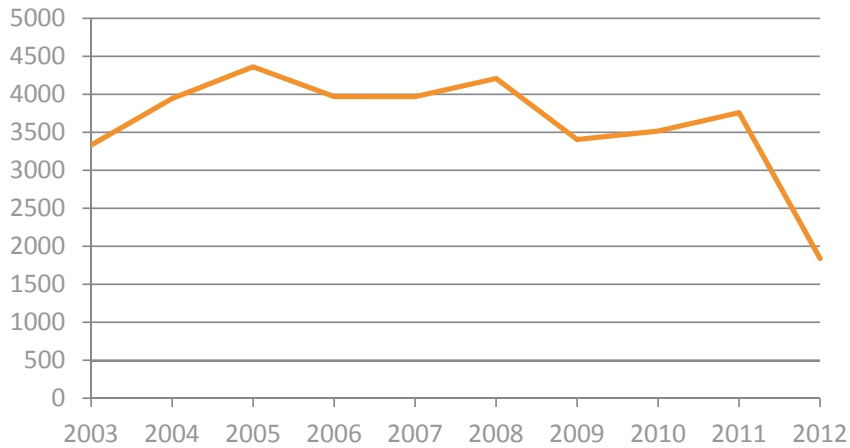
Brazil's research papers in Web of Science increased about three times as fast as the world average from 2003 to 2012 (145% vs. 50%), resulting in a 1% expansion in world share from 1.7% to 2.7%. Citation impact for Brazil relative to the world average, at about 30% below expectation, was essentially unchanged during the period. This is not uncommon among nations whose output rises quickly: capacity is built first and better impact generally follows over the following decade. By far the field in which Brazil held its largest world share during 2008 to 2012 was agricultural sciences, at 8.3%. The citation impact of papers in this area, however, was only half the world average and among the lowest for the nation compared with other fields. Nonetheless, agricultural sciences was the second-highest-ranked field for Brazil in terms of its percent of the world's highly cited papers produced during 2002 to 2011 (environmental sciences and ecology was third). Physical sciences and astronomy were fields in which Brazil exhibited strength in citation impact, whether measured in terms of relative citation impact according to the OECD classification scheme, 2008 to 2012, or percent share of the world's highly cited papers according to Essential Science Indicators fields, 2002 to 2011.

Also see: J. Adams, D. Pendlebury, and B. Stembridge, Building BRICKS: Exploring the Global Research and Innovation Impact of Brazil, Russia, India, China, and South Korea, February 2013 <http://sciencewatch.com/sites/sw/files/sw-article/media/grr-brick.pdf> and J. Adams, and C. King, Global Research Report: Brazil. Research and Collaboration in the New Geography of Science, June 2009 <http://sciencewatch.com/sites/sw/files/sw-article/media/grr-brazil-Jun09.pdf>

BRAZIL

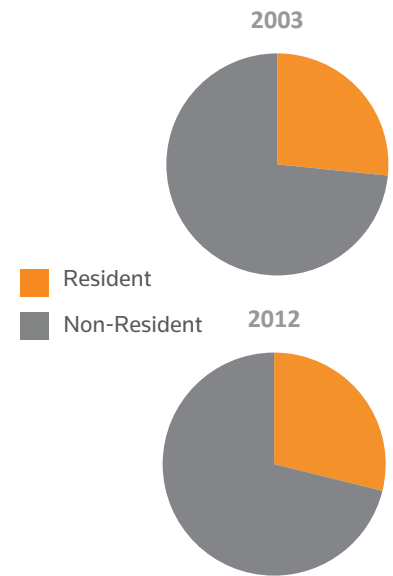
Intellectual Property Research

BR Patent Applications with BR Priority 2003-2012



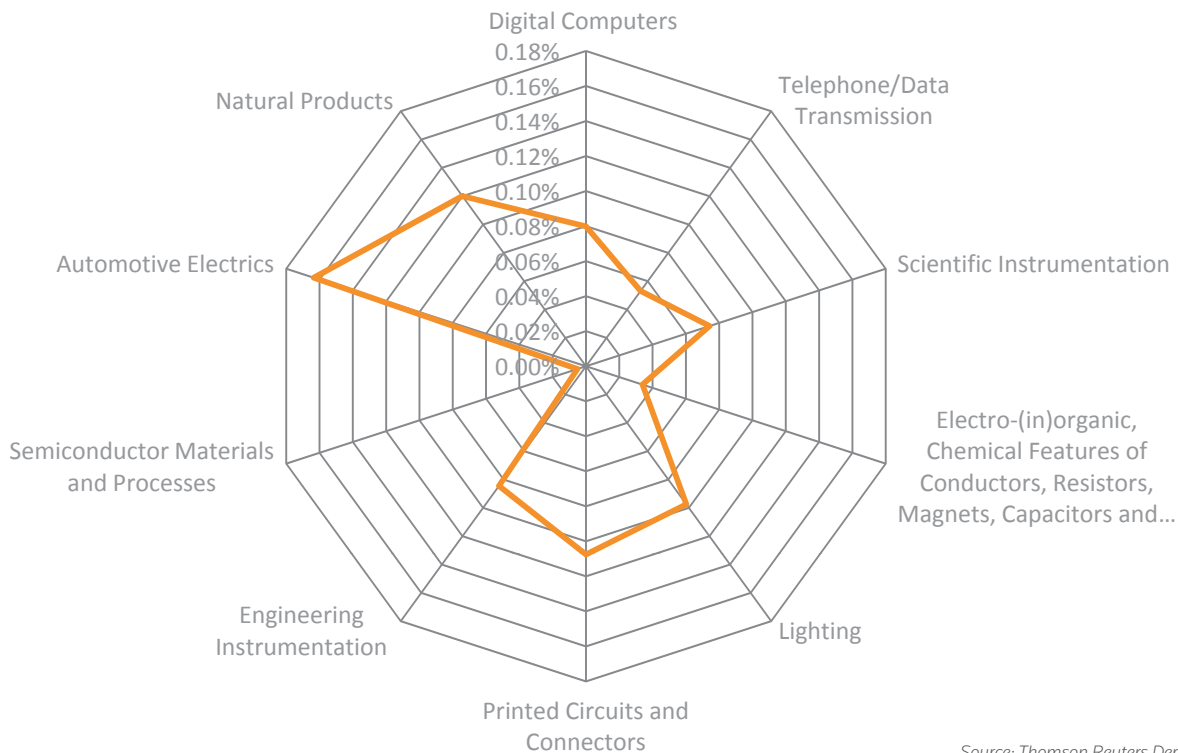
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



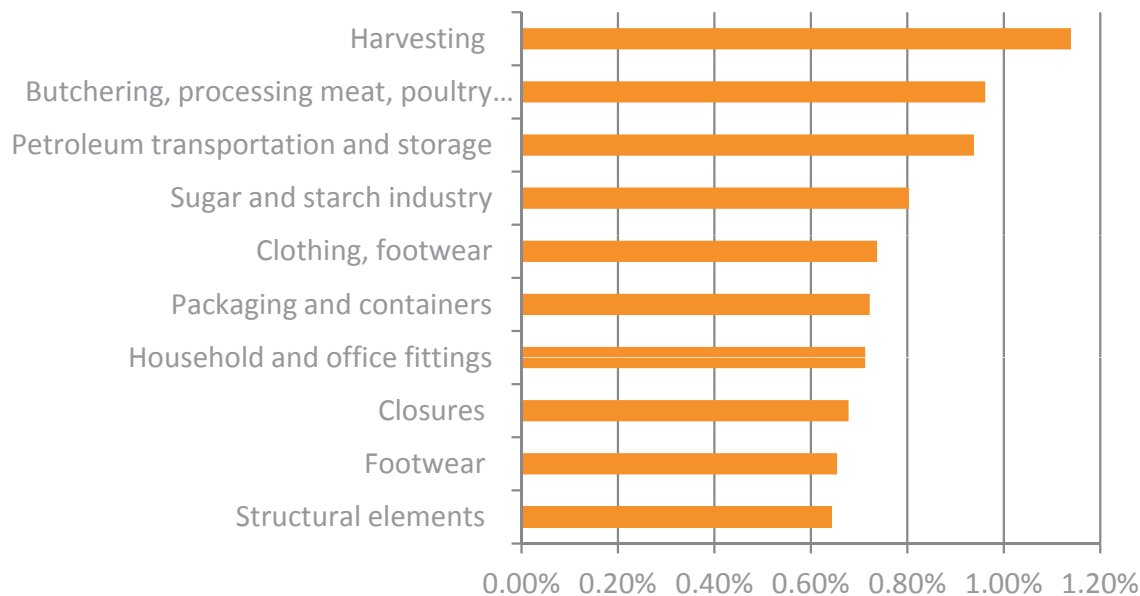
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL BR INVENTIONS 2012
PETROBRAS PETROLEO BRASIL SA	30
UNIV SAO PAULO USP	23
WHIRLPOOL SA	18
UNICAMP UNIV ESTADUAL CAMPINAS	15
UNIV FEDERAL DO RIO GRANDE DO SUL	14
UNIV FEDERAL MINAS GERAIS	13
GRENDENE SA	8
JOBE IND E COMERCIO PLASTICOS LTDA	7
UNIV FEDERAL LAVRAS	7
COMISSAO NACIONAL ENERGIA NUCLEAR	6

COMPANY - RESIDENT	BR INVENTIONS WITH BR PRIORITY 2012
PETROBRAS PETROLEO BRASIL SA	30
UNIV SAO PAULO USP	23
WHIRLPOOL SA	18
UNICAMP UNIV ESTADUAL CAMPINAS	15
UNIV FEDERAL DO RIO GRANDE DO SUL	14
UNIV FEDERAL MINAS GERAIS	13
GRENDENE SA	8
JOBE IND E COMERCIO PLASTICOS LTDA	7
UNIV FEDERAL LAVRAS	7
COMISSAO NACIONAL ENERGIA NUCLEAR	6

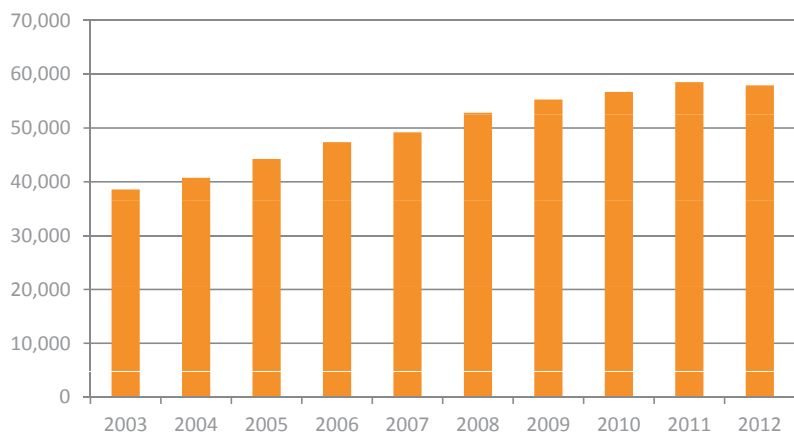
Brazilian innovation at an average of 4,000 inventions p.a. is less than fellow BRICs Russia, India and especially China, but higher than the other South American G20 countries (Argentina, Mexico). More applications from outside Brazil are made to protect inventions in Brazil than originate there, although the proportion of indigenous applications is increasing over time. Interestingly, for new inventions (basics) the Top 10 company lists for all basics and those originating from Brazil are the same; although three times as many patent applications originate from abroad, very few of these are for inventions new to Brazil – instead, they seek protection for existing inventions

in the Brazilian marketplace. Of the Top 10 organizations, six are academic or government concerns. For the Top 10 patented technologies globally, Brazilian focus is on automotive electrics (0.16%), natural products (0.12%) and printed circuits and connectors (0.11%). For Brazilian technology per se, the highest share compared to global patenting is in agriculture & food (harvesting and butchering, processing meat) and petroleum transportation and storage. This reflects the structure of the Brazilian economy which is based on a plentiful supply of natural resources.

CANADA

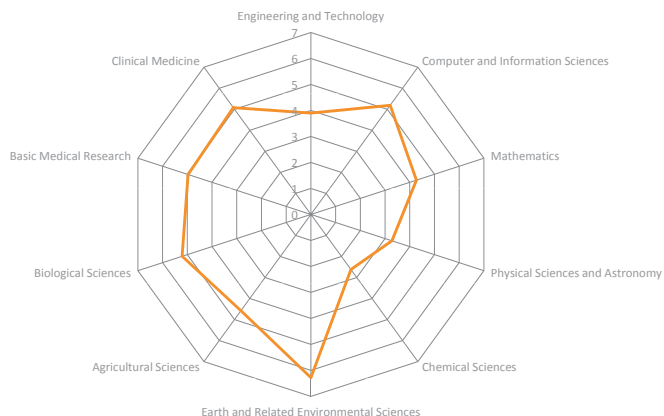
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

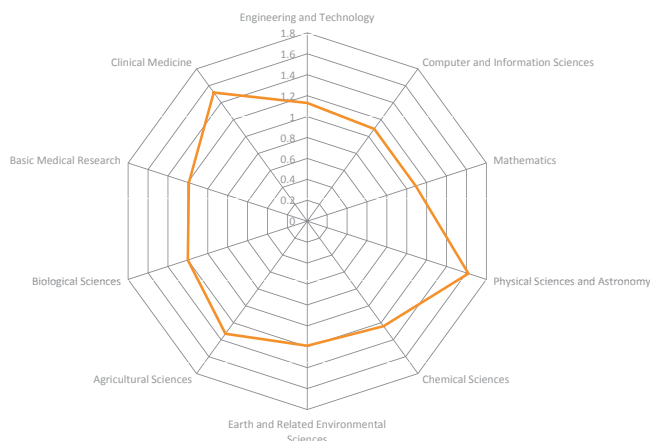


Population: 33.5 million (2011, Statistics Canada)
 GDP (PPP): 1,535 billion \$ (est. 2013, International Monetary Fund)
 GERD (billion current PPP\$): 24.3 (2011, MSTI, OECD)
 GERD as % of GDP: 1.74 (2011, MSTI, OECD)
 BERD as % of GDP: .81 (2011, MSTI, OECD)
 Researchers (FTE) thousands: 149.1 (2010, MSTI, OECD)
 R&D personnel per thousand labor force: 11.91 (2010, MSTI, OECD)

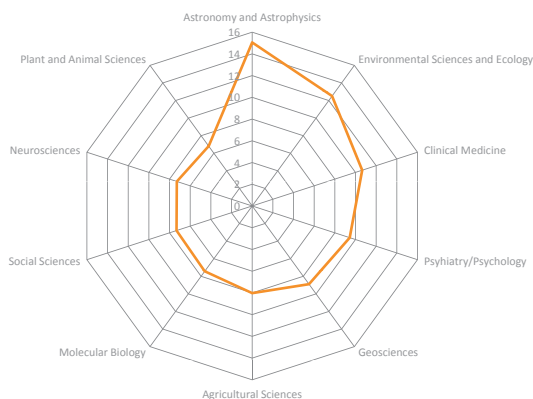
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



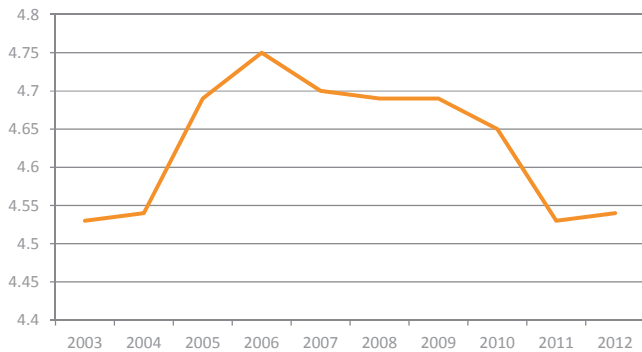
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



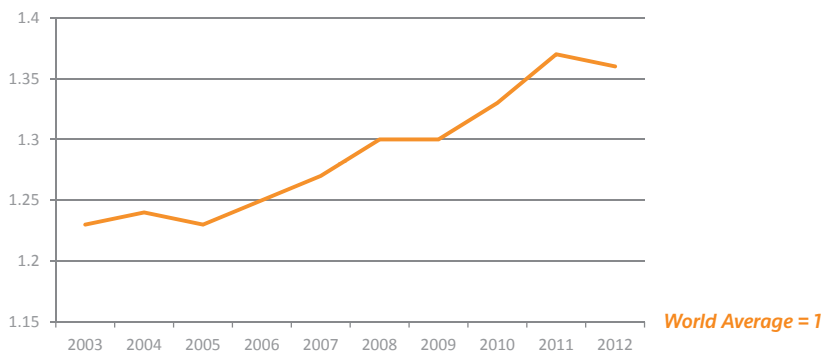
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



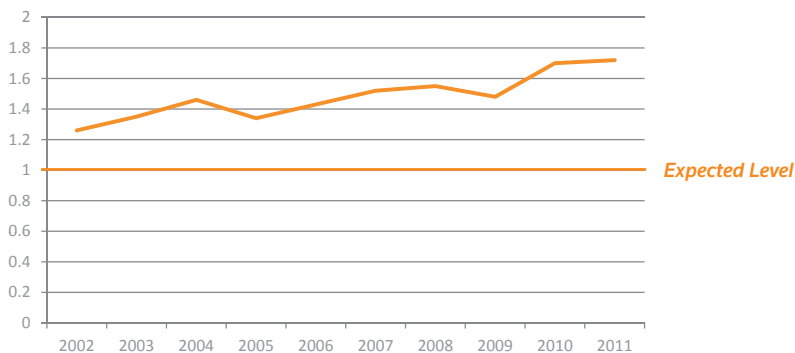
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)

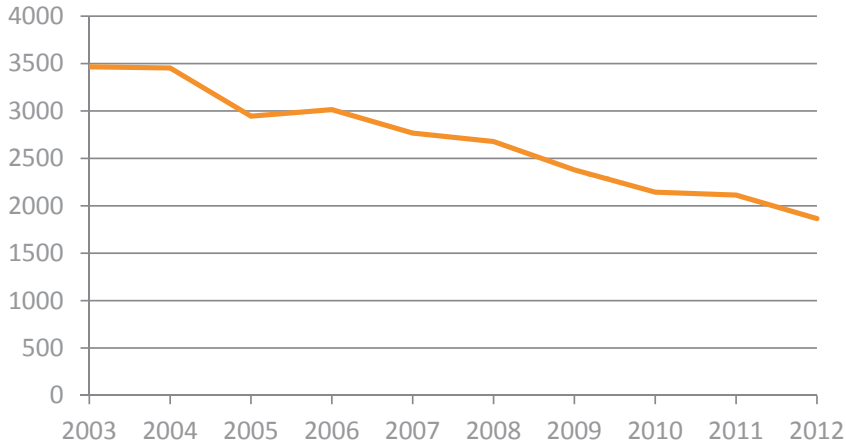


Canada's share of world research output was unchanged over the last decade, ending in 2012, where it began in 2003 at 4.5%. Citation impact, however, rose from 23% to 36% above the world average during the period. Also, highly cited papers as a percent of the nation's output increased from 1.3% in 2002 to 1.7% by 2011, well above the expected level of 1%. In the last five years, 2008 to 2012, Canada captured its highest world share of papers in earth and related environmental sciences, according to the OECD classification scheme. Environmental sciences and ecology was the Essential Science Indicators field in which the nation contributed its second largest share of the world's highly cited papers (geosciences was fifth according to this indicator). In both relative citation impact and share of highly cited papers, Canada also showed strength in clinical medicine and in agricultural sciences. As with many nations in this report, Canada's highest percent share of highly cited papers was in astronomy and astrophysics, which reflects intensive international collaboration on many large-scale, high-impact studies in this field.

CANADA

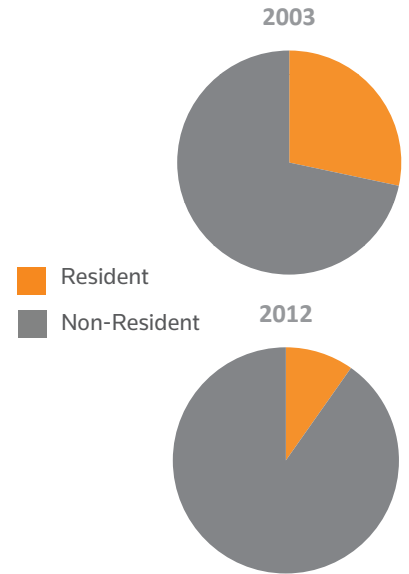
Intellectual Property Research

CA Patent Applications with CA Priority 2003-2012



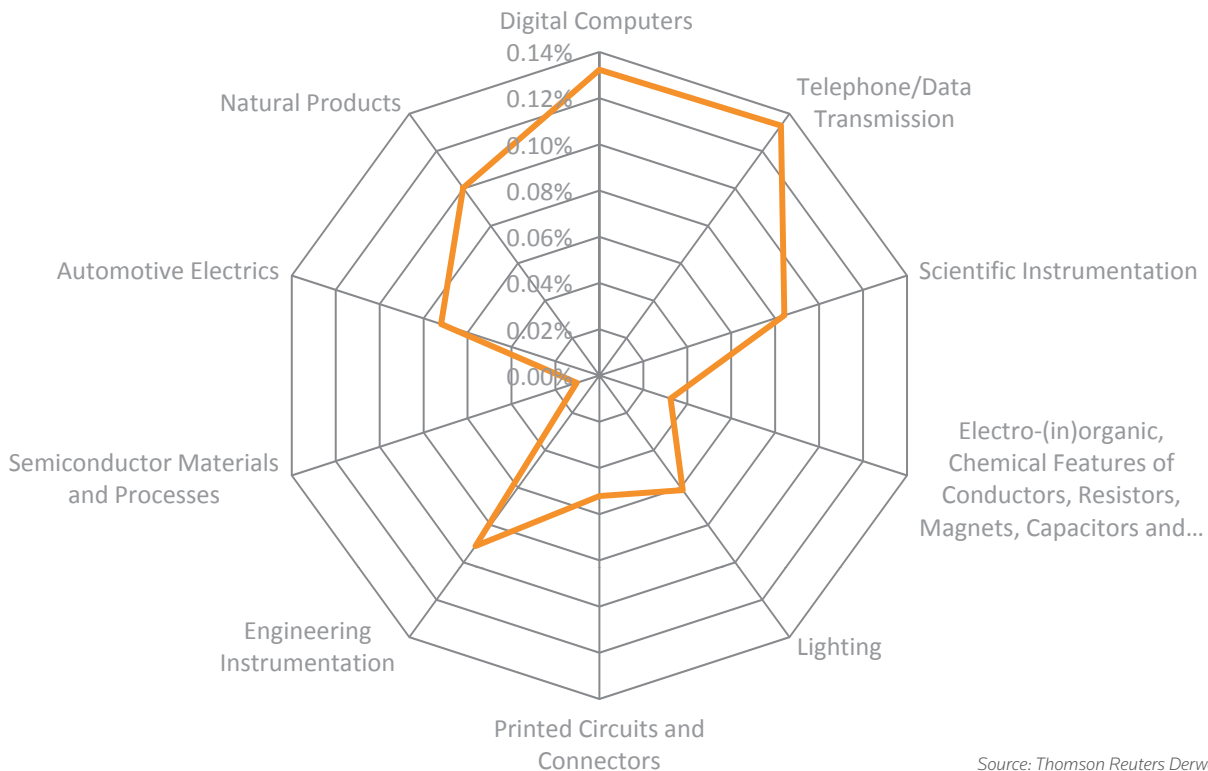
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



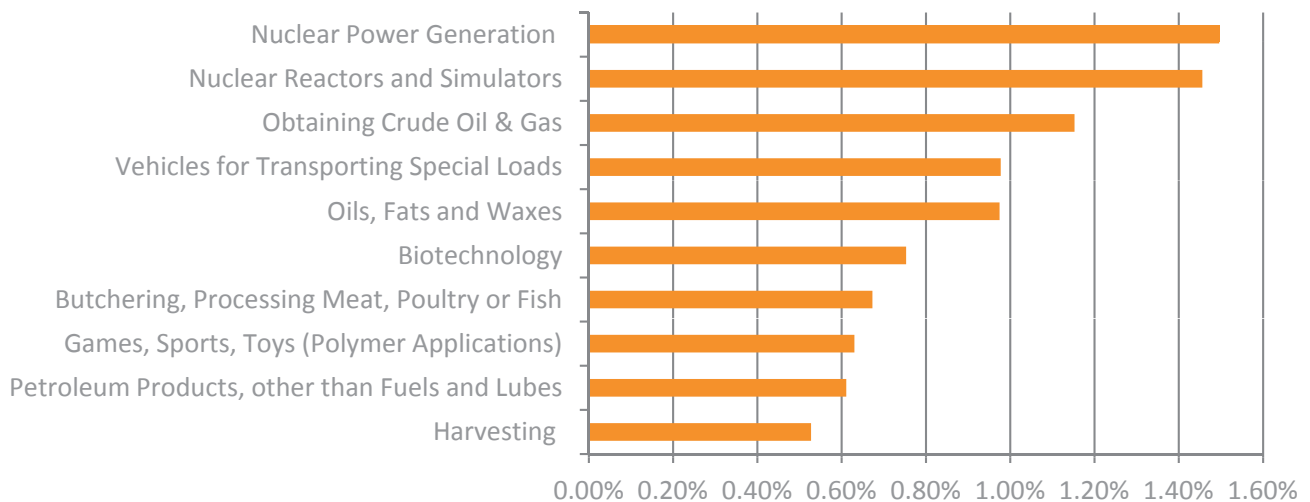
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL CA INVENTIONS 2012
TARGET BRANDS INC	53
PIONEER HI-BRED INT INC	42
RES IN MOTION LTD	36
ITRON INC	14
ATOMIC ENERGY OF CANADA LTD	13
SHELL INT RES MIJ BV	9
ACCENTURE GLOBAL SERVICES LTD	8
MICROSOFT CORP	8
PRATT&WHITNEY CANADA CORP	7
GE-HITACHI NUCLEAR ENERGY CANADA INC	6

COMPANY - RESIDENT	CA INVENTIONS WITH CA PRIORITY 2012
RES IN MOTION LTD	36
ATOMIC ENERGY OF CANADA LTD	13
PRATT&WHITNEY CANADA CORP	7
GE-HITACHI NUCLEAR ENERGY CANADA INC	6
MACDON IND LTD	6
WESTPORT POWER INC	6
ZERO WASTE ENERGY SYSTEMS INC	6
SPORT MASKA INC	5
BAUER HOCKEY CORP	4
GRK CANADA LTD	4

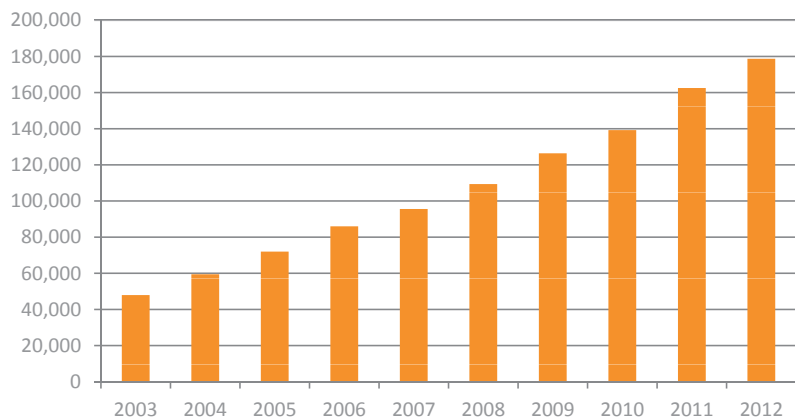
Canadian innovation, as measured by published CA patent applications originating from Canada, has progressively slowed over the decade from around 3,500 inventions in 2003 to just below 2,000 inventions in 2012. At the same time that indigenous applications have been falling, there has been a corresponding rise in foreign applications causing the share of resident versus non-resident applications to decline from over 25% in 2003 to under 10% in 2012. The list of Top 10 companies for all basics published in 2012 however still shows a significant presence of Canadian

concerns with Research in Motion (now Blackberry) and Atomic Energy of Canada featuring prominently. Canada's share of the global Top 10 technologies is balanced between digital computers and telephone/data transmission (both at 0.13%) followed by natural products (0.10%) and engineering instrumentation (0.09%). Innovation originating from Canada as a proportion of global patenting is focused on energy including the nuclear industry (nuclear power generation (1.5%), nuclear reactors and simulators (1.46%)) and obtaining crude oil & gas (1.15%).

CHINA

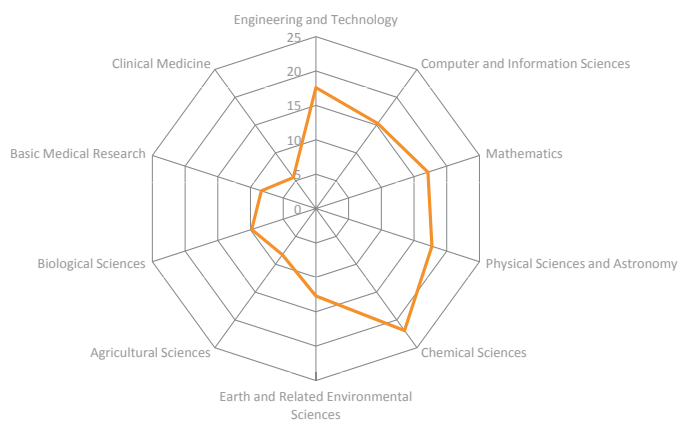
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

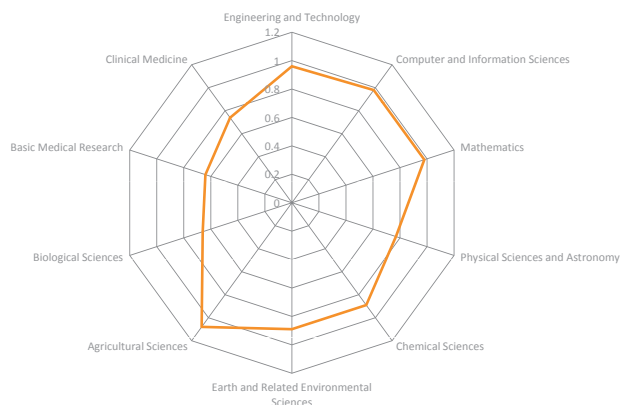


Population: 1,353.8 million (est. 2012, National Bureau of Statistics of China)
 GDP (PPP): 12,405 billion \$ (est. 2012, International Monetary Fund)
 GERD (billion current PPP\$): 208.2 (2011, MSTI, OECD)
 GERD as % of GDP: 1.84 (2011, MSTI, OECD)
 BERD as % of GDP: 1.36 (2011, MSTI, OECD)
 Researchers (FTE) thousands: 1,318.1 (2011, MSTI, OECD)
 R&D personnel per thousand labor force: 3.67 (2011, MSTI, OECD)

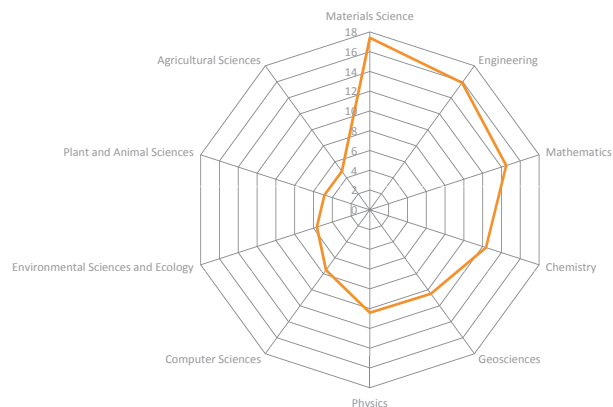
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



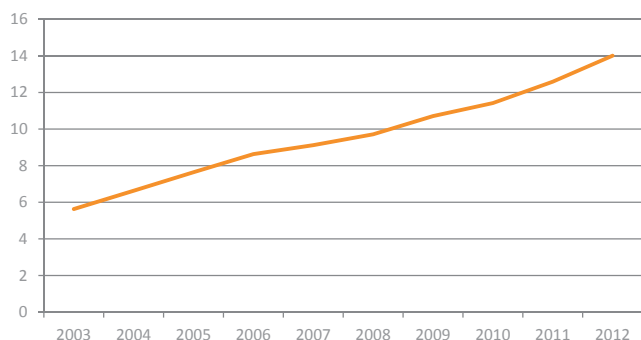
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



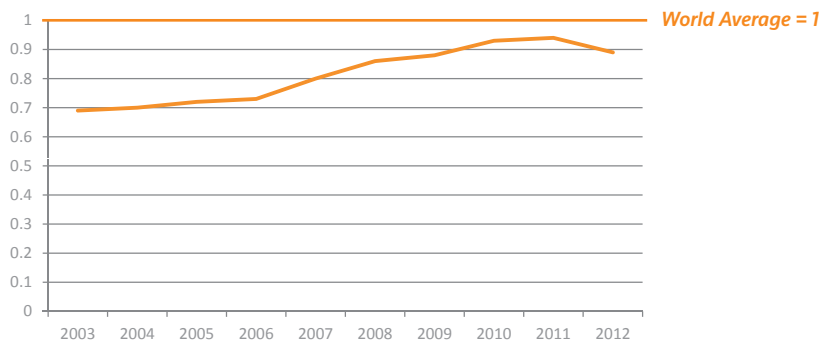
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



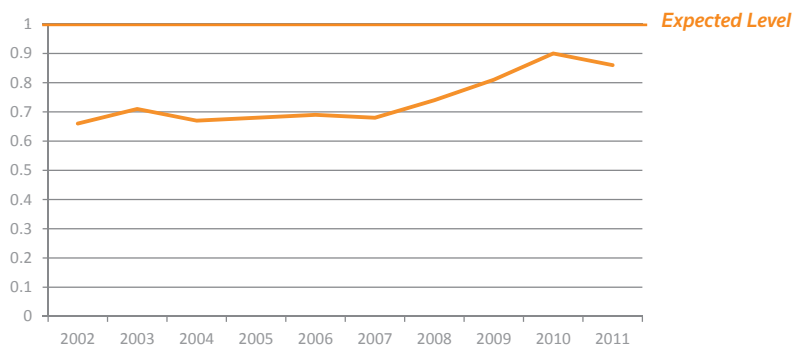
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)



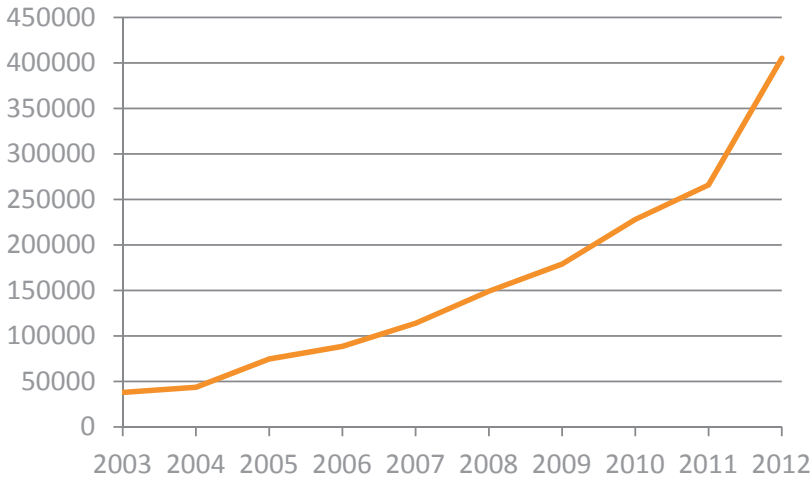
In the global landscape of scientific activity and publishing, the most significant change during the last three decades has been the rise of China. In the last decade alone, the nation's output of papers indexed in Web of Science increased from 47,937 in 2003 to 178,716 in 2012, resulting in a world share that rocketed from 5.6% to 14%. At the beginning of the 1980s, China claimed a world share of less than .5%. Since the 1990s, and the establishment of the government's 211 and 985 programs, China has built a broad capacity for scientific research in terms of people, funding and facilities – all of which expressed itself in a massive increase in publication output. And now citation impact, which has long been well below world average, is moving steadily upward. For 2012, China's citation impact stood just 11% below the world level; in the next few years, this measure will surpass that mark and come more in line with traditional research leaders, including many EU nations. The same holds for production of highly cited papers, also now nearing the expected level of 1% of output. The physical sciences - especially materials science, chemistry and physics - are emphasized in the Chinese research portfolio. In these fields, along with engineering, mathematics and geosciences, China recorded its largest shares of the world's highly cited papers, 2002 to 2011. The biological sciences have lagged in development but are recently receiving more attention. China's citation impact in agricultural sciences was 8% above world average in the last five years, despite the nation's relatively low research output in this area. China now ranks second globally in number of papers indexed in Web of Science.

Also see: J. Adams, D. Pendlebury, and B. Stembridge, Building BRICKS: Exploring the Global Research and Innovation Impact of Brazil, Russia, India, China, and South Korea, February 2013 <http://sciencewatch.com/sites/sw/files/sw-article/media/grr-brick.pdf> and J. Adams, C. King, and N. Ma, Global Research Report: China. Research and Collaboration in the New Geography of Science, November 2009 <http://sciencewatch.com/sites/sw/files/sw-article/media/grr-china-nov09.pdf>

CHINA

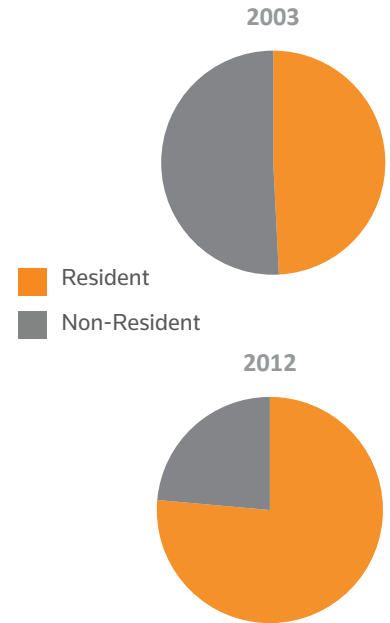
Intellectual Property Research

CN Patent Applications with CN Priority 2003-2012



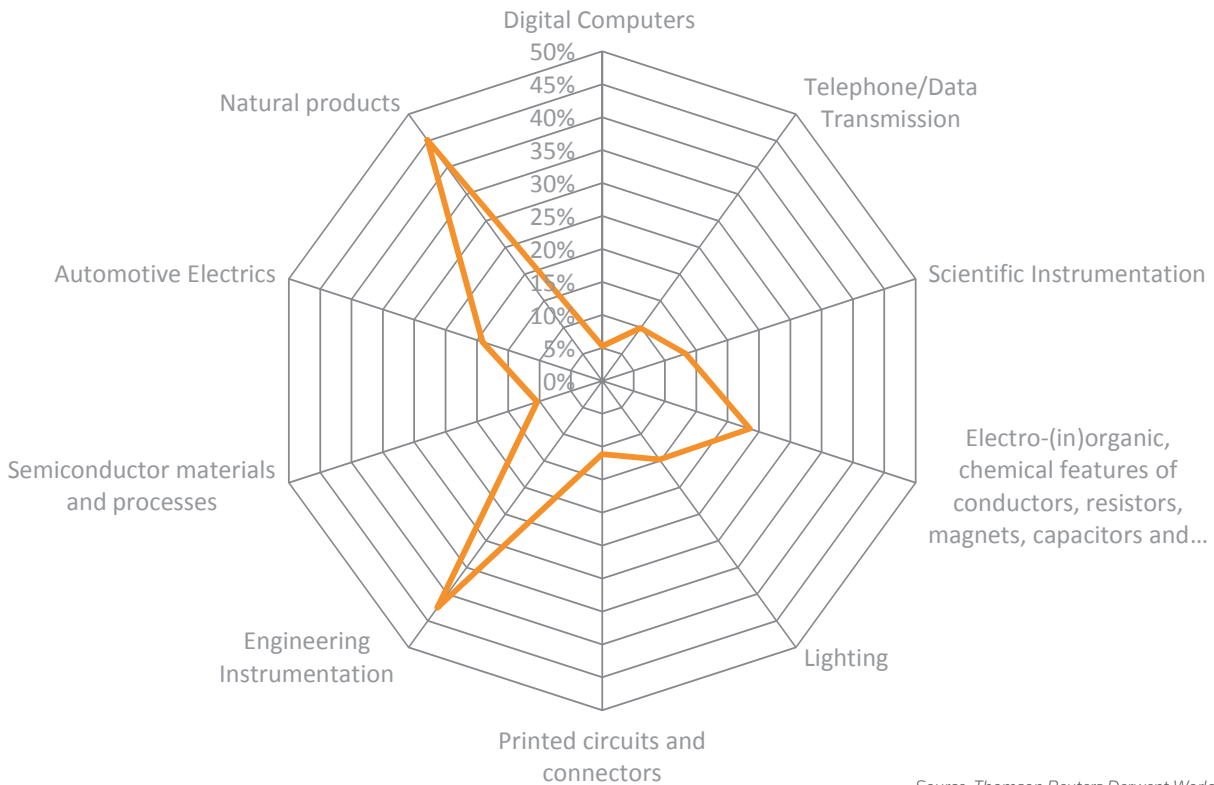
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



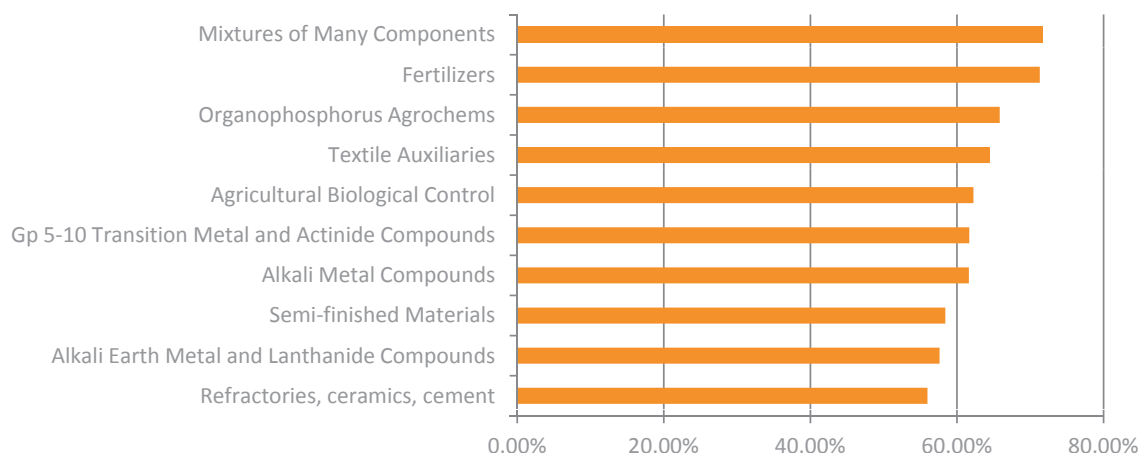
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL CN INVENTIONS 2012
ZTE CORP	2532
SINOPEC CHINA PETROCHEMICAL CO LTD	2491
UNIV ZHEJIANG	2441
HUAWEI TECHNOLOGIES CO LTD	2342
UNIV TSINGHUA	1911
UNIV SHANGHAI JIAOTONG	1697
HON HAI PRECISION IND CO LTD	1645
UNIV SOUTHEAST	1584
HARBIN INST TECHNOLOGY	1583
HONGFUJIN PRECISION IND SHENZHEN CO LTD	1426

COMPANY - RESIDENT	CN INVENTIONS WITH CN PRIORITY 2012
ZTE CORP	2532
SINOPEC CHINA PETROCHEMICAL CO LTD	2491
UNIV ZHEJIANG	2441
HUAWEI TECHNOLOGIES CO LTD	2342
UNIV TSINGHUA	1911
UNIV SHANGHAI JIAOTONG	1697
HON HAI PRECISION IND CO LTD	1645
UNIV SOUTHEAST	1584
HARBIN INST TECHNOLOGY	1583
HONGFUJIN PRECISION IND SHENZHEN CO LTD	1426

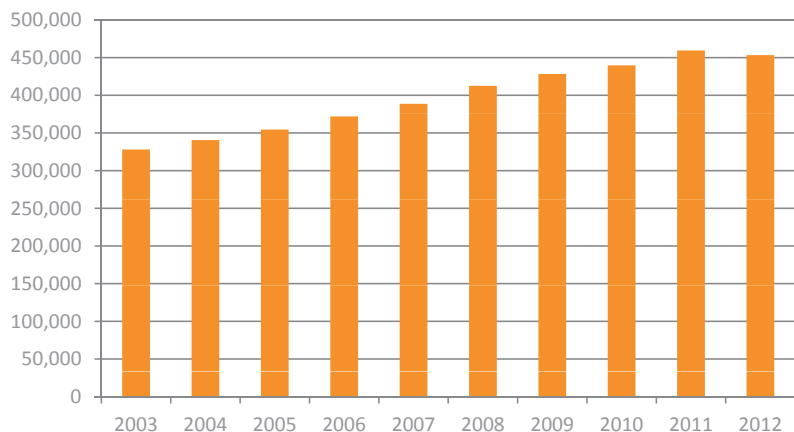
China's dramatic surge in patenting over the last decade has been well documented elsewhere - and is again shown here - with the increase in Chinese priority invention patent applications from less than 40,000 in 2003 to over 400,000 in 2012. In that time the ratio of domestic to foreign applications also shifted from just under 50% to over 75%. The spectacular growth in patenting in China is fueled by homegrown innovation. This is borne out by the Top 10 lists of organizations for 2012 - like fellow BRIC Brazil, both lists for all basics and those originating from China are the same. Similar to Brazil, a significant proportion of these are academic or government entities. China's share of the global Top 10 technologies is also high with 45%

of natural products and 43% of engineering instrumentation inventions globally originating from China. By contrast, only a relatively modest 5.25% of digital computer inventions come from China. For Chinese indigenous innovation, 72% of all basics classified in the chemical class for mixtures of many components (Derwent Class E37) come from China. Similarly, 71% of fertilizer inventions and 66% of organophosphorus agrochemical inventions have Chinese basic patent applications. In 2012, much of Chinese innovation relative to global activity is still focused on basic chemistry and agricultural technology.

EUROPEAN UNION

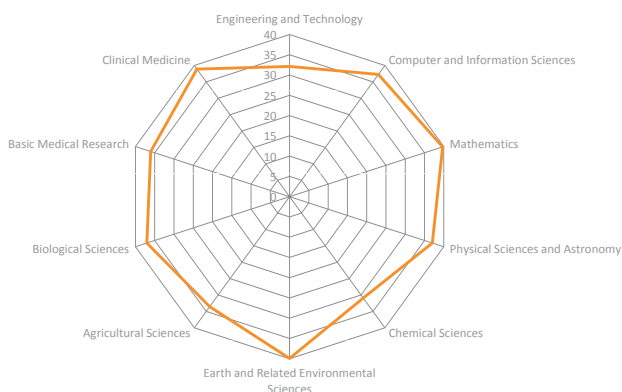
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

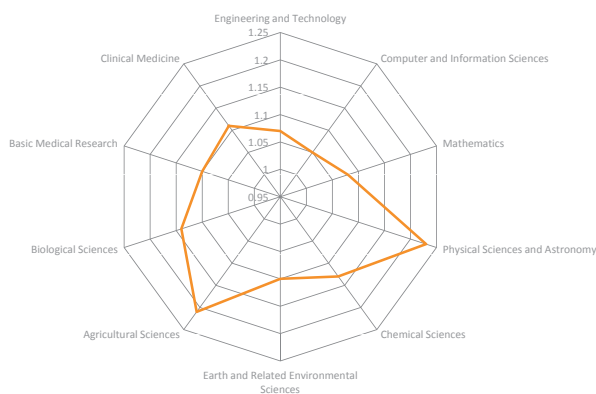


Population: 507.9 million (est. 2012, Eurostat)
 GDP (PPP): 15,821 billion \$ (est. 2011, International Monetary Fund)
 GERD (billion current PPP\$): 320.5 (2011, MSTI, OECD)
 GERD as % of GDP: 1.94 (2011, MSTI, OECD)
 BERD as % of GDP: 1.02 (2010, MSTI, OECD)
 Researchers (FTE) thousands: 1,595.6 (2010, MSTI, OECD)
 R&D personnel per thousand labor force: 10.72 (2011, MSTI, OECD)

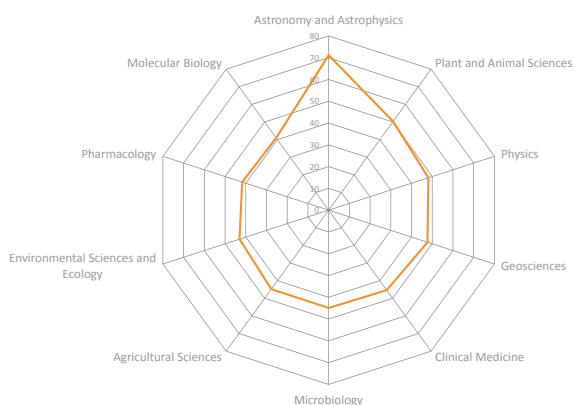
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



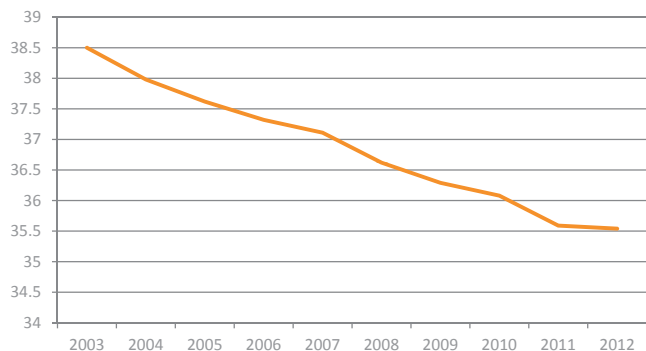
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



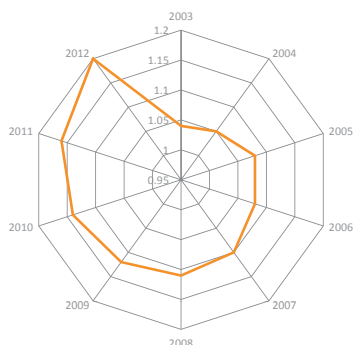
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



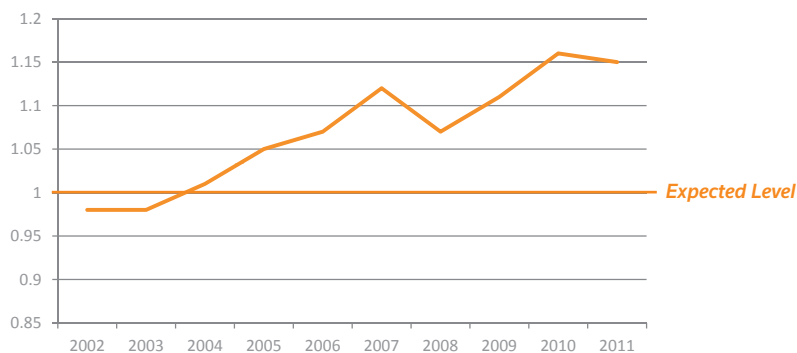
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)

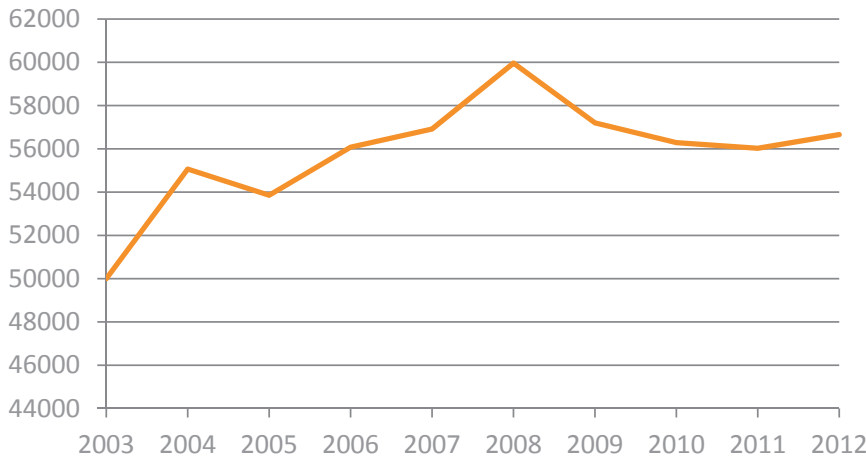


As a federation of 28 diverse states, the European Union is not strictly comparable to individual nations featured in this report. In terms of gross domestic product, however, the European Union and the United States are similar; also, as historical regional leaders in global research, comparing and contrasting the activity and performance of each seems reasonable. As of 2012, the then 27 European Union nations collectively published 453,340 Web of Science papers for a world share of 35.5%. While output grew 38% since 2003, from 328,034 papers that year, EU world share declined 3% from 38.5% a decade ago. The figures for the United States were 281,503 papers (33% world share) in 2003 and 354,269 papers (27.8% share) in 2012. Thus, world share declined for both as developing nations published papers at a faster rate than the more mature European Union and United States. Citation impact for the European Union rose from 4% to 20% above world average from 2003 to 2012, more dramatically than that for the United States (42% to 45% above world average during the same period). The European Union's percentage of the world's highly cited papers as a function of its output rose from just below 1%, the expected level, to 1.2% by 2012—a substantial increase. The same indicator for the United States was significantly higher, around 1.8% of output, but flat over the decade in contrast to a rise for the European Union. World shares by discipline for the European Union, 2008 to 2012, cluster closely around its overall share, unlike the United States which exhibits more dispersion. The European Union's output tilted slightly toward earth and related environmental sciences, biological and biomedical sciences, computer and information sciences, and physical sciences and astronomy, and somewhat less to chemical sciences, engineering and technology, and agricultural sciences. Citation impact for the five-year period was highest for the European Union in physical sciences and astronomy and in agricultural sciences, at 23% and 21% above world average, respectively. The top fields for the European Union by world share of highly cited papers, 2002 to 2011, were astronomy and astrophysics, plant and animal sciences, physics, geosciences and clinical medicine. By comparison, only astrophysics and astronomy ranked in the top five for the United States by the same indicator. As noted, it is a field with a high degree of international collaboration, so the finding is unsurprising.

EUROPEAN UNION

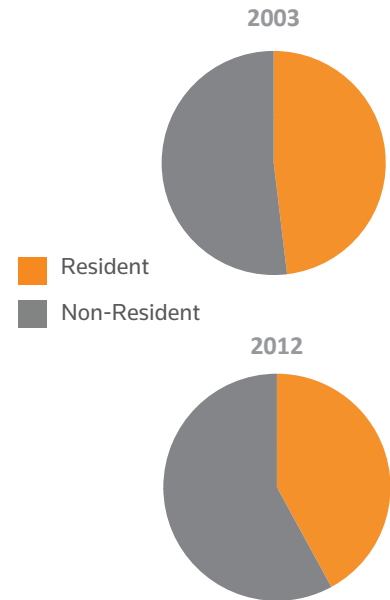
Intellectual Property Research

EU Patent Applications with EU Priority 2003-2012



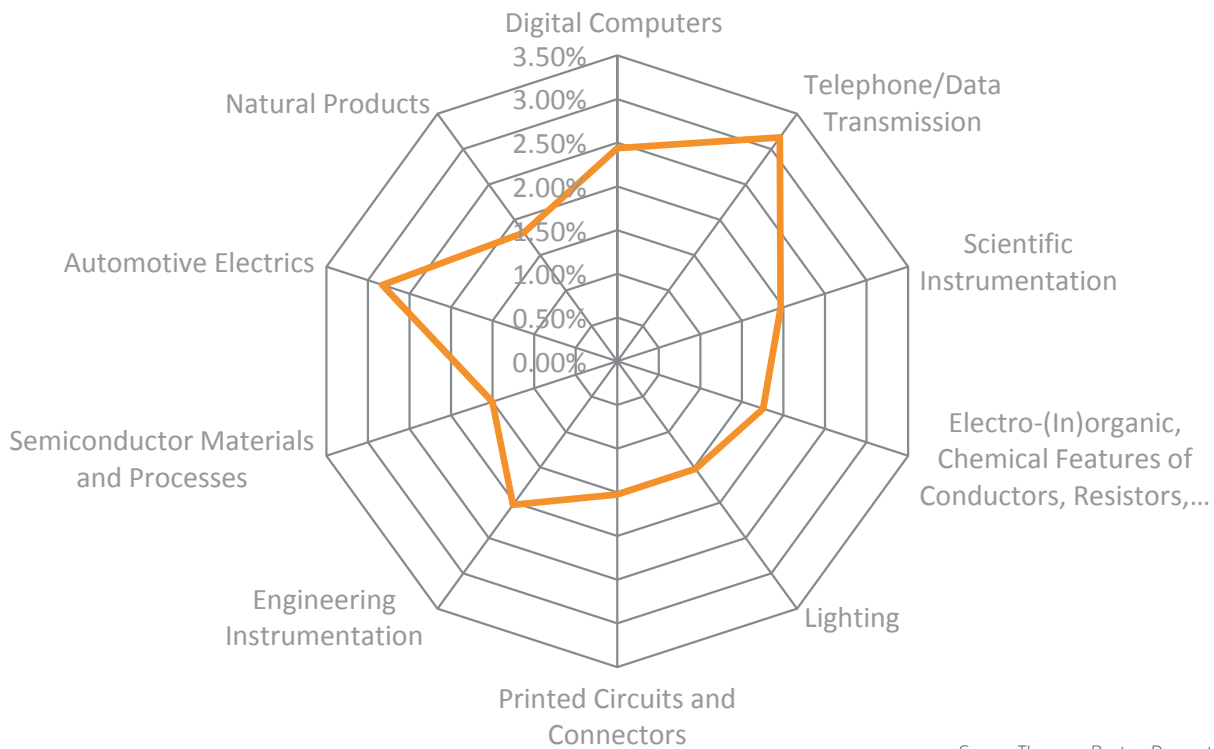
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



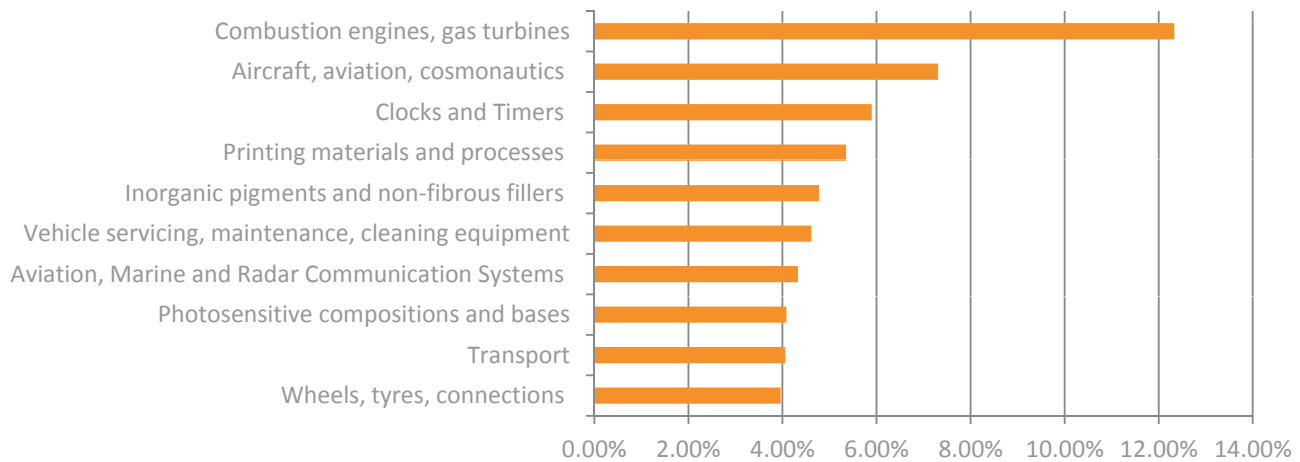
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL EPO INVENTIONS 2012
SIEMENS AG	764
SAMSUNG ELECTRONICS CO LTD	740
GENERAL ELECTRIC CO	617
RES IN MOTION LTD	565
ALCATEL LUCENT	453
SONY CORP	393
LG ELECTRONICS INC	309
CANON KK	284
HONEYWELL INT INC	238
BSH BOSCH&SIEMENS HAUSGERAETE GMBH	218

COMPANY - RESIDENT	EPO INVENTIONS WITH EPO PRIORITY 2012
SIEMENS AG	764
ALCATEL LUCENT	453
BSH BOSCH&SIEMENS HAUSGERAETE GMBH	218
TYCO HEALTHCARE GROUP LP	196
NXP BV	184
BOSCH GMBH ROBERT	165
ELECTROLUX HOME PROD CORP NV	158
ROLLS-ROYCE PLC	136
ABB TECHNOLOGY AG	127
ALSTOM TECHNOLOGY LTD	116

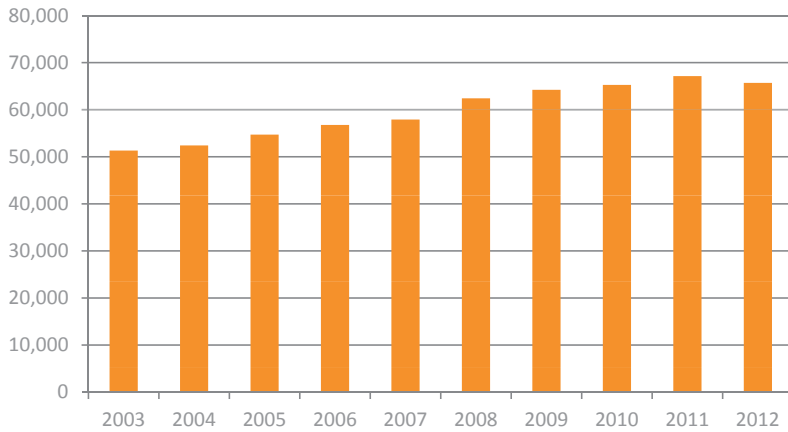
The G20 group of 20 major economies comprises 19 countries and one economic area: Europe. For the purposes of assessing innovation activity for this area, figures for patent applications published by the European Patent Office have been captured and analyzed. Innovation as measured by published EP priority patent applications grew significantly from 50,000 p.a. in 2003 to a peak of 60,000 in 2008. Levels then dropped to around 56,000 in 2011, but a slight resurgence was seen in 2012 to around 56,500 p.a. Slightly less than half of those applications originated from European concerns in 2003 falling somewhat to 42% in 2012. Although applications originating from Europe grew over the period, applications from outside Europe grew somewhat faster.

Interest in Europe as a major global economy is borne out by the Top 10 companies with EP inventions in 2012. Foreign companies seeking protection in this market come from Japan, the U.S., Canada and South Korea. Resident companies come from across Europe including companies from Germany, France, the Netherlands, the United Kingdom and Switzerland. European share of the Top 10 global technologies is focused on telephone/data transmission (3.2%), automotive electrics (2.8%) and digital computers (2.4%). Innovation within Europe relative to global activity is focused on automotive, aerospace and other diverse technologies.

FRANCE

Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)



Population: 65.4 million (2012, Institut National de la Statistique et des Études Économiques)

GDP (PPP): 2,254 billion \$ (est. 2012, International Monetary Fund)

GERD (billion current PPP\$): 51.9 (2011, MSTI, OECD)

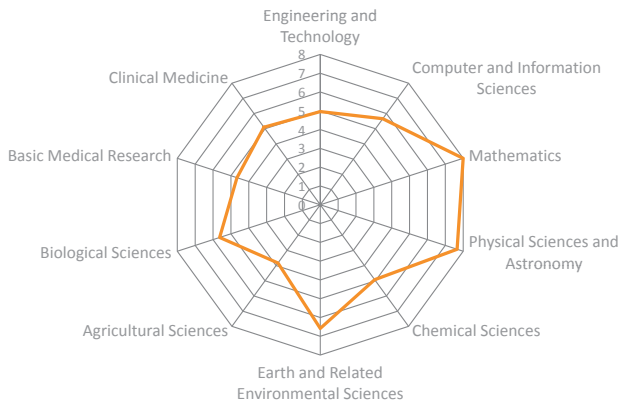
GERD as % of GDP: 2.24 (2011, MSTI, OECD)

BERD as % of GDP: 1.20 (2010, MSTI, OECD)

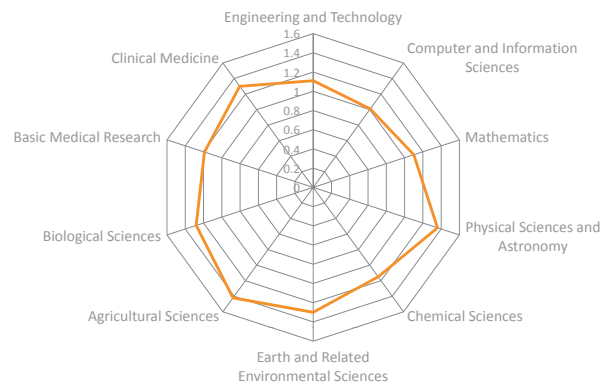
Researchers (FTE) thousands: 239.6 (2010, MSTI, OECD)

R&D personnel per thousand labor force: 13.87 (2010, MSTI, OECD)

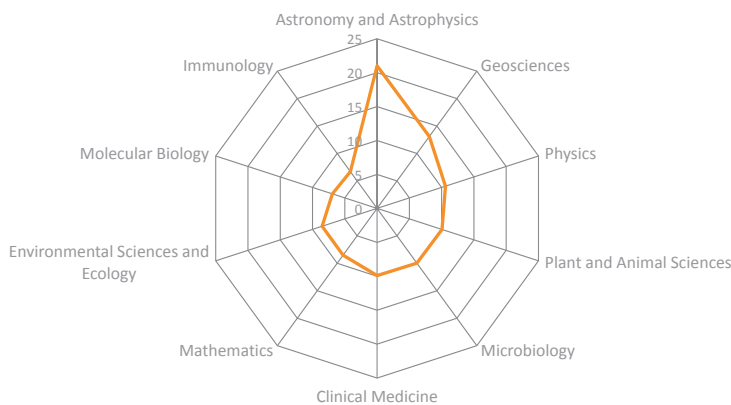
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



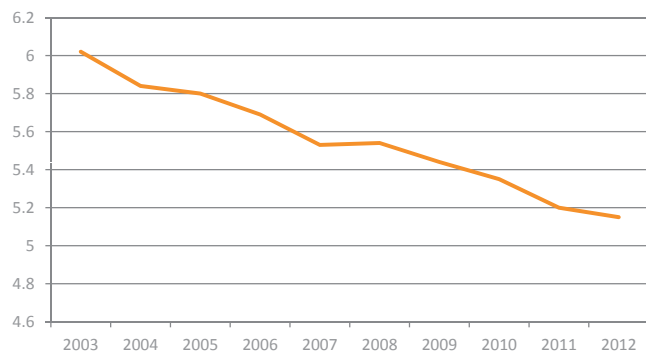
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



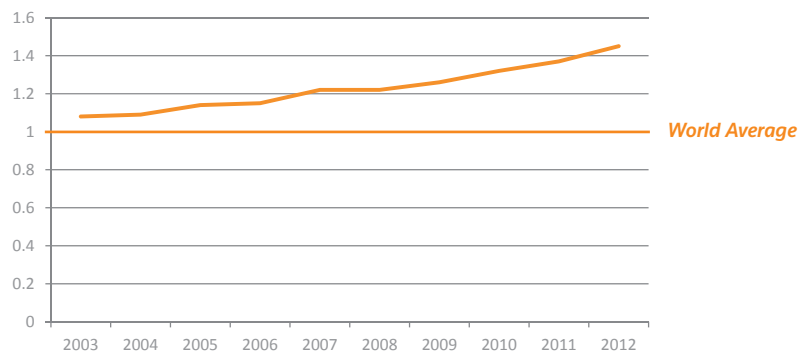
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



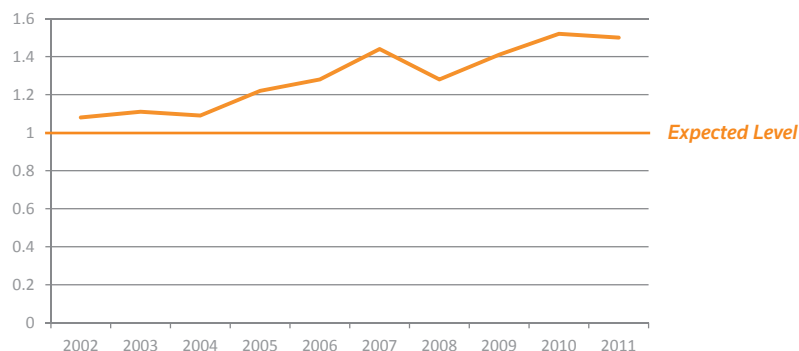
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)

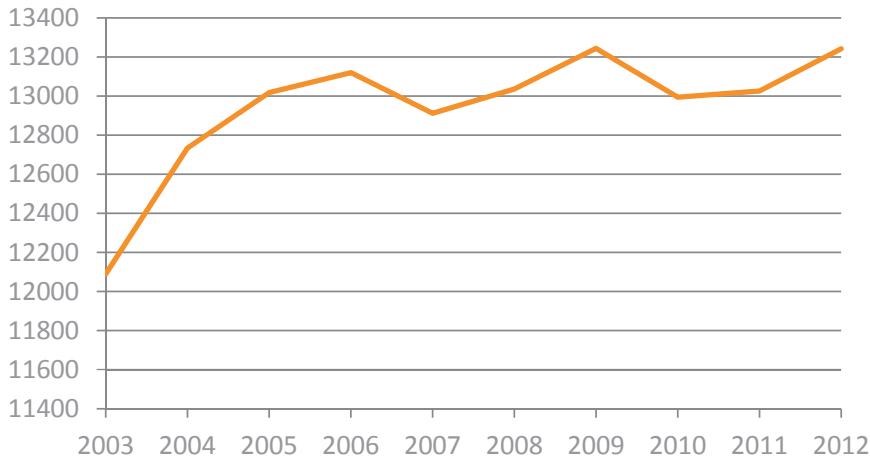


Despite a 28% increase in output during the last decade, from 51,317 papers in 2003 to 65,685 in 2012, France lost world share, from 6% to 5.2%, owing to the more rapid increase in production from other nations, principally China. World share, after all, is a zero sum game: as some advance more quickly others must fall behind. Over the period, however, the nation's citation impact improved from 8% to 45% above the world average, demonstrating that output, world share and citation impact are different phenomena. Earth or geosciences was a favored area of activity for French researchers, a field in which the nation achieved high world share, relative citation impact, and percent of the world's most influential papers. Mathematics, physics and astronomy, too, were focus areas, the last two exhibiting relatively high citation impact for France for the period 2008 to 2012. Agricultural sciences papers, however, actually produced the top score for France in relative citation impact (42% above the world average) during the last five years, according to the OECD's classification scheme. Curiously, it was not among the top 10 fields for the nation in world share of highly cited papers, which rose from a world share of 1.1% in 2002 to 1.5% in 2011. To a degree, this reflects the effect of growing international collaboration in the European sphere and on 'big science' highly cited projects, such as those of CERN, for which all nations represented on these reports receive publication and citation credit (see J. Adams, 'The fourth age of research,' *Nature*, 497, pages 557-560, 30 May 2013).

FRANCE

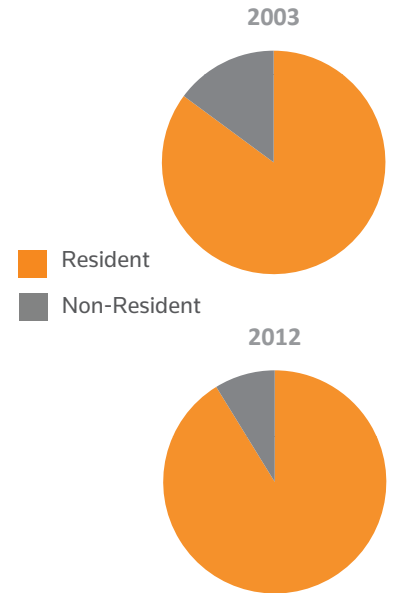
Intellectual Property Research

FR Patent Applications with FR Priority 2003-2012



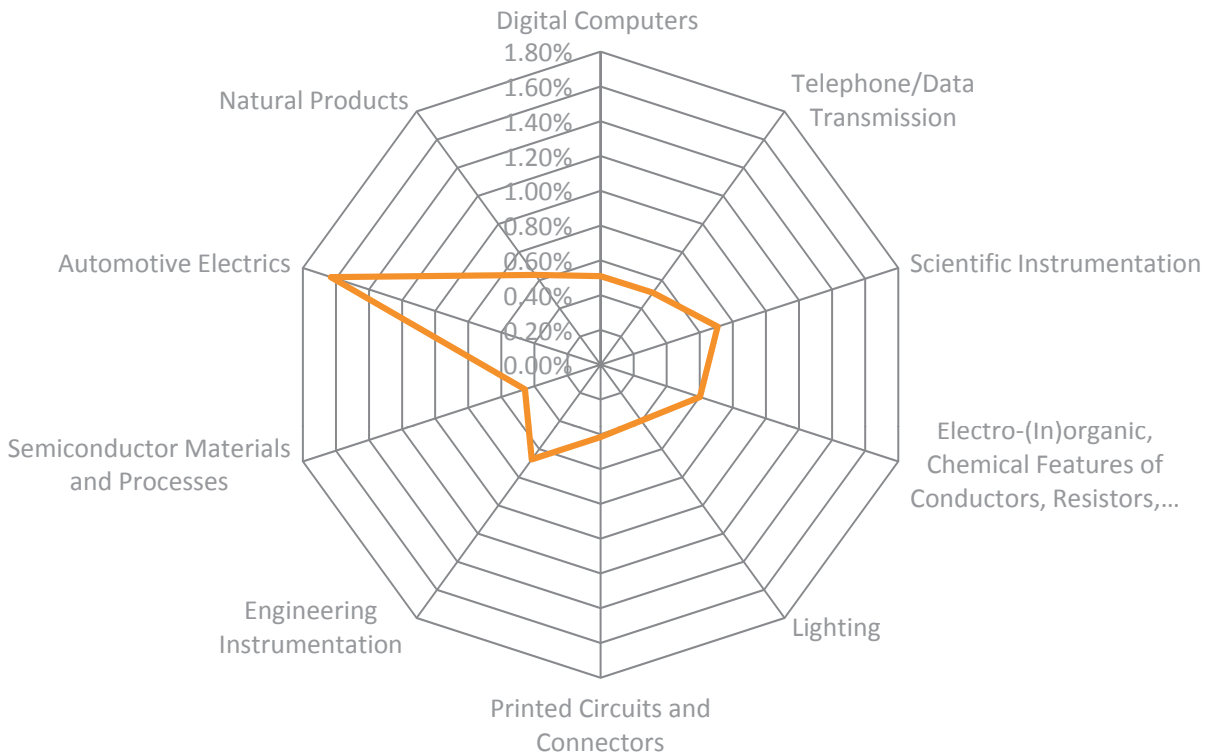
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



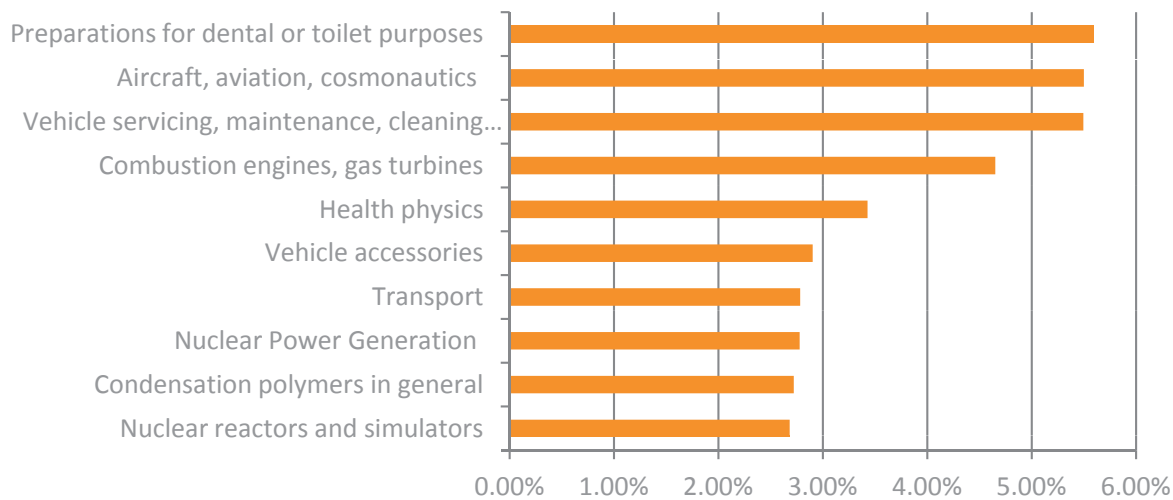
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL FR INVENTIONS 2012
PEUGEOT CITROEN AUTOMOBILES SA	1162
COMMISSARIAT ENERGIE ATOMIQUE	411
L'OREAL SA	408
CNRS	350
SNECMA	313
RENAULT SAS	295
FRANCE TELECOM	164
STMICROELECTRONICS SA	159
MICHELIN SOC TECHNOLOGIE	153
THALES	153

COMPANY - RESIDENT	FR INVENTIONS WITH FR PRIORITY 2012
PEUGEOT CITROEN AUTOMOBILES SA	1162
COMMISSARIAT ENERGIE ATOMIQUE	411
L'OREAL SA	408
CNRS	350
SNECMA	313
RENAULT SAS	295
FRANCE TELECOM	164
STMICROELECTRONICS SA	159
MICHELIN SOC TECHNOLOGIE	153
THALES	153

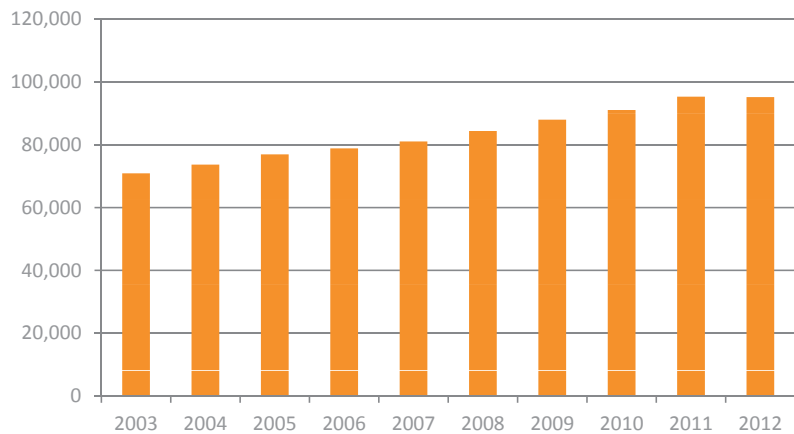
French innovation has been largely stable over the 10 years from 2003 to 2012 with around 13,000 published priority applications p.a. Most of that innovation is domestic, the percentage of which rose from 85% in 2003 to over 90% in 2012. This is confirmed by the Top 10 company lists which show that the Top 10 companies for all basics (foreign & resident) and for basics from resident companies only are the same. France's share of the Top 10 global technologies is biased towards automotive electrics (1.63%)

followed by scientific instrumentation (0.71%) and engineering instrumentation (0.67%). For French innovation relative to global patenting, dental or toilet preparations (5.60%), aviation (5.50%) and vehicle maintenance (5.49%) are prominent, reflecting France's economic profile of cosmetics, aerospace and automotive technology sectors. This again is reflected in the Top 10 company lists.

GERMANY

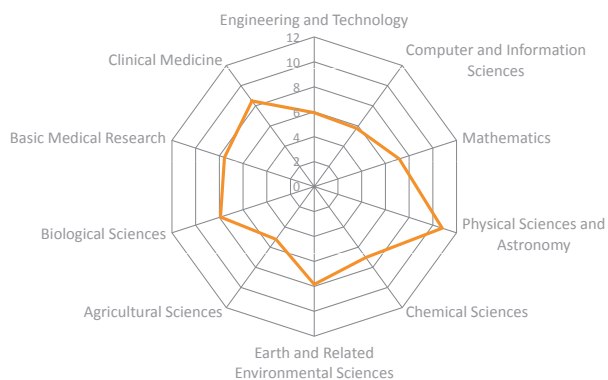
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

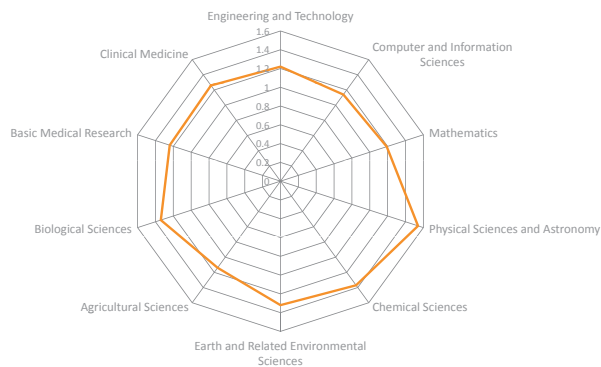


Population: 80.4 million (est. 2012, Statistisches Bundesamt)
 GDP (PPP): 3,197 billion \$ (est. 2012, International Monetary Fund)
 GERD (billion current PPP\$): 93.1 (2011, MSTI, OECD)
 GERD as % of GDP: 2.88 (2011, MSTI, OECD)
 BERD as % of GDP: 1.84 (2010, MSTI, OECD)
 Researchers (FTE) thousands: 328.0 (2010, MSTI, OECD)
 R&D personnel per thousand labor force: 13.32 (2011, MSTI, OECD)

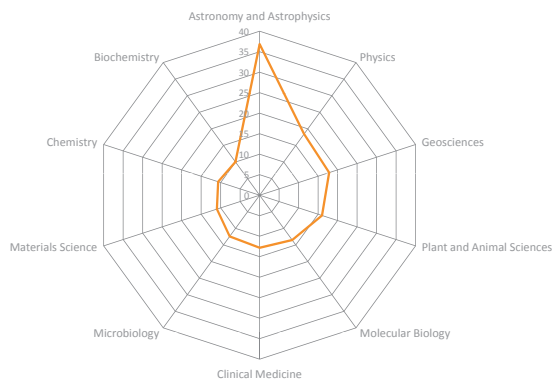
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



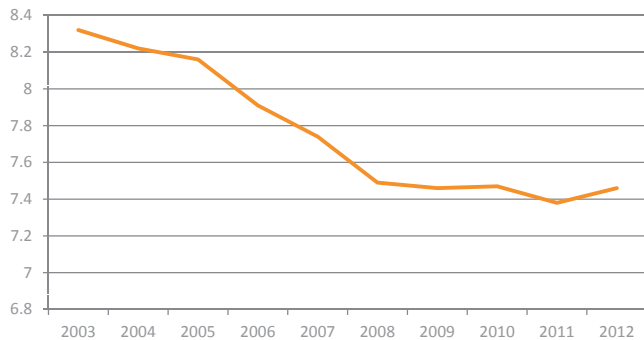
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



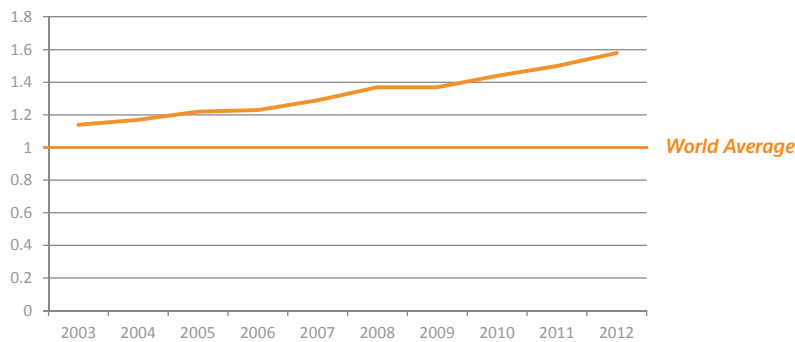
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



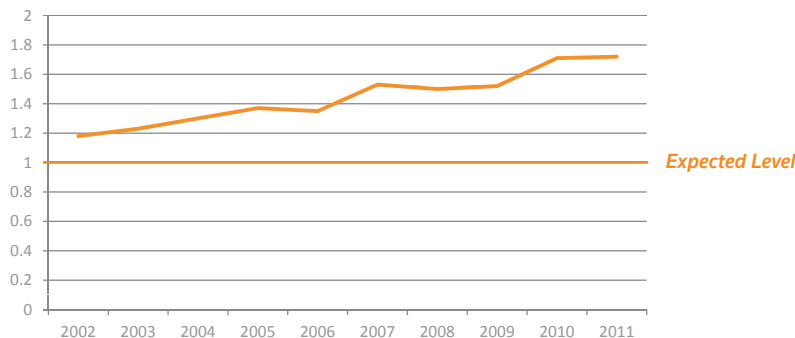
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)

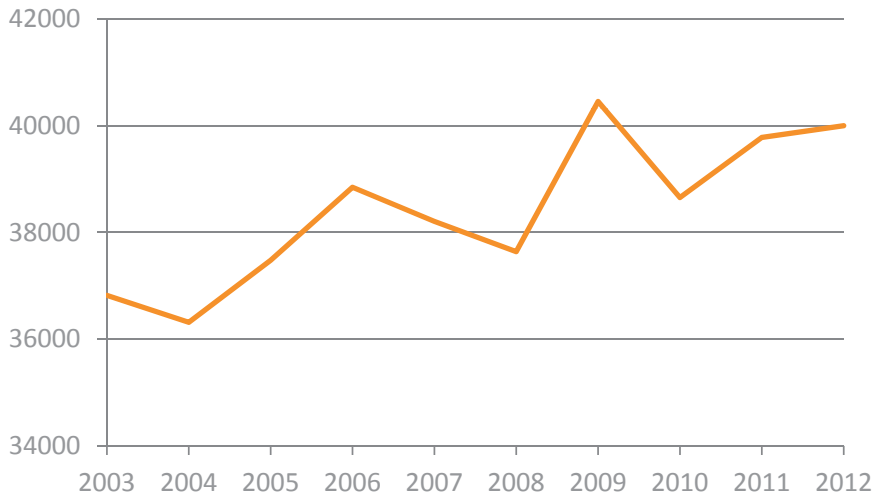


Germany - central to European science more than geographically - presents a picture of research performance similar to that of its neighbor France. Output increased some 34% during the past decade (70,912 papers in 2003 to 95,192 in 2012), but world share fell, from 8.3% to 7.5%. Citation impact, as with France, rose since 2003, from 14% to 58% above the world average. Germany's world share of highly cited papers—those cited in the top 1% by total citations taking into account their field and year of publication—also increased, from 1.2% to 1.7% for the period 2002 to 2011. With leadership of the Max Planck Society's institutes, German authors were represented on more than one third of all highly cited papers in astronomy and astrophysics over the last decade. Physics and astronomy is also the research area in which Germany held its largest world share of papers (10.8%) and highest relative citation impact (54% above the world average), 2008 to 2012, according to the OECD classification scheme. Germany's world share and citation impact in biological sciences during this five-year period was likewise quite strong. A survey of all indicators reveals more uniform performance in output and impact across the divide of physical and biological sciences than for other nations, which leaves the impression of a well-balanced research portfolio.

GERMANY

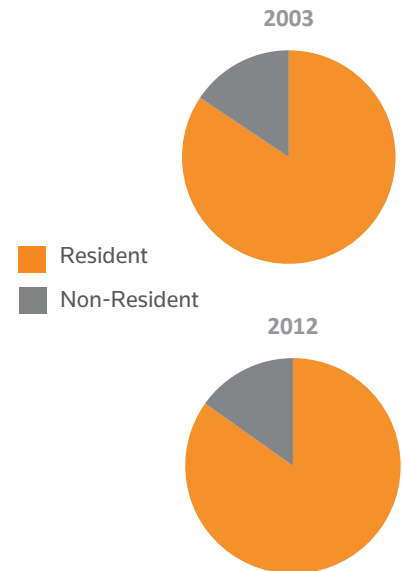
Intellectual Property Research

DE Patent Applications with DE Priority 2003-2012



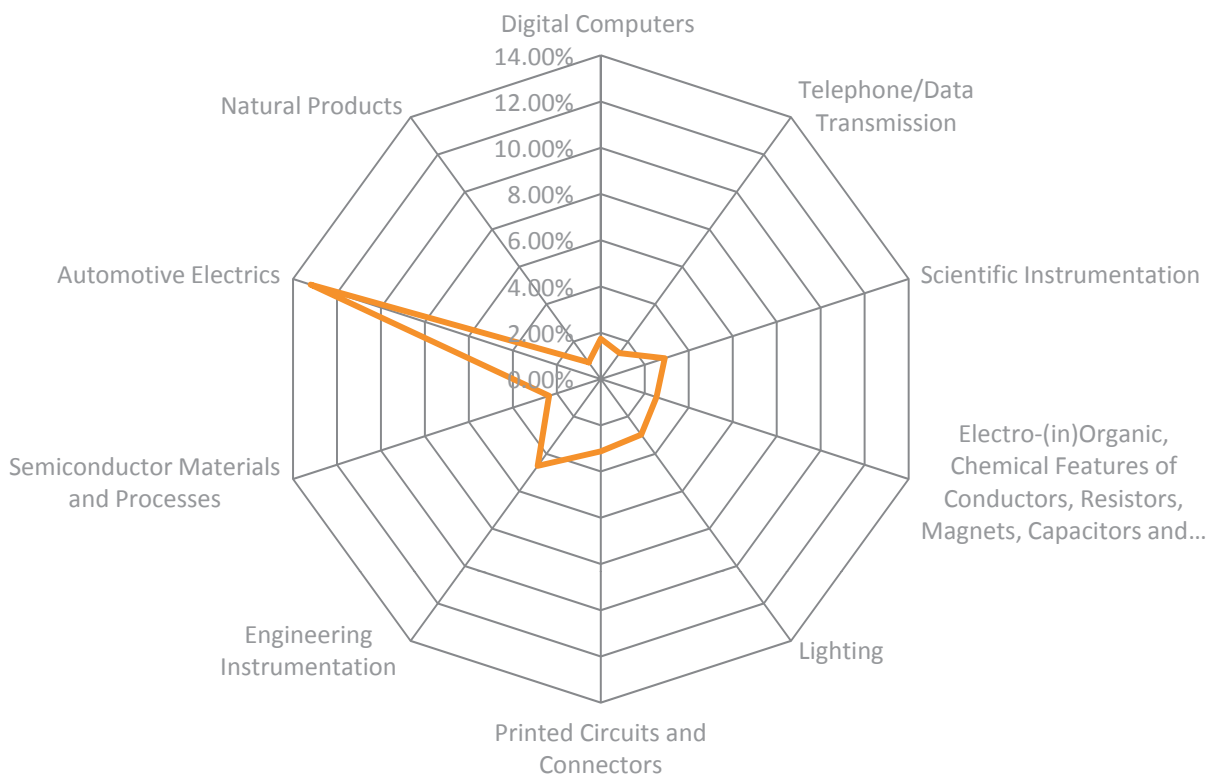
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



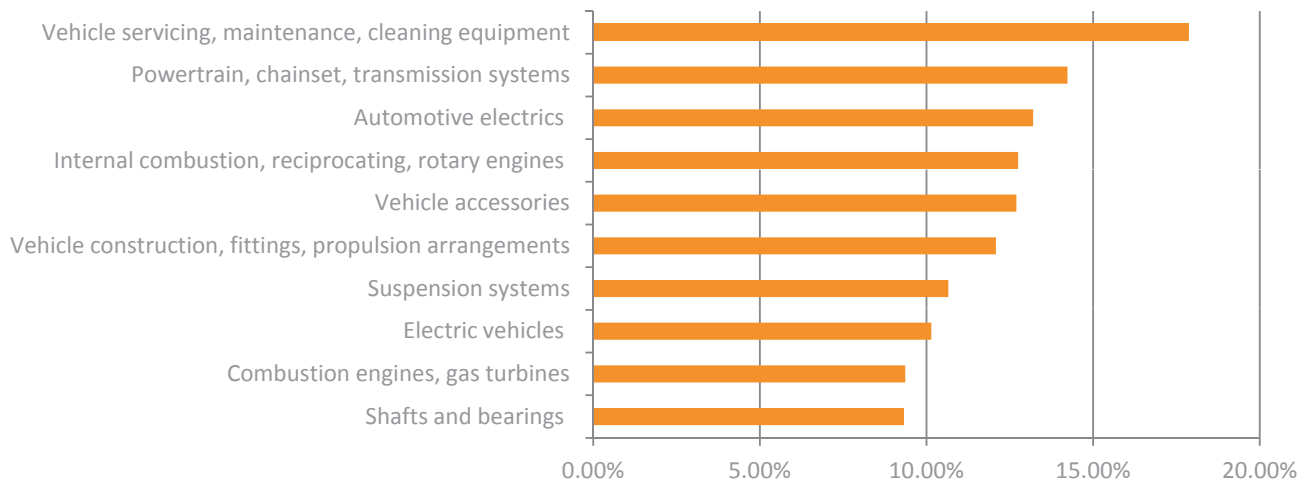
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL DE INVENTIONS 2012
BOSCH GMBH ROBERT	3361
DAIMLER AG	2171
SIEMENS AG	1653
GM GLOBAL TECHNOLOGY OPERATIONS INC	1295
SCHAEFFLER TECHNOLOGIES GMBH&CO KG	1068
BSH BOSCH&SIEMENS HAUSGERAETE GMBH	868
VOLKSWAGEN AG	614
ZF FRIEDRICHSHAFEN AG	572
AUDI AG	544
BAYERISCHE MOTOREN WERKE AG	524

COMPANY - RESIDENT	DE INVENTIONS WITH DE PRIORITY 2012
BOSCH GMBH ROBERT	3361
DAIMLER AG	2171
SIEMENS AG	1653
SCHAEFFLER TECHNOLOGIES GMBH&CO KG	1068
BSH BOSCH&SIEMENS HAUSGERAETE GMBH	868
VOLKSWAGEN AG	614
ZF FRIEDRICHSHAFEN AG	572
AUDI AG	544
BAYERISCHE MOTOREN WERKE AG	524
PORSCHE AG F	370

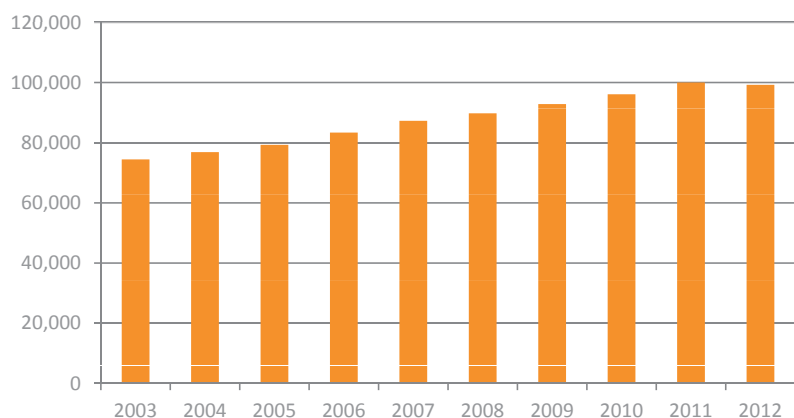
Germany, the economic powerhouse of Europe, shows modest but steady growth in innovation from 2003 to 2012. Much of this was driven by domestic innovation, with around 85% of applications originating from Germany consistently throughout the decade. The Top 10 list for companies with German basics published in 2012 is dominated by German automotive companies with only US-based GM (itself an automotive firm

with strong European links) joining. Germany's share of the Top 10 global technologies again reflects its world-renowned automotive industry with nearly 14% of global innovation in automotive electrics in 2012 originating from Germany. The automotive theme continues with all 10 of Germany's Top 10 technologies relative to global activity being in the automotive field.

GREAT BRITAIN

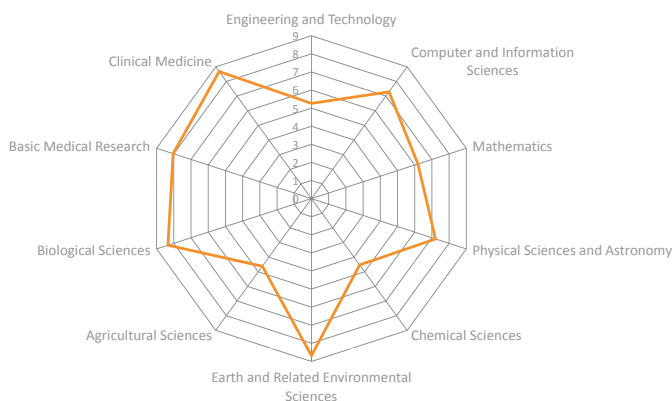
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

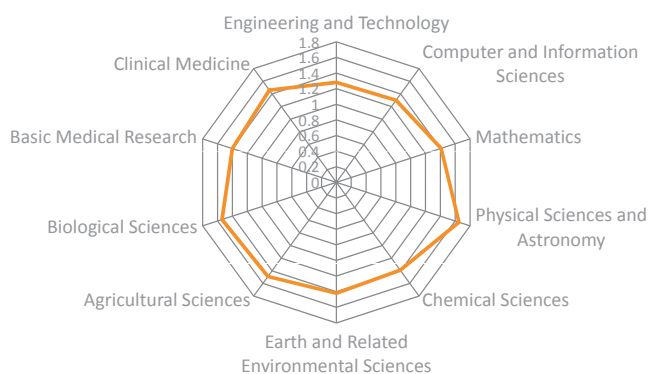


Population: 63.2 million (2011 census, Office for National Statistics, UK)
 GDP (PPP): 2,316 billion \$ (est. 2012, International Monetary Fund)
 GERD (billion current PPP\$): 39.6 (2011, MSTI, OECD)
 GERD as % of GDP: 1.77 (2011, MSTI, OECD)
 BERD as % of GDP: .79 (2011, MSTI, OECD)
 Researchers (FTE) thousands: 262.3 (2011, MSTI, OECD)
 R&D personnel per thousand labor force: 11.34 (2011, MSTI, OECD)

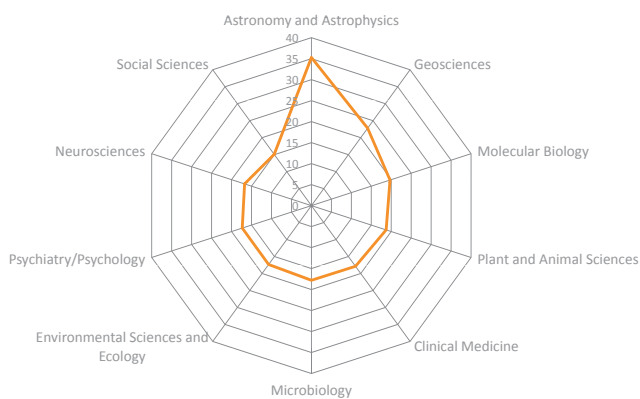
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



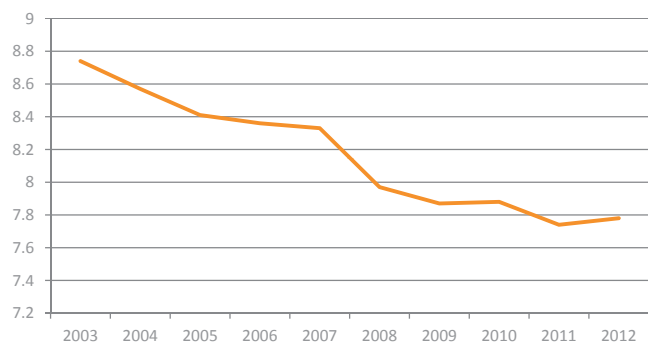
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



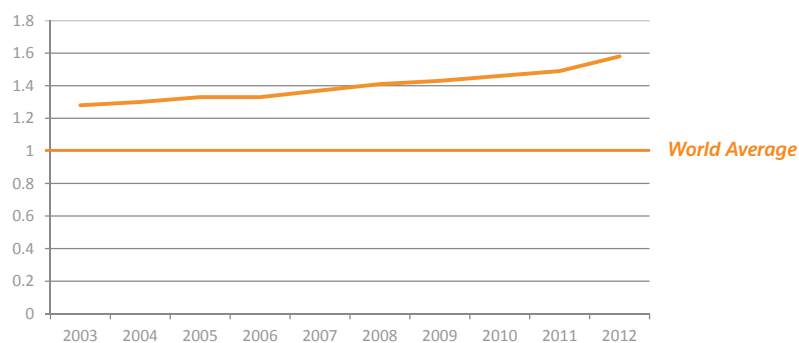
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



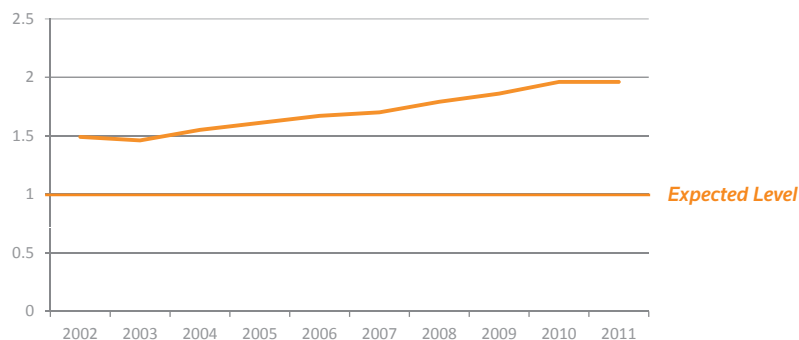
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)



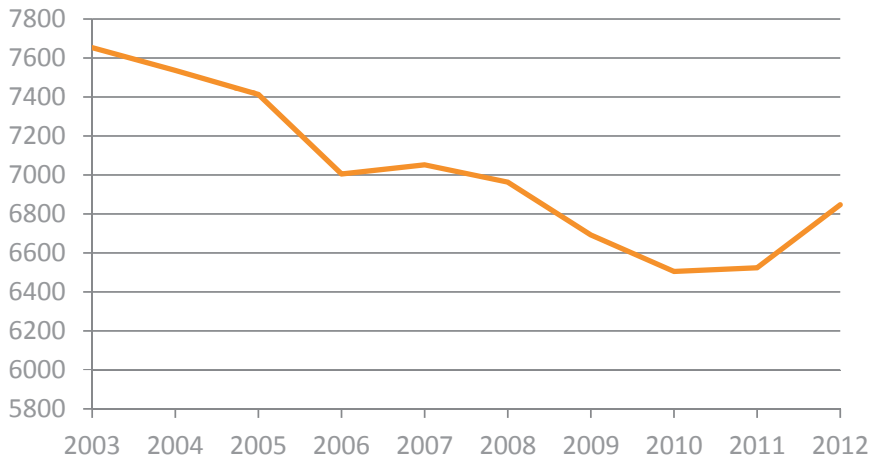
Great Britain's output in Web of Science increased by 33% from 2003 to 2012 (74,460 to 99,237 papers), but its world share during the decade fell from 8.7% to 7.8%. Prominent in the nation's research portfolio were the biological sciences. Its top disciplines for 2008 to 2012 ranked by world share were clinical medicine (8.7%), earth and related environmental sciences (also 8.7%), biological sciences (8.3%) and basic medical research (8%). These also exhibited high citation impact, in the range of 40% to 54% greater than the world average over this five-year period. Great Britain's top-ranked field in citation impact, however, was physical sciences and astronomy, at 65% above the world mark. Most interesting is the remarkable record of the nation in its production of highly cited papers during the last decade: from 1.5% of output in 2002 to 2% of output in 2011. The expected percentage, based on the definition of highly cited papers as those that rank in the top 1% by citations according to their field and year of publication, is 1%. Therefore, the performance of Great Britain at this level was truly superior and significantly better than the record of the second-ranked United States, at 1.8% of output in 2011. Seven of the top ten fields for Great Britain according to world share of highly cited papers, 2002 to 2011, were related to the biological sciences. Astronomy and astrophysics, nonetheless, was first at 35.1%, geosciences came second at 22.8% and social sciences took tenth place at 15.1%. It was in the production of exceptional, high-impact papers, however, that the nation made its mark during the last decade.

Also see: J. Adams, Global Research Report: United Kingdom, October 2011 <http://sciencewatch.com/sites/sw/files/sw-article/media/globalresearchreport-uk.pdf>

GREAT BRITAIN

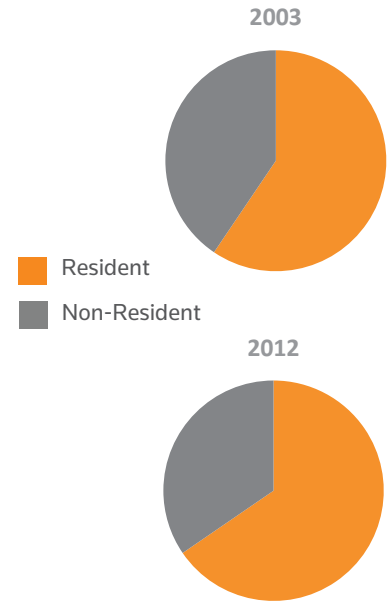
Intellectual Property Research

GB Patent Applications with GB Priority 2003-2012



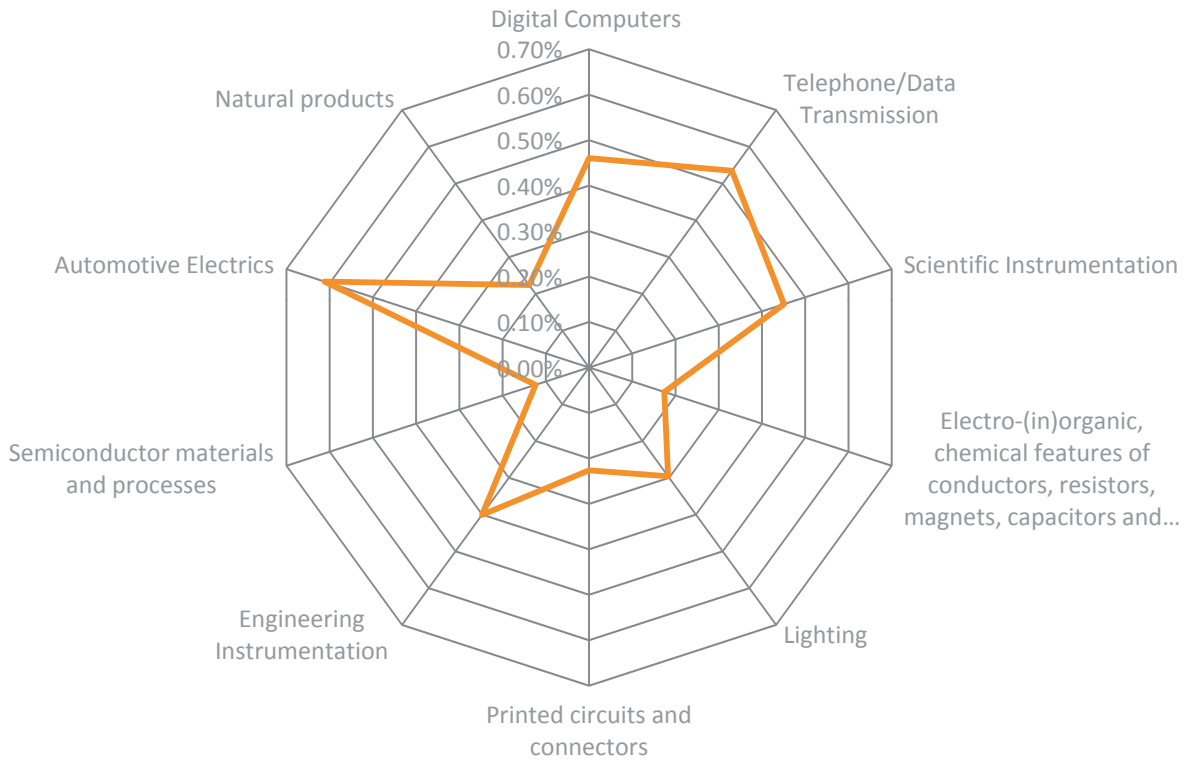
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



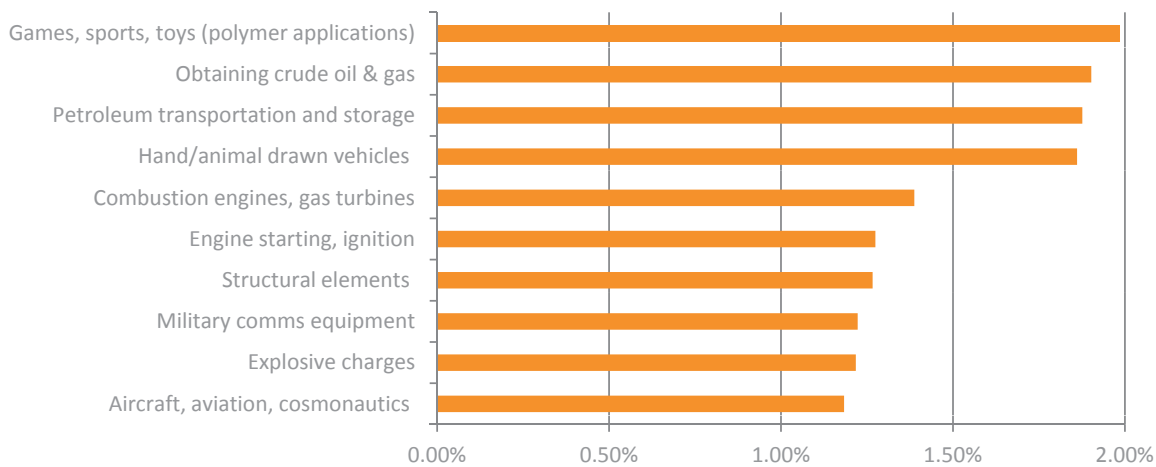
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL GB INVENTIONS 2012
GM GLOBAL TECHNOLOGY OPERATIONS INC	160
RENASAS MOBILE CORP	86
ROLLS-ROYCE PLC	77
GENERAL ELECTRIC CO	60
CANON KK	59
LAND ROVER	48
VETCO GRAY INC	46
DYSON TECHNOLOGY LTD	45
BOSCH GMBH ROBERT	42
ARM LTD	34

COMPANY - RESIDENT	GB INVENTIONS WITH GB PRIORITY 2012
ROLLS-ROYCE PLC	77
LAND ROVER	48
DYSON TECHNOLOGY LTD	45
ARM LTD	34
WIRELESS TECHNOLOGY SOLUTIONS LLC	25
JAGUAR CARS LTD	24
TOSHIBA RES EURO LTD	21
CAMBRIDGE SILICON RADIO LTD	19
WOLFSON MICROELECTRONICS PLC	18
NDS LTD	16

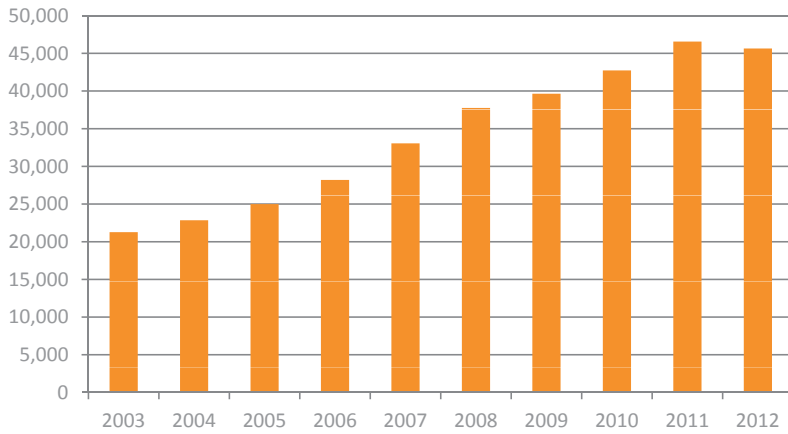
Great Britain shows a gradual decline in innovation, as measured by GB published patent applications originating from Great Britain, from over 7,500 inventions p.a. in 2003 to 6,500 inventions p.a. in 2011. This is followed by a small resurgence in 2012 to just below 6,900. These inventions are predominantly registered by domestic inventors, although to a lesser extent than the other major EU members France and Germany. In common with those countries however, is the trend towards more domestic innovation from 60% in 2003 to 66% in 2012. Of the Top 10 technologies globally, the major

focus of innovation is in automotive electrics and telephone/ data transmission systems. The major areas of technology in Great Britain compared to the rest of the world are polymer applications for games, obtaining crude oil & gas, petroleum transport and vehicle technology. This is reflected in the list of top innovating companies which includes automotive and oil exploration companies.

INDIA

Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)



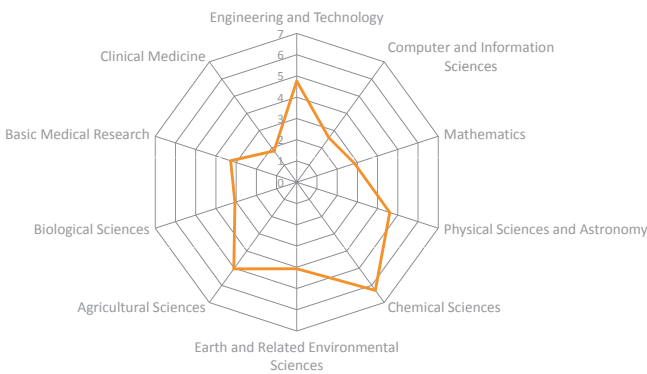
Population: 1,210.2 million (2011 census, Ministry of Home Affairs)

GDP (PPP): 4,711 billion \$ (est. 2012, International Monetary Fund)

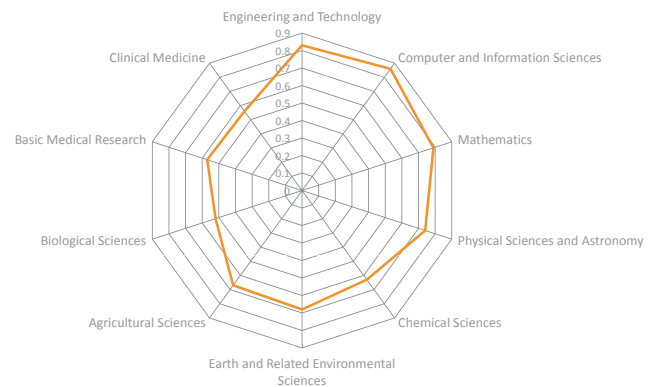
GERD (billion current PPP\$): 36.7 (est. 2011-2012, Department of Science and Technology, Government of India)

GERD as % of GDP: .88 (est. 2011-2012, Department of Science and Technology, Government of India)

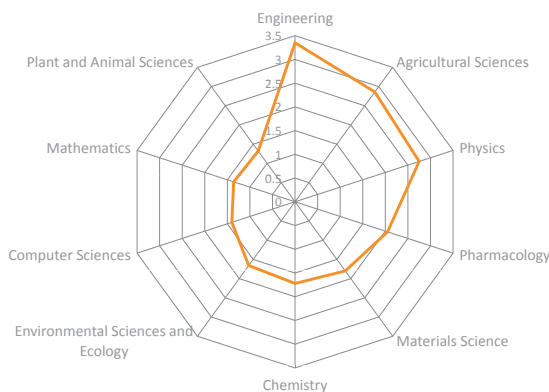
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



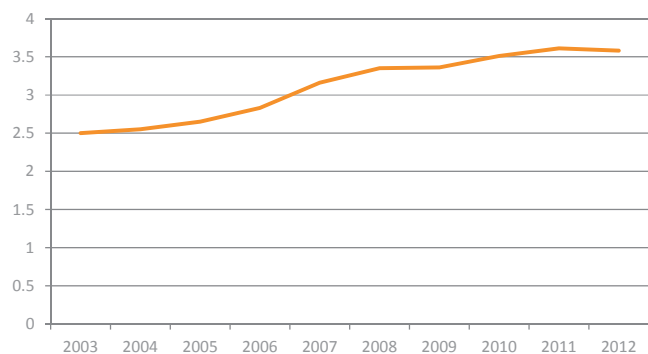
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



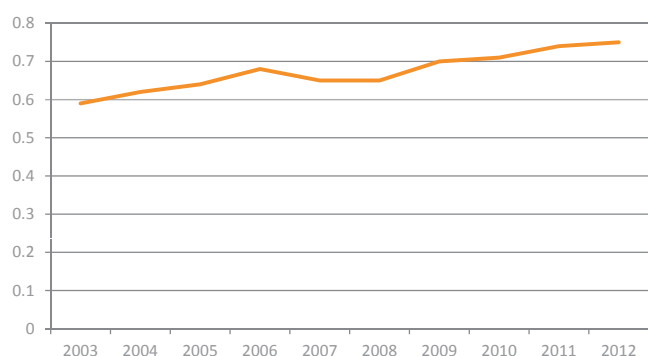
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



Percent World Share of Papers in Web of Science (2003 - 2012)

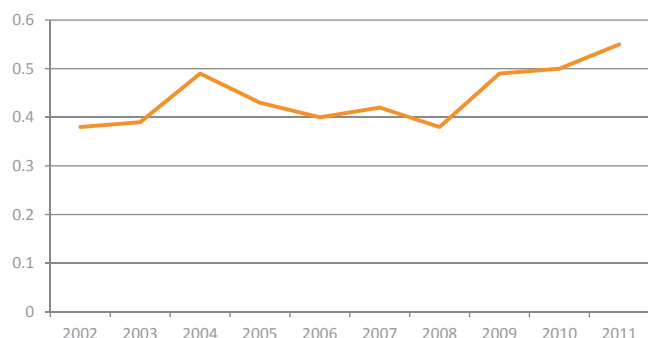


Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



World Average=1

Percent of Highly Cited Papers Based on National Output (2002 - 2011)



Expected Level=1

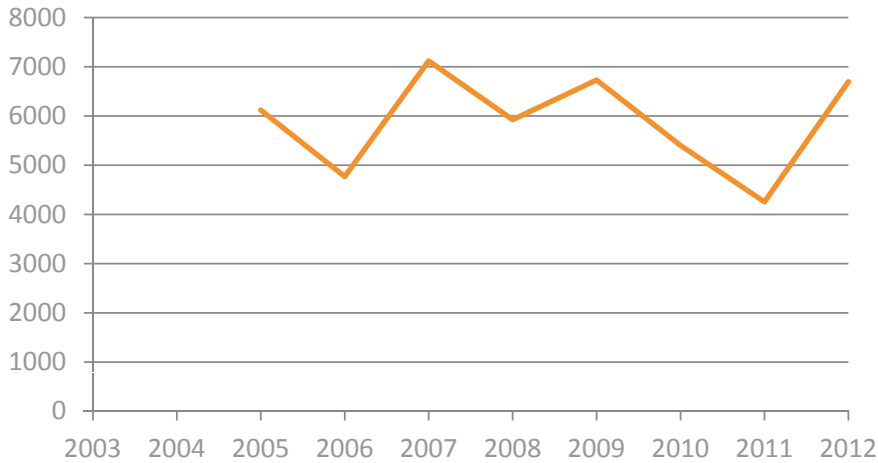
India, like China, is rapidly enlarging its research presence globally. Its output expanded nearly three times the world average over the last decade, some 146%, from 21,269 Web of Science papers in 2003 to 45,639 in 2012. Only in comparison to China does this look like underperformance – it is in fact impressive growth and gained for the nation an increase in world share of 1.1%, from 2.5% to 3.6%. Citation impact rose from about half to three quarters of the world average during the decade. For 2008 to 2012, India captured its greatest world share of papers in chemistry, some 6.3% of the world total. Second was agricultural sciences followed by engineering and technology, at 5% and 4.8%, respectively. These two fields were also those that ranked first and second for India in its world share of highly cited papers; chemistry came sixth. And yet, while India's contribution of highly cited papers, as a percentage of total output, has improved, it has remained stubbornly low, achieving by 2011 only about half of the 1% expected (the definition of highly cited papers). There is much good scientific research in India but a seeming dearth of contributions at the highest level, when measured by citation impact.

Also see: J. Adams, D. Pendlebury, and B. Stembridge, Building BRICKS: Exploring the Global Research and Innovation Impact of Brazil, Russia, India, China, and South Korea, February 2013 <http://sciencewatch.com/sites/sw/files/sw-article/media/grr-brick.pdf> and J. Adams, C. King, and V. Singh, Global Research Report: India. Research and Collaboration in the New Geography of Science, October 2009 http://sciencewatch.com/sites/sw/files/sw-article/media/grr-india-oct09_ag0908174.pdf

INDIA

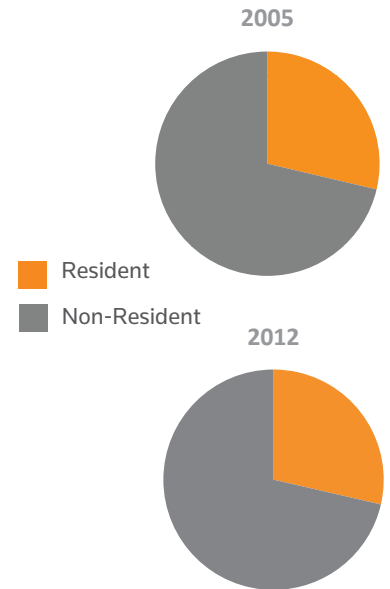
Intellectual Property Research

IN Patent Applications with IN Priority 2005-2012



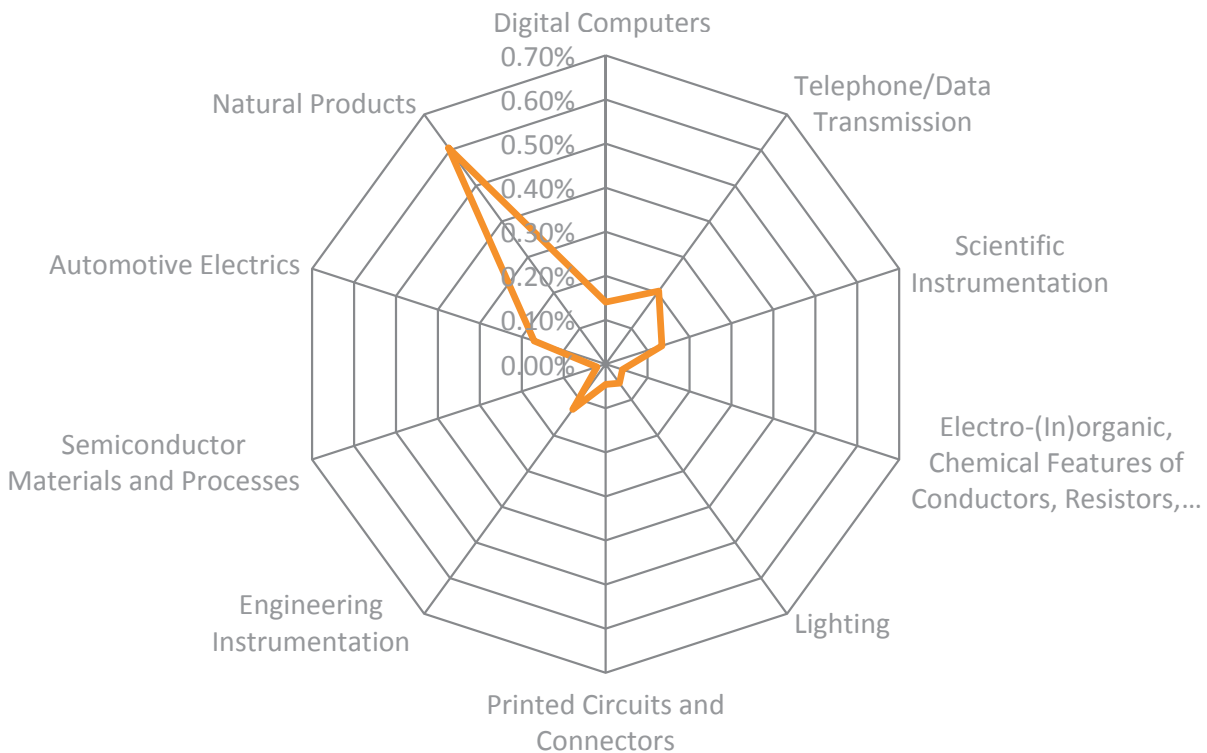
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



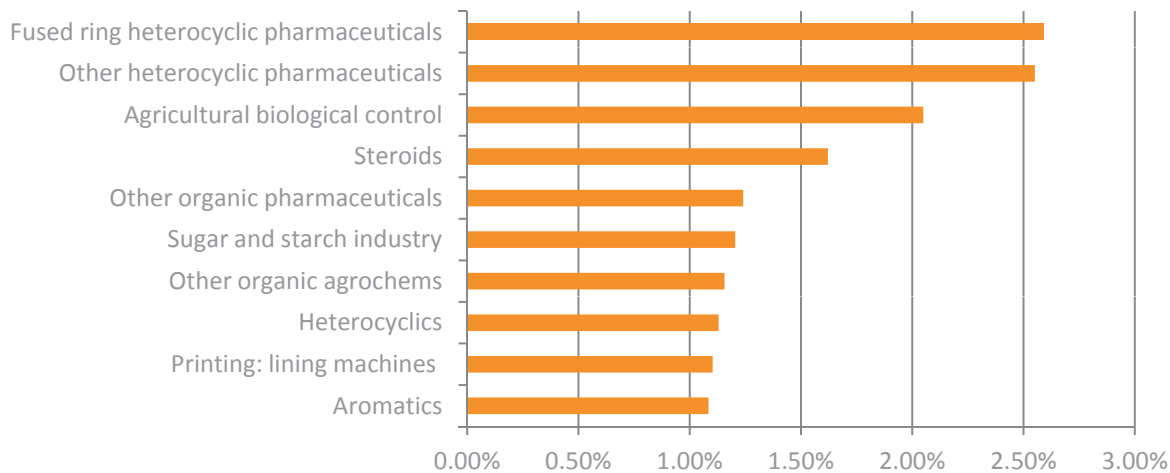
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL IN INVENTIONS 2012
BHARAT HEAVY ELECTRICALS LTD	176
TVS MOTOR CO LTD	143
COUNCIL SCI&IND RES INDIA	121
LARSEN&TOUBRO LTD	84
CROMPTON GREAVES LTD	72
SAMSUNG INDIA SOFTWARE OPERATIONS PVT	67
TATA STEEL LTD	57
TATA CONSULTANCY SERVICES LTD	51
BOSCH GMBH ROBERT	47
TATA MOTORS LTD	47

COMPANY - RESIDENT	IN INVENTIONS WITH IN PRIORITY 2012
BHARAT HEAVY ELECTRICALS LTD	176
TVS MOTOR CO LTD	143
COUNCIL SCI&IND RES INDIA	121
LARSEN&TOUBRO LTD	84
CROMPTON GREAVES LTD	72
TATA STEEL LTD	57
TATA CONSULTANCY SERVICES LTD	51
TATA MOTORS LTD	47
INDIA DEFENCE RES&DEV ORG	45
INDIAN COUNCIL AGRIC RES	44

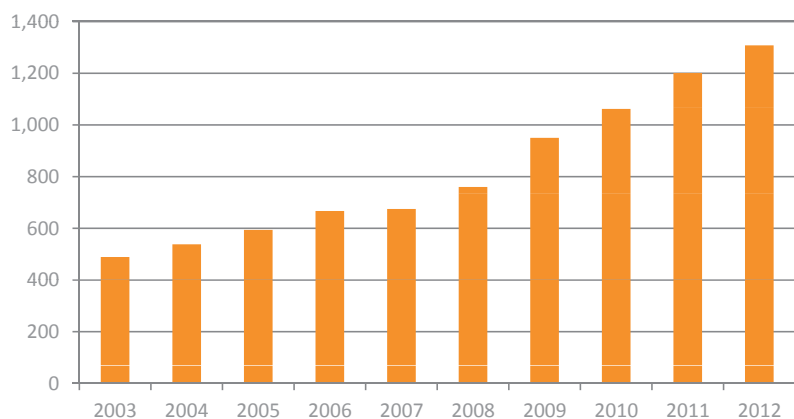
Data for India prior to 2005 is incomplete or not available. Over the eight years from 2005 to 2012, published patent applications originating from India have oscillated between 4,000 and 7,000 p.a. but maintained an average over the period of around 5,900 p.a., which is around the same level as Australia and Great Britain. However, with a population of over 1.2 billion compared to 22 million for Australia and 62 million for Great Britain, this level of patenting is particularly low. Domestic innovation has remained stable from 2005 to 2012 at around 29%. Nearly two thirds of all Indian patent applications in 2012 are from foreign concerns seeking protection for their innovations in the Indian market. India's share of the Top 10 technologies globally is predominantly weighted towards

natural products with little relative share in high-tech fields of computing and communications and less in lighting and semiconductor materials. Indian innovation relative to global patenting is focused on fused ring heterocyclics (a key component of pharmaceuticals) and other agrochem and pharma-related technology sectors. However, the Top 10 list of companies shows a heavy emphasis on mechanical, automotive and electrical engineering. Although pharma-chem technologies are relatively strong compared to global patenting, absolute levels of patenting are much lower for these technologies so the analysis of top companies by count of inventions shows the engineering bias seen here.

INDONESIA

Scientific and Scholarly Research

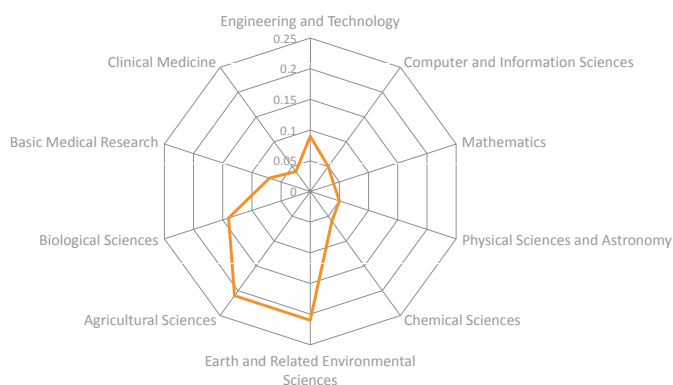
Output of Papers Indexed in Web of Science (2003 - 2012)



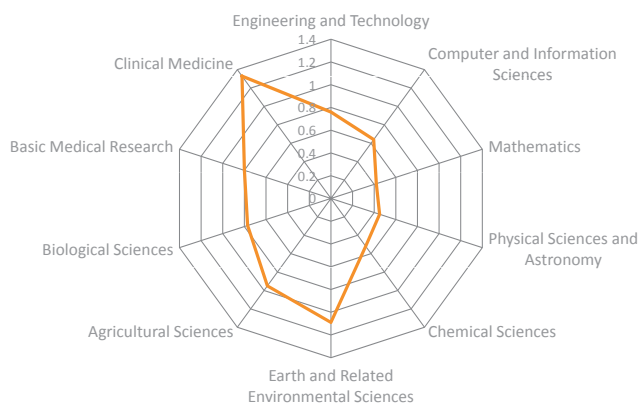
Population: 237.4 million (census 2011, International Monetary Fund)

GDP (PPP): 1,314 billion \$ (est. 2013, International Monetary Fund)

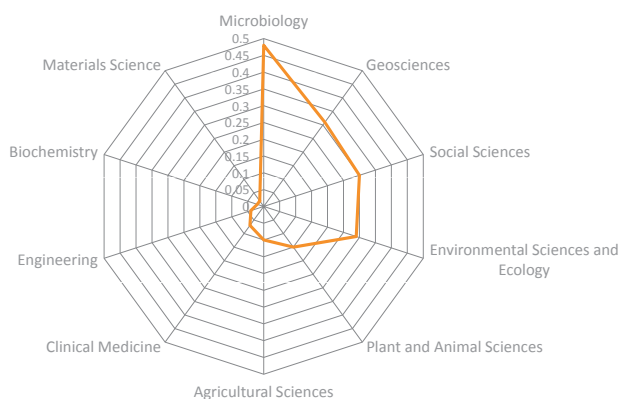
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



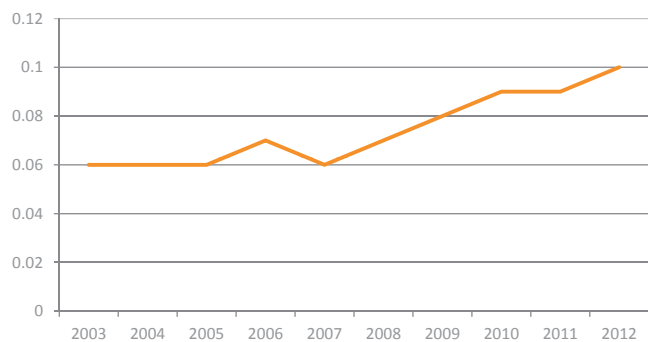
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



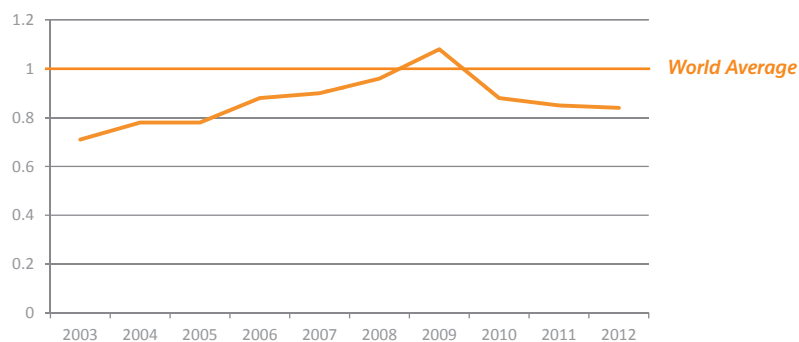
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



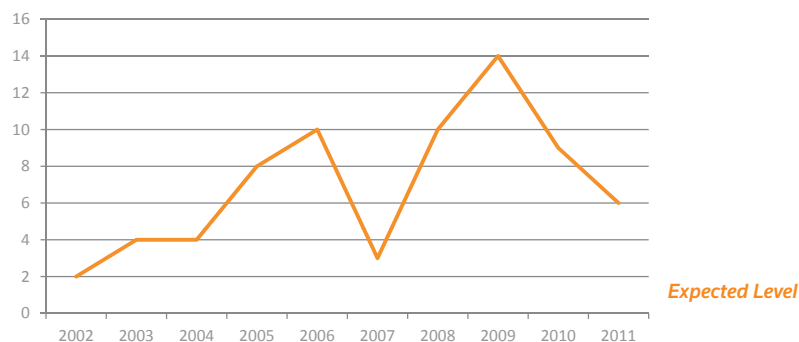
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Number of Highly Cited Papers (2002 - 2011)

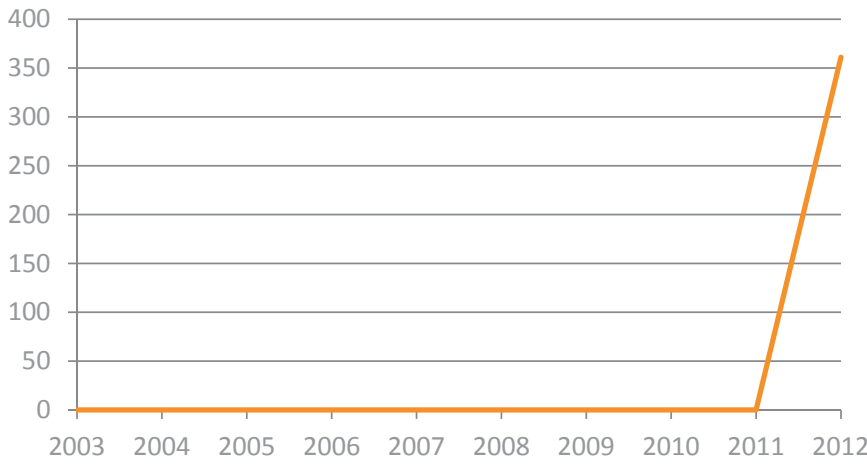


While a logical member of the G20 by gross domestic product, population and other indicators, Indonesia is just now emerging as a serious contributor to the internationally influential journal and proceedings literature indexed in Web of Science. Only in 2010 did Indonesia's scientists surpass 1,000 in their paper production. This still represented a mere .1% of world output. Citation impact, as anticipated, is below the world benchmark, and even in those fields where performance exceeds that level, the figures are based on a small number of papers. At this juncture in Indonesia's development of its research base, output and world share are more informative and reliable indicators than citation impact. It is notable that in the fields of earth and related environmental sciences, and in agricultural sciences, Indonesia contributed about twice its overall share, or .2%, during 2008 to 2012. Only two of the highly cited papers recorded for Indonesia are wholly 'homegrown.' That is not a critical observation but rather indicates that advancement and improvement in research for a nation in the position of Indonesia often comes by way of international exchange and collaboration.

INDONESIA

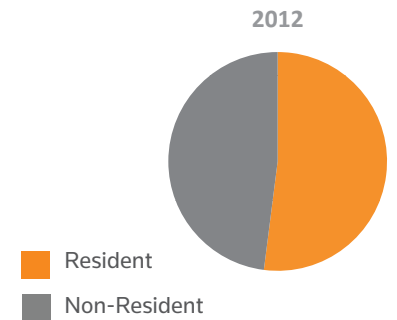
Intellectual Property Research

ID Patent Applications with ID Priority 2003-2012

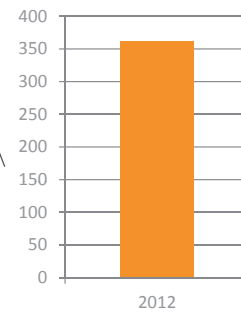


Source: Thomson Reuters Derwent World Patents Index

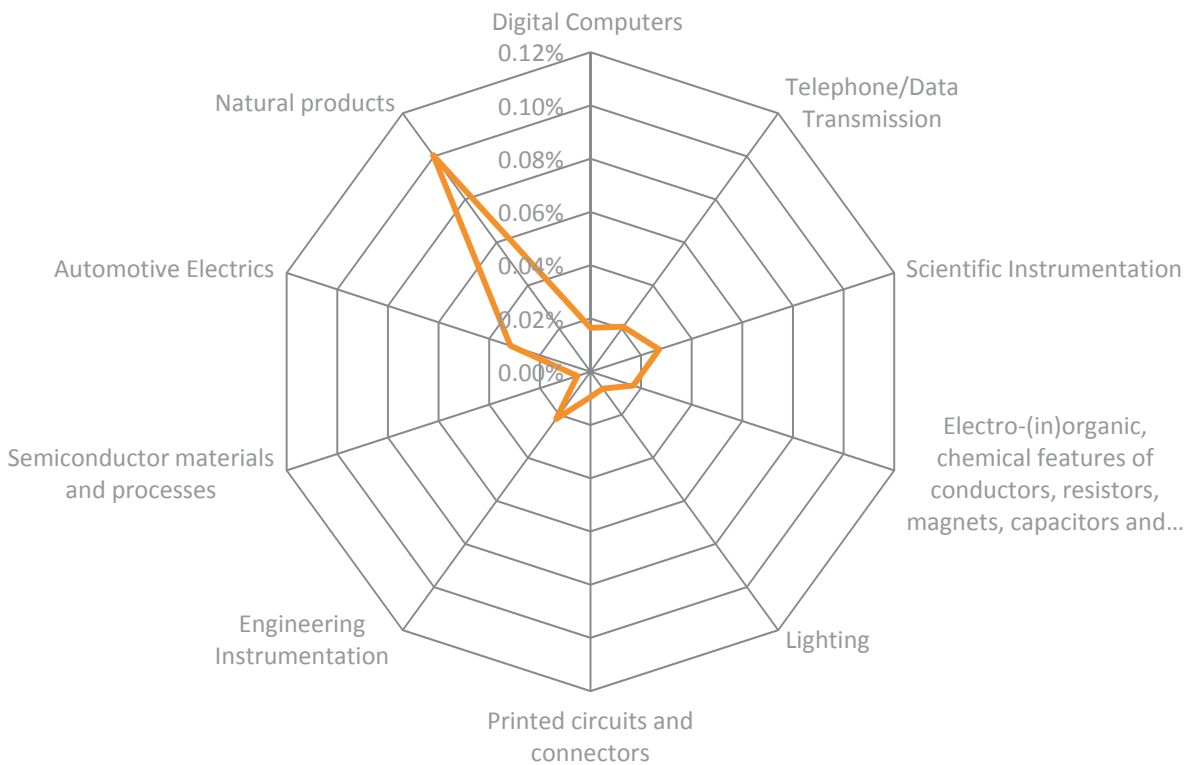
Resident vs. Non-Resident



Source: Thomson Reuters Derwent World Patents Index

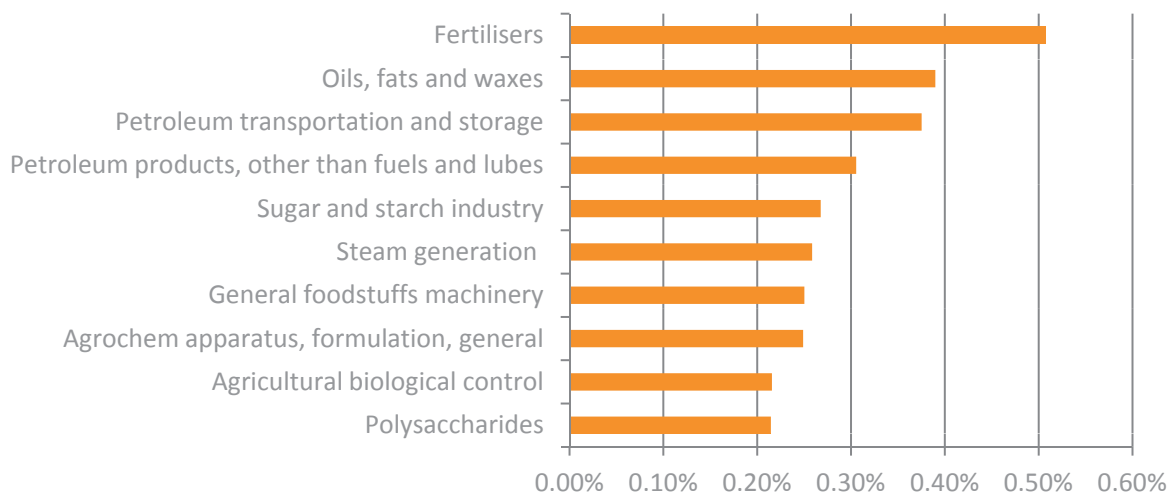


Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL ID INVENTIONS 2012
UNIV BRAWIJAYA	30
INST PERTANIAN BOGOR	26
LEMBAGA ILMU PENGETAHUAN INDONESIA LIPI PUSAT INOVASI	25
BADAN PENGKAJIAN DAN PENERAPAN TEKNOLOGI	15
BADAN TENAGA NUKLIR NASIONAL	15
PT PURA BARUTAMA	8
INST TEKNOLOGI BANDUNG	7
LEMBAGA PEMBANGUNAN IND PEMBINAAN	5
TVS MOTOR CO LTD	5
UNIV GUNADARMA	5

COMPANY - RESIDENT	ID INVENTIONS WITH ID PRIORITY 2012
UNIV BRAWIJAYA	30
INST PERTANIAN BOGOR	26
LEMBAGA ILMU PENGETAHUAN INDONESIA LIPI PUSAT INOVASI	25
BADAN PENGKAJIAN DAN PENERAPAN TEKNOLOGI	15
BADAN TENAGA NUKLIR NASIONAL	15
PT PURA BARUTAMA	8
INST TEKNOLOGI BANDUNG	7
LEMBAGA PEMBANGUNAN IND PEMBINAAN	5
UNIV GUNADARMA	5
UNIV SEBELAS MARET	5

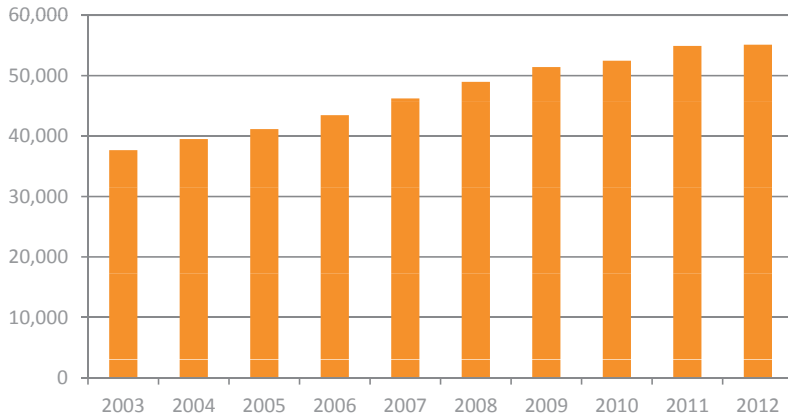
Data for Indonesia is available only for 2012. Just over 350 priority applications were published in 2012. Slightly more than 50% of applications for patents in Indonesia in 2012 originated locally. Indonesia has a small share of the Top 10 global technologies mostly in the field of natural products (0.10%). Indigenous innovation as measured by Indonesia's share of technologies globally is focused on chemicals (fertilizers, oils, fats and waxes) and petroleum (transportation, storage, and

products other than fuels and lubricants). It also shows activity in foodstuffs (sugar and starch industry, general foodstuffs machinery) and agriculture (agrochemicals, biological control). The Top 10 company lists are dominated by Indonesian concerns; TVS Motors is the only foreign representative on these lists. Nine of ten Indonesian organizations listed are academic or government bodies.

ITALY

Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)



Population: 59.7 million (census 2012, Istituto Nazionale di Statistica)

GDP (PPP): 1,833 billion \$ (est. 2012, International Monetary Fund)

GERD (billion current PPP\$): 24.8 (2011, MSTI, OECD)

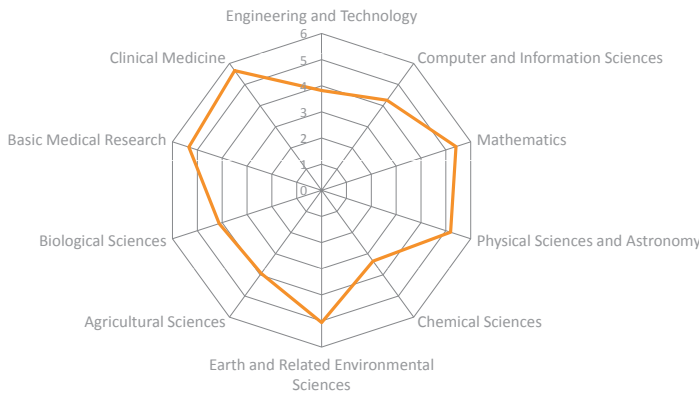
GERD as % of GDP: 1.25 (2011, MSTI, OECD)

BERD as % of GDP: .56 (2010, MSTI, OECD)

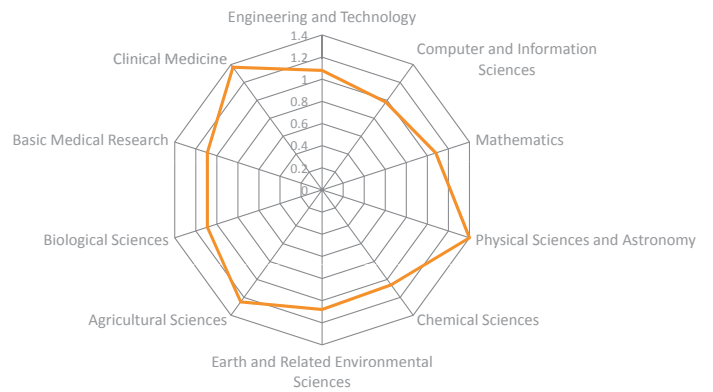
Researchers (FTE) thousands: 106.8 (2011, MSTI, OECD)

R&D personnel per thousand labor force: 9.25 (2011, MSTI, OECD)

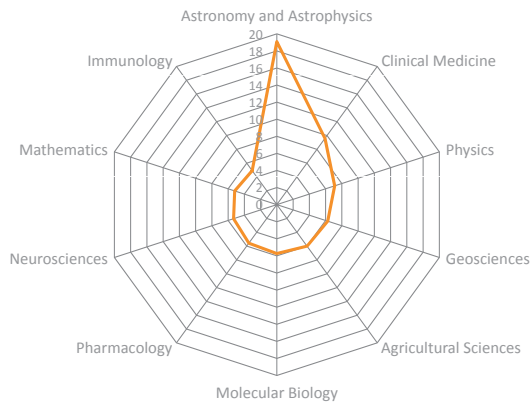
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



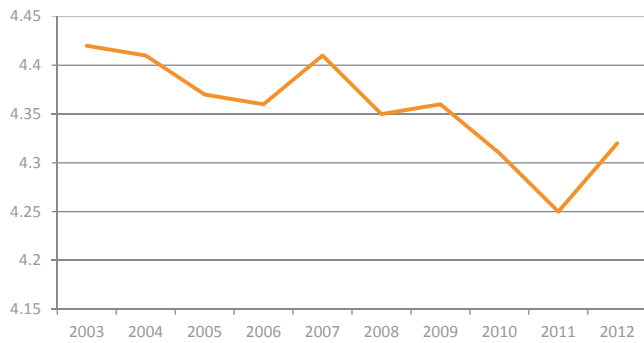
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



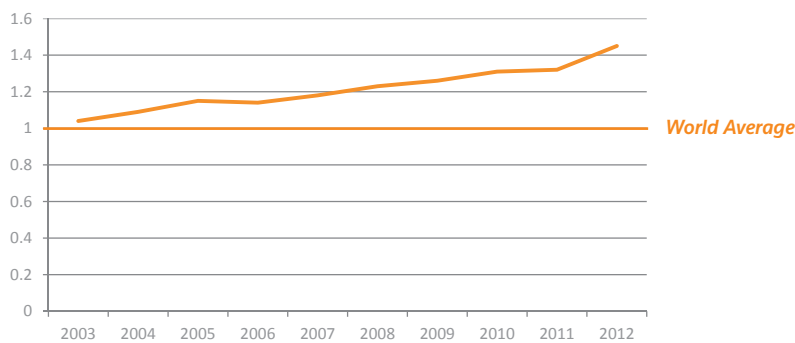
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



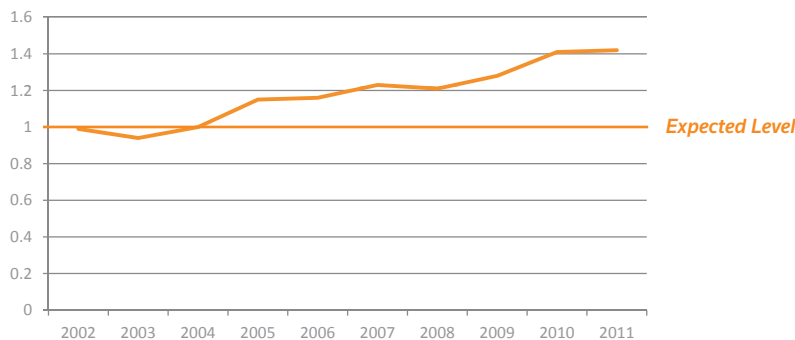
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)

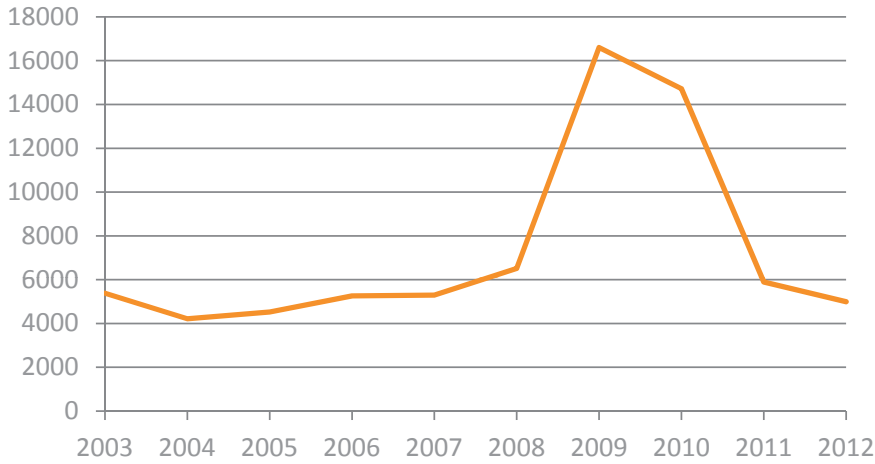


Italy's production of research papers was almost enough to maintain its world share during the last decade. In 2003, it contributed 37,674 papers, or 4.4% of the world total, and 55,121 papers in 2012, for a 4.3% share. Meanwhile, citation impact increased from just 4% to 45% above the world average by the end of the period. International collaboration was mentioned above as one reason for a general increase in citation impact among nations with mature science systems, and especially for those participating in the European Community's Framework program that encourages such relationships. But another reason is the growing share of papers in Web of Science from China and other BRIC nations that typically exhibit lower citation impact, which reduces the bar relatively in terms of world averages. During the period 2008 to 2012, Italy held its highest world shares in the OECD-defined fields of clinical medicine, basic medical research, mathematics, physical sciences and astronomy, and earth and related environmental sciences, all at more than 5%. Clinical medicine was a standout in citation impact as well, registering a score 37% above the world mark. Physical sciences and astronomy had a slightly higher impact, at 40% above world average, while agricultural sciences was third and behind clinical medicine at 25% more than the world average. All of these fields, with the addition of geosciences, were ranked first through fifth for Italy in terms of its world share of highly cited papers, 2002 to 2011. Italy's overall share of highly cited papers based on its output advanced over the decade, from just under 1% to 1.4%.

ITALY

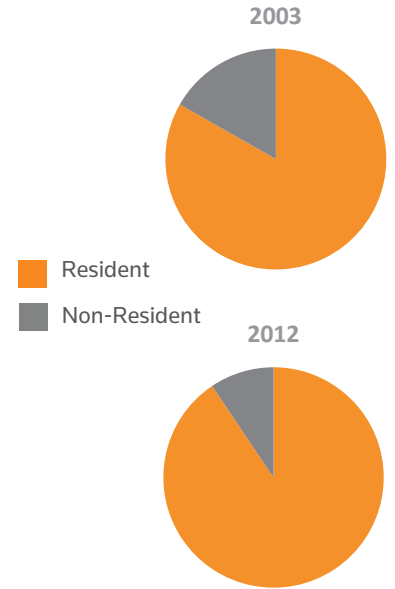
Intellectual Property Research

IT Patent Applications with IT Priority 2003-2012



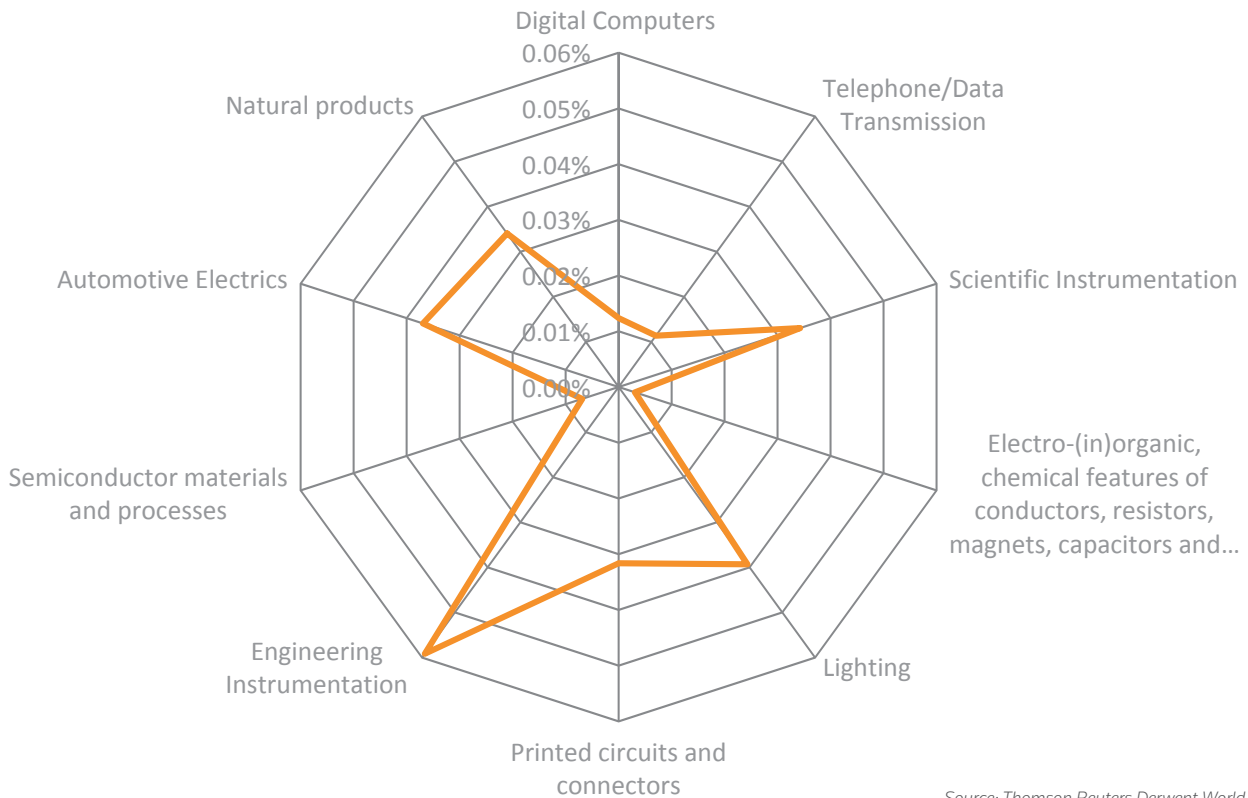
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



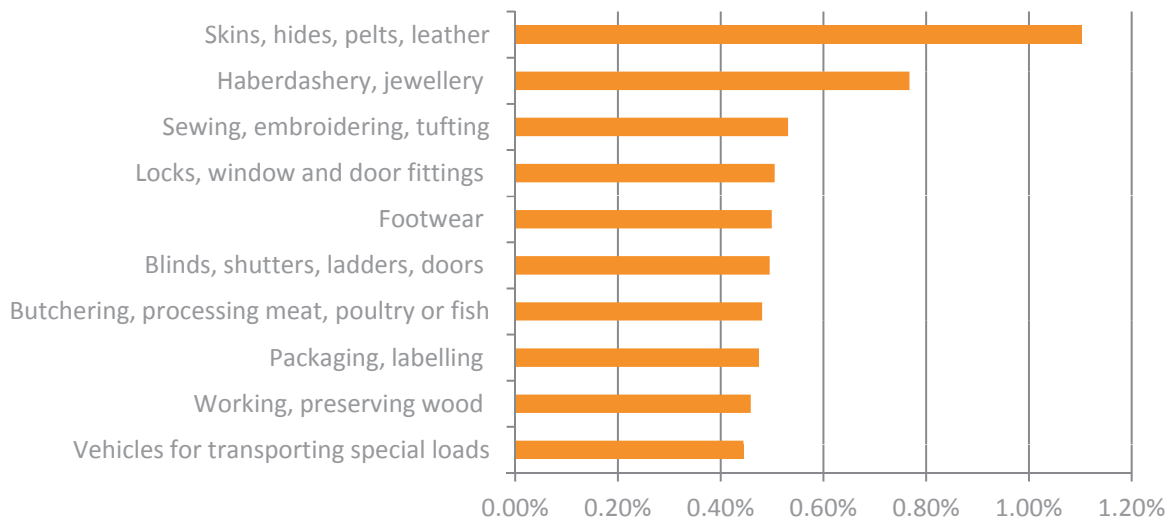
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL IT INVENTIONS 2012
BOSCH GMBH ROBERT	20
MILANO POLITECNICO	13
GD SPA	7
INDESIT CO SPA	7
ENEA ENTE NUOVE TECNOLOGIE ENERGIA	6
FOND IST ITAL DI TECNOLOGIA	6
GRUPPO CIMBALI SPA	6
ISI HOLDING SRL	6
ENI SPA	5
IND MAGNETI MARELLI SPA	5

COMPANY - RESIDENT	IT INVENTIONS WITH IT PRIORITY 2012
MILANO POLITECNICO	13
GD SPA	7
INDESIT CO SPA	7
ENEA ENTE NUOVE TECNOLOGIE ENERGIA	6
FOND IST ITAL DI TECNOLOGIA	6
GRUPPO CIMBALI SPA	6
ISI HOLDING SRL	6
ENI SPA	5
IND MAGNETI MARELLI SPA	5
META SYSTEM SPA	5

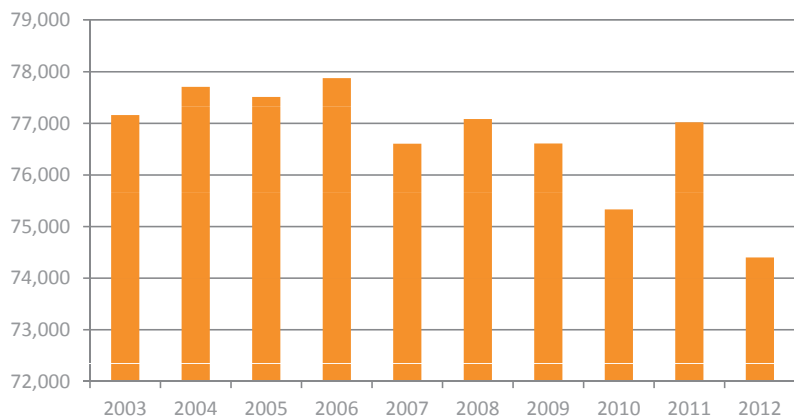
Coverage of Italian patent documents is restricted to type B documents (patents of invention – second publication), and analyses are based on this data. Italian priority patents averaged 5,000 p.a. over the last decade with a brief surge to over 15,000 applications in 2009 to 2010 returning to former levels in 2011 to 2012. Over the decade, resident patents form a larger proportion in 2012 compared to 2003. Italy's share of global Top 10 technologies is very low overall, the highest being just 0.06% in engineering instrumentation followed by lighting

at 0.04%, and scientific instrumentation, automotive electrics and natural products at around 0.035% each. Italian patenting relative to global patenting is focused on technologies related to the fashion industry (skins, hides, haberdashery, jewelery, sewing and embroidery). Only one foreign company featured in the list of Top 10 companies with Italian basics in 2012 (Robert Bosch); the remainder are a mixture of Italian companies and academic institutes.

JAPAN

Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)



Population: 126.7 million (est. 2012, Internal Affairs and Communications Ministry)

GDP (PPP): 4,779 billion \$ (est. 2013, International Monetary Fund)

GERD (billion current PPP\$): 146.5 (2011, MSTI, OECD)

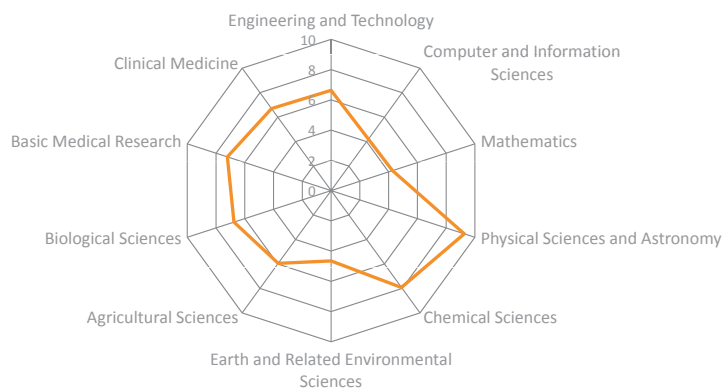
GERD as % of GDP: 3.39 (2011, MSTI, OECD)

BERD as % of GDP: 2.59 (2011, MSTI, OECD)

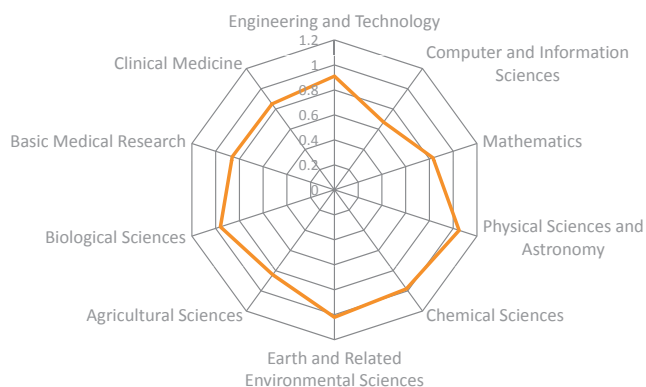
Researchers (FTE) thousands: 656.7 (2011, MSTI, OECD)

R&D personnel per thousand labor force: 13.20 (2011, MSTI, OECD)

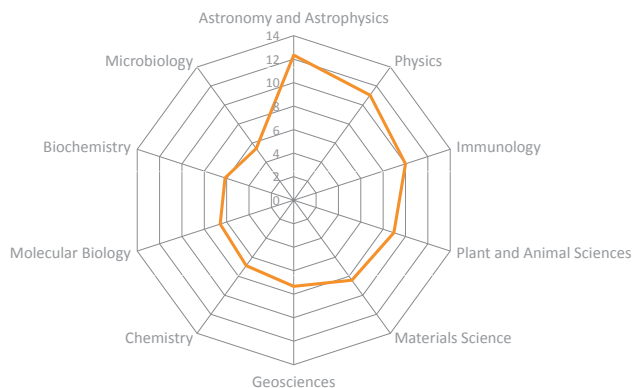
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



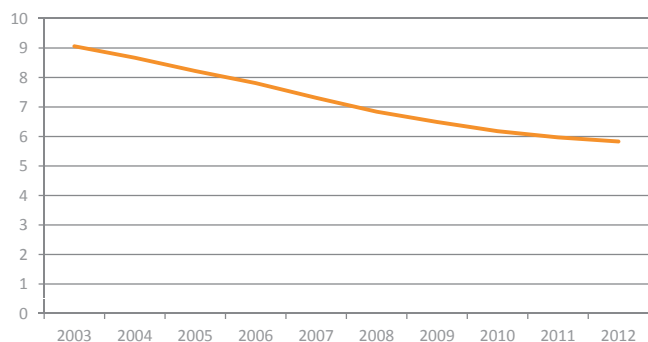
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



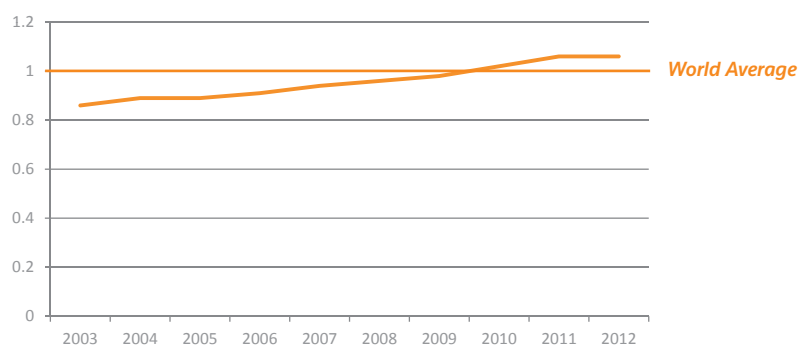
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



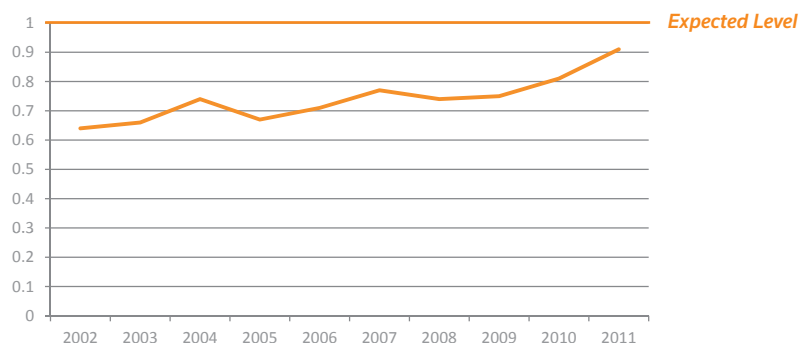
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)



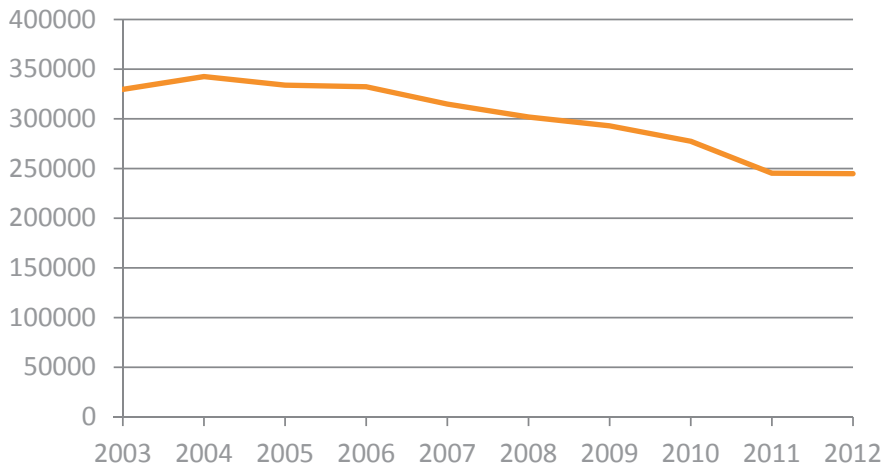
Over the last decade, Japan's world share of Web of Science papers declined more sharply than that of other global research leaders. Thomson Reuters recorded 77,161 Japanese papers in 2003 and 74,401 in 2012, representing 9.1% and 5.8% world shares, respectively. Even if 2012 is a small undercount because some publication year 2012 papers that appeared in delayed journals have not yet been indexed, the clear impression from the time series is a complete lack of growth in output. In contrast, citation impact for Japan increased during the decade, from 14% below the world average to 6% above the world average. Also, the nation's production of highly cited papers, those ranked in the top 1% by citations, increased as a percentage of output, from .6% in 2002 to .9% in 2011, almost reaching the expected level. Among OECD-defined disciplines, Japan held its largest share during 2008 to 2012 in physical sciences and astronomy (9.2%), followed by chemistry (7.9%), basic medical research (7.2%) and biological sciences (6.8%). Physical sciences and astronomy was first for the nation in citation impact as well as world share, at 5% greater than the world average. The other field in which Japan achieved citation impact above world average was earth and related environmental sciences, at 2% above the world benchmark. Chemistry and biological sciences were just below this, at 2% and 4% below world average, respectively. Therefore, output and impact are somewhat aligned for Japan in that concentration of activity and impact generally match. Immunology is a field of exceptional excellence for Japan, thanks to some four dozen highly cited papers during 2002 to 2011 from Shizuo Akira and his team at Osaka University, as well as others at the University of Tokyo, Kyoto University, and the RIKEN Research Center for Allergy and Immunology in Yokohama.

Also see: J. Adams, C. King, N. Miyairi, and D. Pendlebury, Global Research Report: Japan, June 2010 <http://sciencewatch.com/sites/sw/files/sw-article/media/globalresearchreport-japan.pdf>

JAPAN

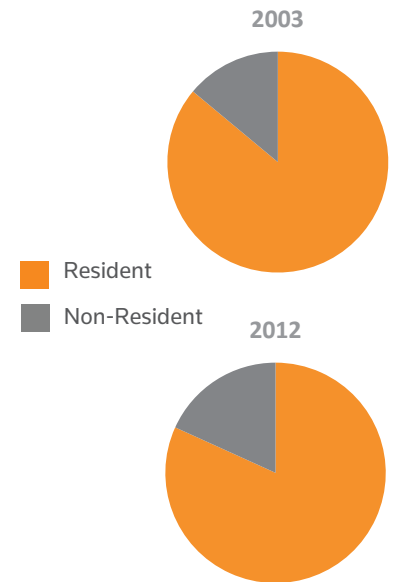
Intellectual Property Research

JP Patent Applications with JP Priority 2003-2012



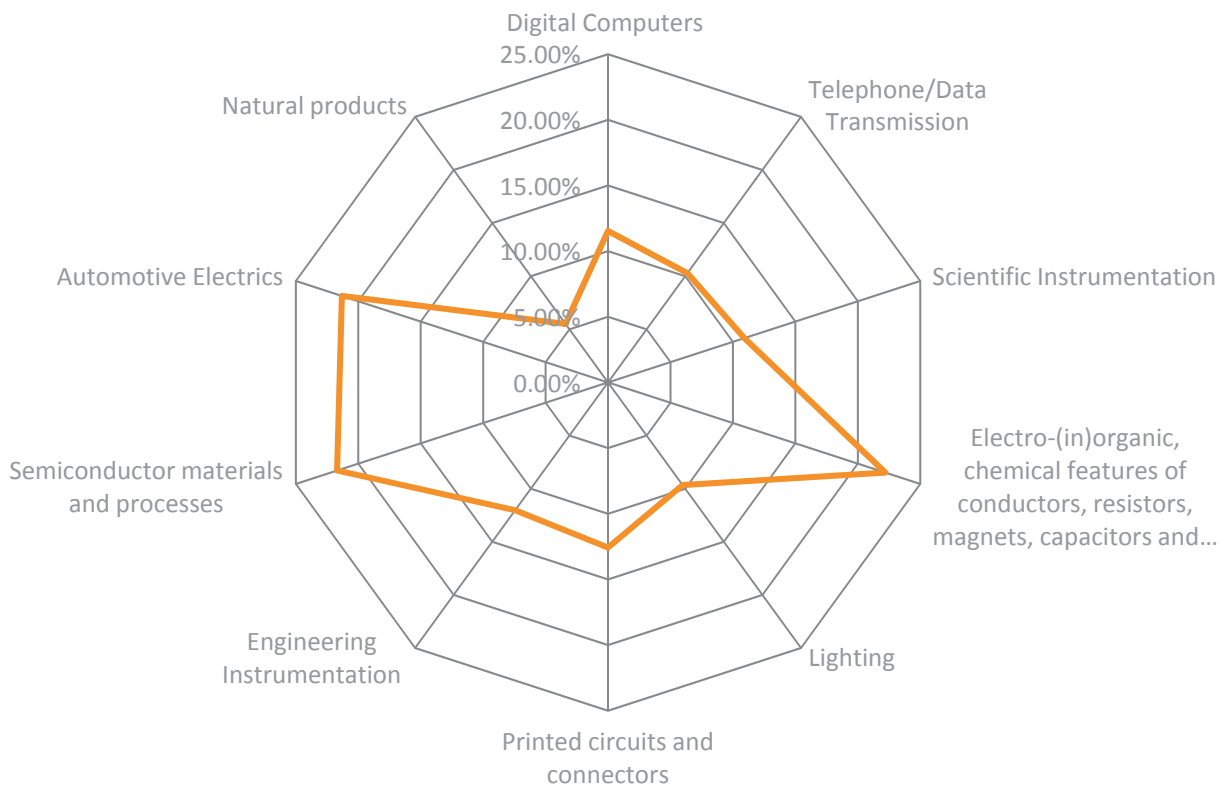
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



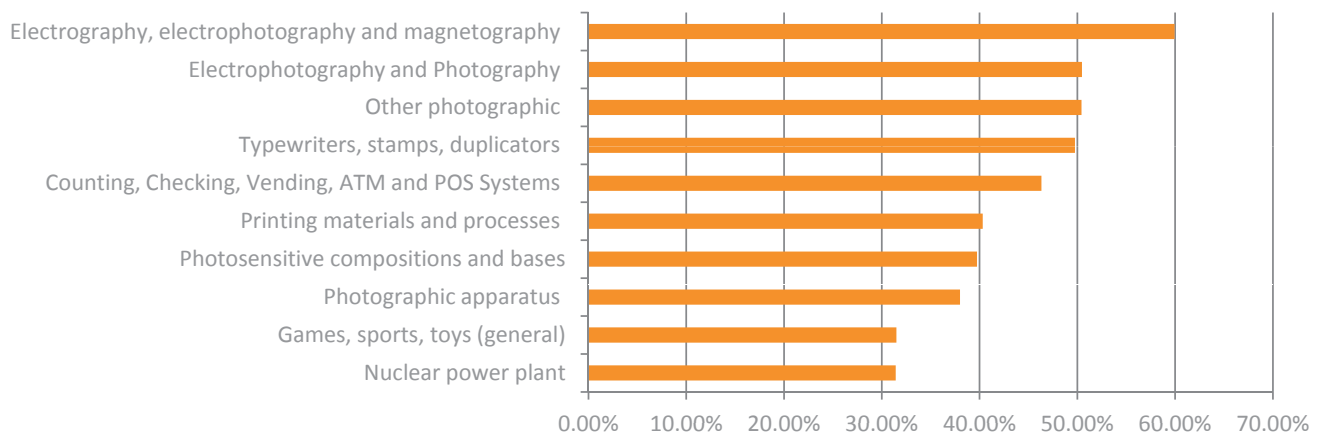
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL JP INVENTIONS 2012
PANASONIC	6279
TOYOTA JIDOSHA KK	4823
MITSUBISHI ELECTRIC CORP	4017
SEIKO EPSON CORP	3746
CANON KK	3654
TOSHIBA KK	3191
RICOH KK	3107
NIPPONDENSO CO LTD	2247
SHARP KK	2150
DAINIPPON PRINTING CO LTD	1922

COMPANY - RESIDENT	JP INVENTIONS WITH JP PRIORITY 2012
PANASONIC	6279
TOYOTA JIDOSHA KK	4823
MITSUBISHI ELECTRIC CORP	4017
SEIKO EPSON CORP	3746
CANON KK	3654
TOSHIBA KK	3191
RICOH KK	3107
NIPPONDENSO CO LTD	2247
SHARP KK	2150
DAINIPPON PRINTING CO LTD	1922

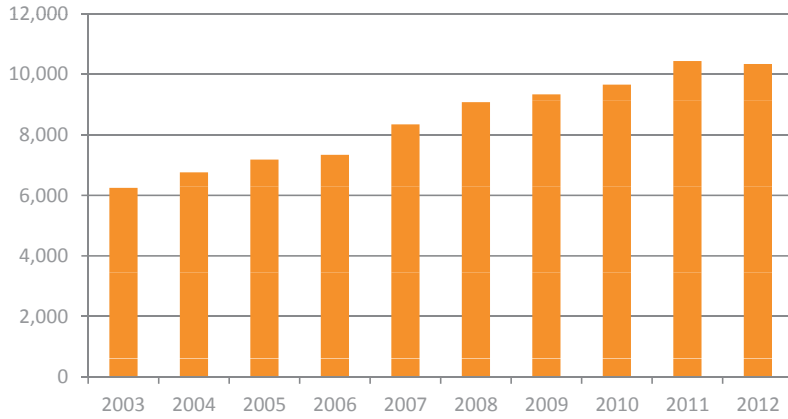
Japanese published priority patent applications have fallen steadily in number over the last decade from a peak of just over 340,000 in 2004 to just less than 245,000 in 2012. Over that time, the proportion of resident applications, although declining, has remained high at 82% in 2012. Japan, however, still accounts for a significant proportion of the Top 10 global technologies, with over 20% share of global applications in electro-(in) organic materials, semiconductor materials and automotive

electrics, respectively. Japanese innovation relative to global innovation is focused on imaging technologies of electrography, magnetography and other photographic technologies, as well as printing and ATM technologies. This is reflected in the Top 10 company lists which are exclusively populated with Japanese companies predominantly in the printing and photographic market sectors.

MEXICO

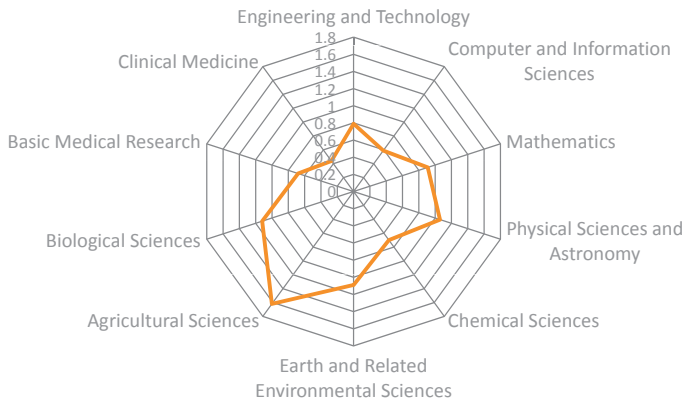
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

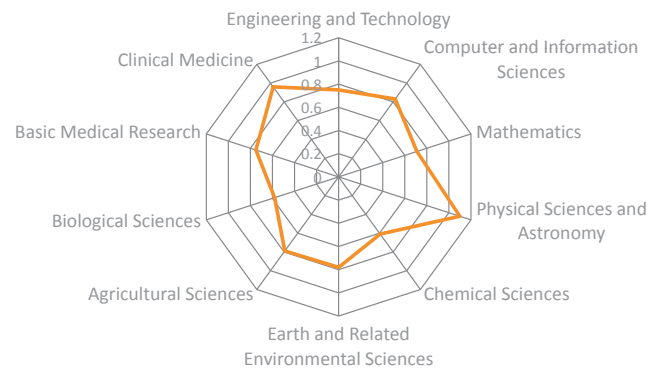


Population: 118.4 million (est. 2013, Consejo Nacional de Población)
 GDP (PPP): 1,759 billion \$ (est. 2013, International Monetary Fund)
 GERD (billion current PPP\$): 8.2 (2011, MSTI, OECD)
 GERD as % of GDP: .43 (2011, MSTI, OECD)
 BERD as % of GDP: .16 (2011, MSTI, OECD)
 Researchers (FTE) thousands: 46.1 (2011, MSTI, OECD)
 R&D personnel per thousand labor force: 1.54 (2007, MSTI, OECD)

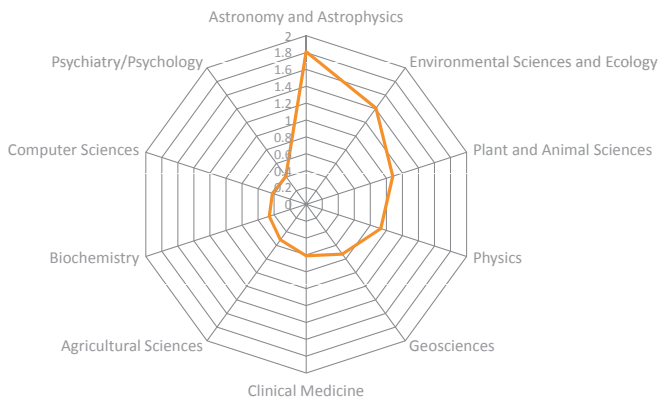
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



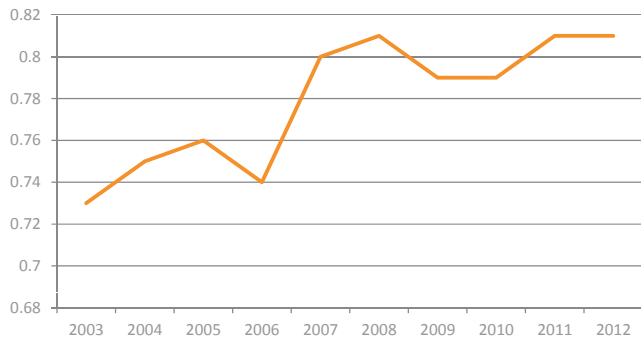
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



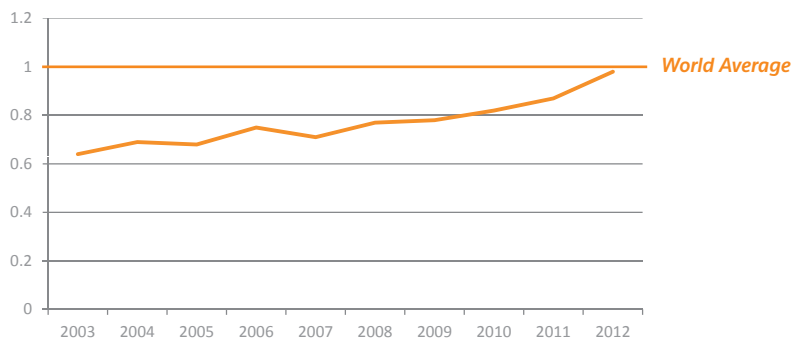
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



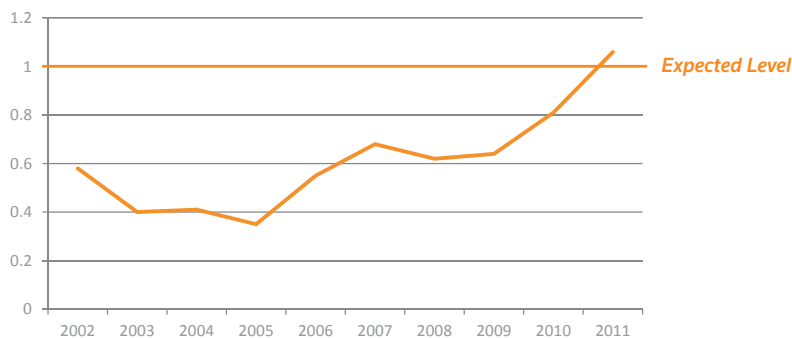
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)

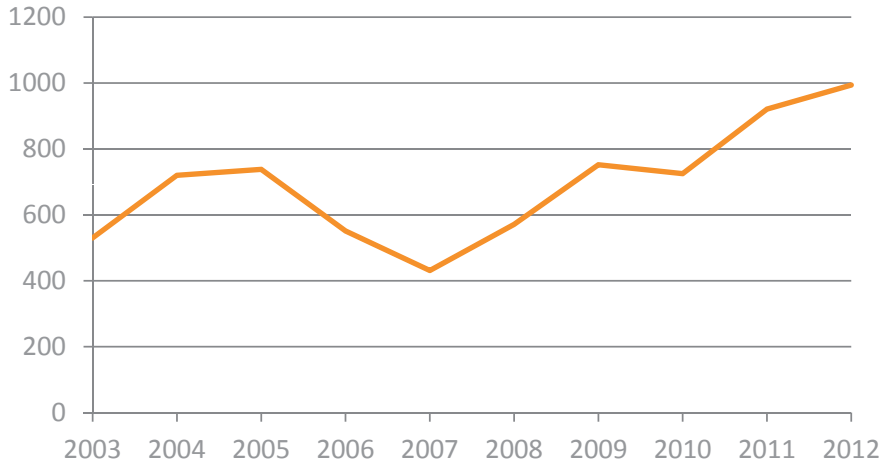


Mexico's output of Web of Science papers rose 65% during the past decade, resulting in a modest gain in world share for the nation from .7% to .8%. Citation impact increased from 36% to 2% below the world average, 2003 to 2012. According to the OECD classification scheme, the fields in which Mexico contributed its largest world shares of papers during the last five years, 2008 to 2012, were agricultural sciences (1.6%), earth and related environmental sciences, biological sciences, and physical sciences and astronomy (all three 1.1%). Physical sciences and astronomy was the only field in which Mexico earned more citations per paper than the world average (10% above the world mark). Highly cited papers from Mexico nearly doubled in percentage terms based on its output, from .6% in 2002 to 1.1% in 2011, and therefore the nation's production of such papers now exceeds the expected level of 1%. Astronomy and physics were also among the Essential Science Indicators fields top ranked for Mexico in its world share of highly cited papers, as well as environmental sciences and ecology, strong for the nation in world share, and the related area of plant and animal sciences.

MEXICO

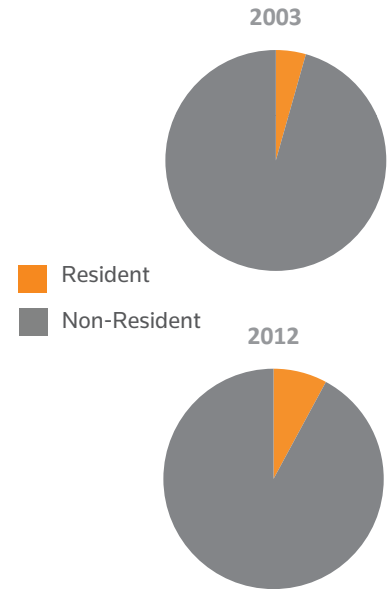
Intellectual Property Research

MX Patent Applications with MX Priority 2003-2012



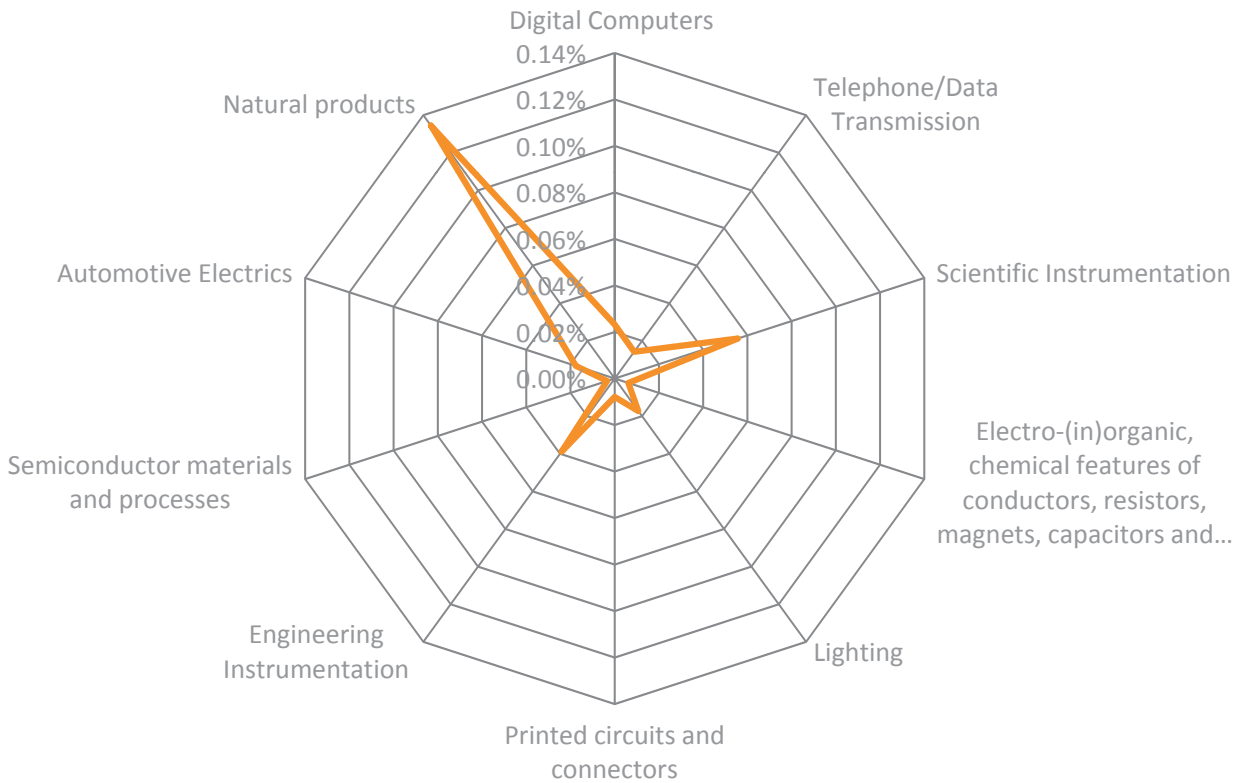
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



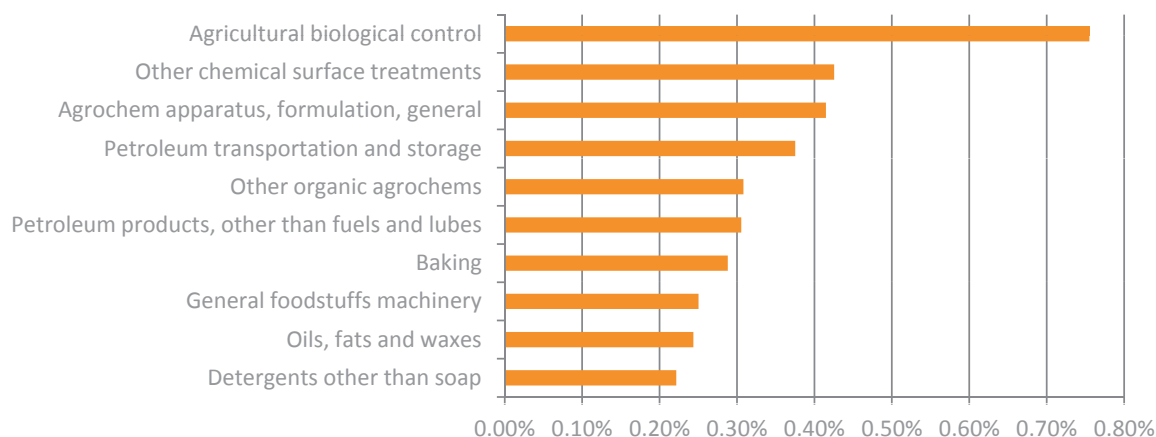
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL MX INVENTIONS 2012
INST TECNOLOGICO Y ESTUDIOS SUPERIORES	36
CENT INVESTIGACION ESTUDIOS AVANZADOS	31
UNIV MEXICO NACIONAL AUTONOMA	28
CENT INVESTIGACION EN QUIMICA APLICADA	10
INST MEXICANO DEL PETROLEO	10
INST POLITECNICO NACIONAL	10
UNIV GUANAJUATO	8
INST MEXICANO DEL SEGURO SOCIAL	7
UNIV AUTONOMA DEL ESTADO BAJA CALIFORNIA	7
INST INVESTIGACIONES ELECTRICAS	6

COMPANY - RESIDENT	MX INVENTIONS WITH MX PRIORITY 2012
INST TECNOLOGICO Y ESTUDIOS SUPERIORES	36
CENT INVESTIGACION ESTUDIOS AVANZADOS	31
UNIV MEXICO NACIONAL AUTONOMA	28
CENT INVESTIGACION EN QUIMICA APLICADA	10
INST MEXICANO DEL PETROLEO	10
INST POLITECNICO NACIONAL	10
UNIV GUANAJUATO	8
INST MEXICANO DEL SEGURO SOCIAL	7
UNIV AUTONOMA DEL ESTADO BAJA CALIFORNIA	7
INST INVESTIGACIONES ELECTRICAS	6

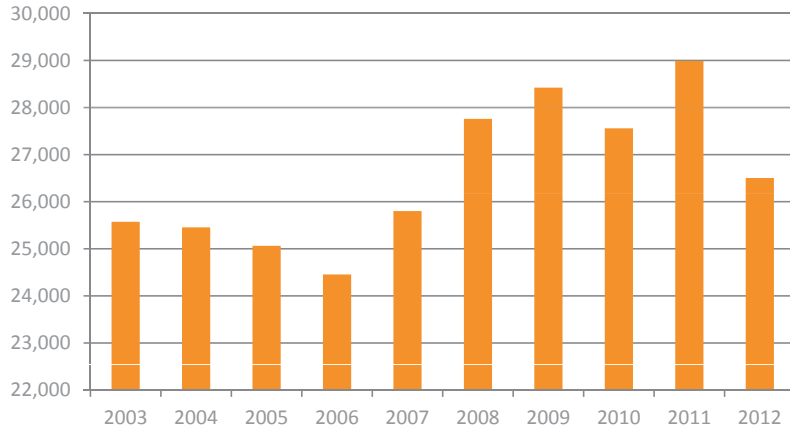
Mexican innovation, as measured by MX published patent applications originating from Mexico, is ramping up steadily from less than 600 priority applications in 2003 to 1,000 applications in 2012. However, this indigenous innovation is overshadowed by foreign concerns seeking protection for their innovation in Mexico. Although domestic share of innovation has increased from 4.4% to 7.9%, the vast majority of patenting in Mexico is from non-resident organizations. Most of this patenting, however, is for existing technology first patented elsewhere.

Hence the Top 10 company lists of basics originating from Mexico is populated exclusively with Mexican organizations. Note that these are all academic institutes. Mexico's share of the Top 10 global technologies is almost exclusively in the natural products field with very little share in the other nine areas. Mexican innovation itself is focused on agricultural, agrochemical and petroleum technologies reflecting Mexico's agricultural sector and status as the sixth-largest global oil producer.

RUSSIA

Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)



Population: 143.4 million (est. 2013, Federal State Statistics Service of the Russian Federation)

GDP (PPP): 3,380 billion \$ (est. 2012, Russian government)

GERD (billion current PPP\$): 35.0 (2011, MSTI, OECD)

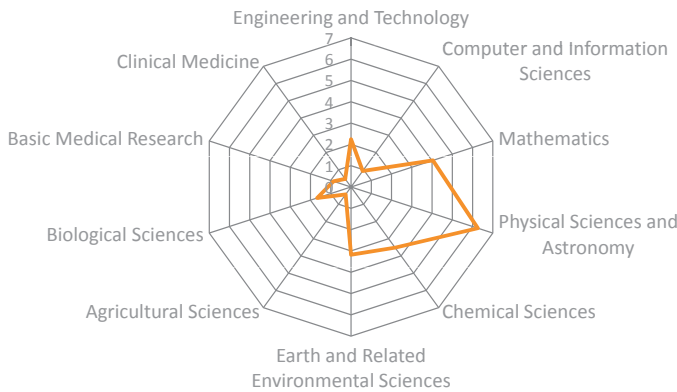
GERD as % of GDP: 1.09 (2011, MSTI, OECD)

BERD as % of GDP: .30 (2011, MSTI, OECD)

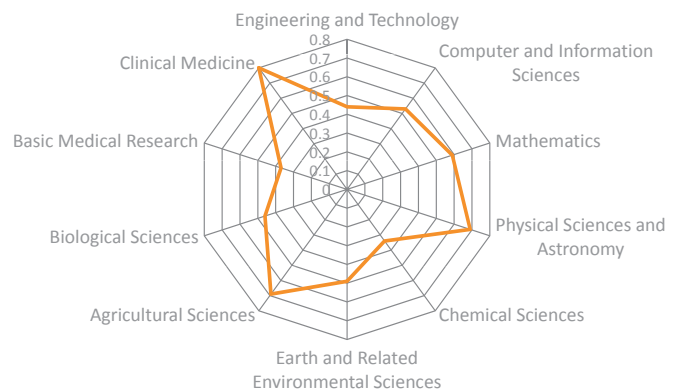
Researchers (FTE) thousands: 447.6 (2011, MSTI, OECD)

R&D personnel per thousand labor force: 11.08 (2011, MSTI, OECD)

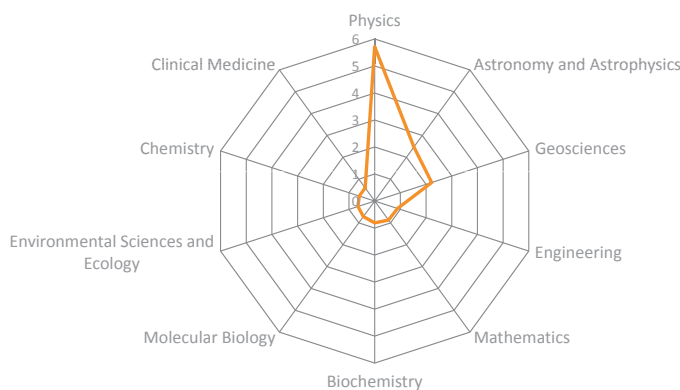
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



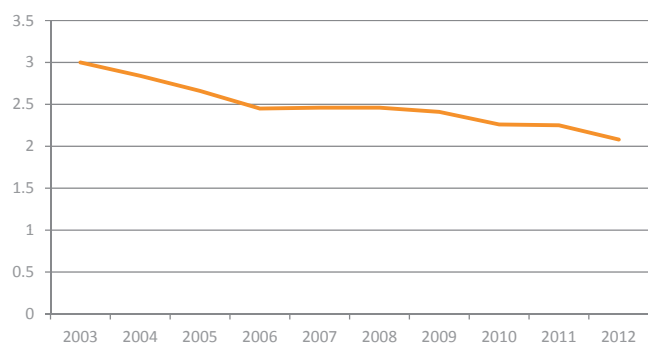
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



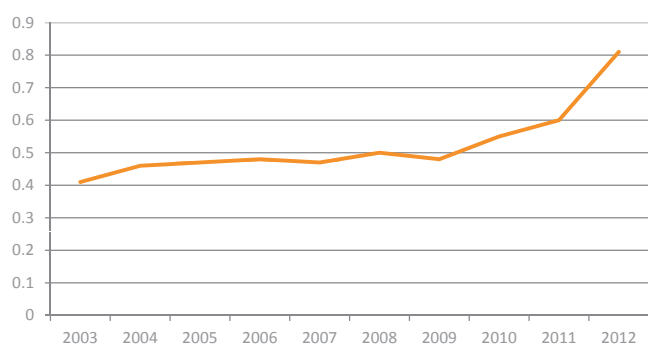
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



Percent World Share of Papers in Web of Science (2003 - 2012)

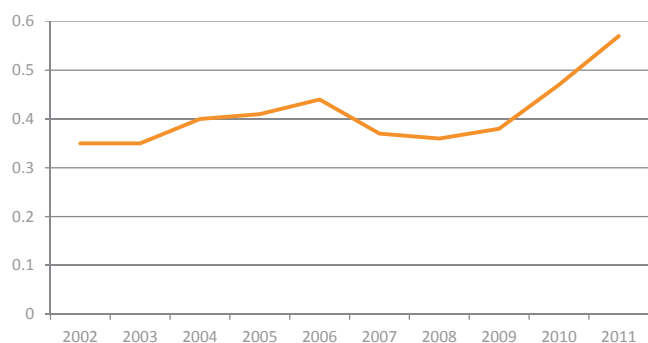


Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



World Average=1

Percent of Highly Cited Papers Based on National Output (2002 - 2011)



Expected Level=1

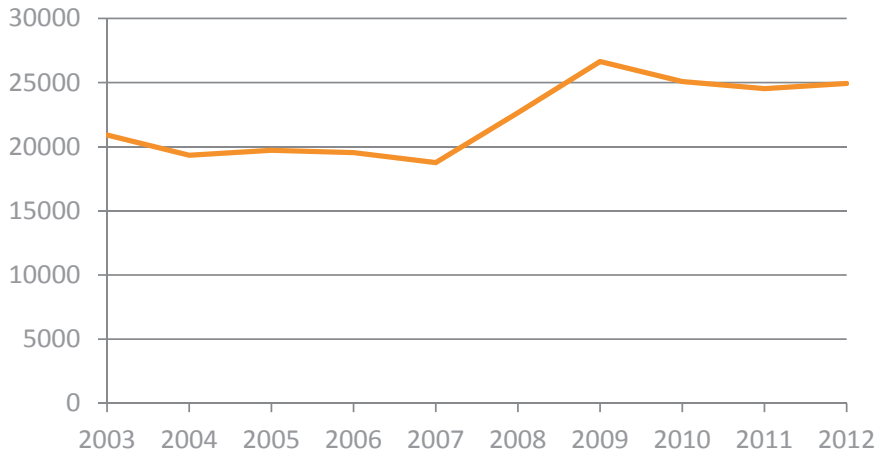
Russian output advanced little during the decade, from 25,573 papers in 2003 to 26,503 in 2012, an increase of just 4% compared with 50% for all papers indexed in Web of Science. This small growth resulted in a falling world share for Russia, from 3% to 2.1%. Citation impact for the nation was low throughout the decade but improved by the end, in 2012, to reach 19% under the world average. Russia's historical research focus on the physical sciences is evident in its world shares for 2008 to 2012, during which physical sciences and astronomy (6.3%), mathematics (4%) and chemical sciences (3.5%) were top ranked. Papers in clinical medicine, however, actually earned the highest score in relative citation impact (20% below world average), followed by those in the physical sciences and astronomy, and also in agricultural sciences, both at 31% below the world level. Russia's production of highly cited papers over the decade closely resembles the record of India, both in quantity and trend, and like India seems unusually low for a nation with the scientific talent that it possesses. In terms of Essential Science Indicators fields, physics was first for Russia in world share of highly cited papers from 2002 to 2011, at 5.7%. As noted in a recent Global Research Report, 'Russia's achievements in physics are globally acknowledged,' but the nation has slipped to 'back-marker' status in recent years.

Also see: J. Adams, D. Pendlebury, and B. Stembridge, Building BRICKS: Exploring the Global Research and Innovation Impact of Brazil, Russia, India, China, and South Korea, February 2013, pages 11 and 16 <http://sciencewatch.com/sites/sw/files/sw-article/media/grr-brick.pdf> and J. Adams and C. King, Global Research Report: Russia. Research and Collaboration in the New Geography of Science, January 2010 <http://sciencewatch.com/sites/sw/files/sw-article/media/grr-russia-jan10.pdf>

RUSSIA

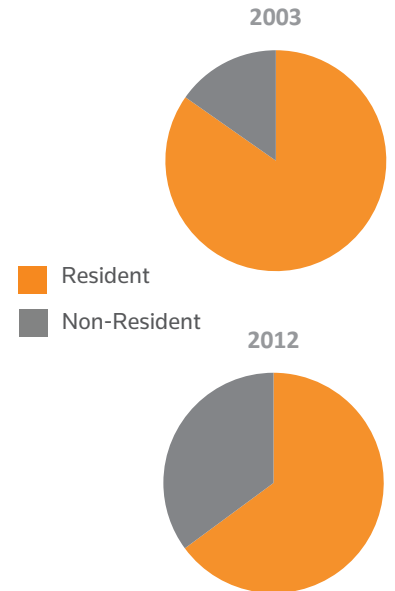
Intellectual Property Research

RU Patent Applications with RU Priority 2003-2012



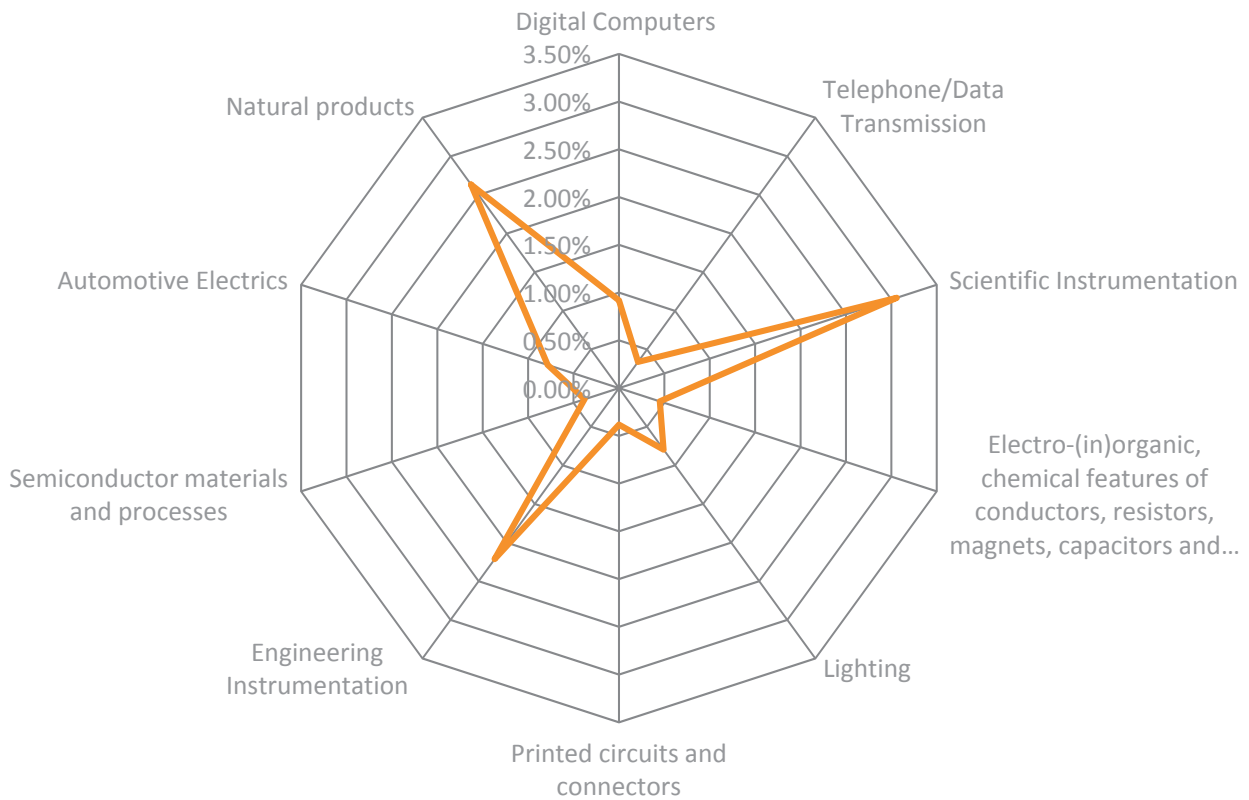
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



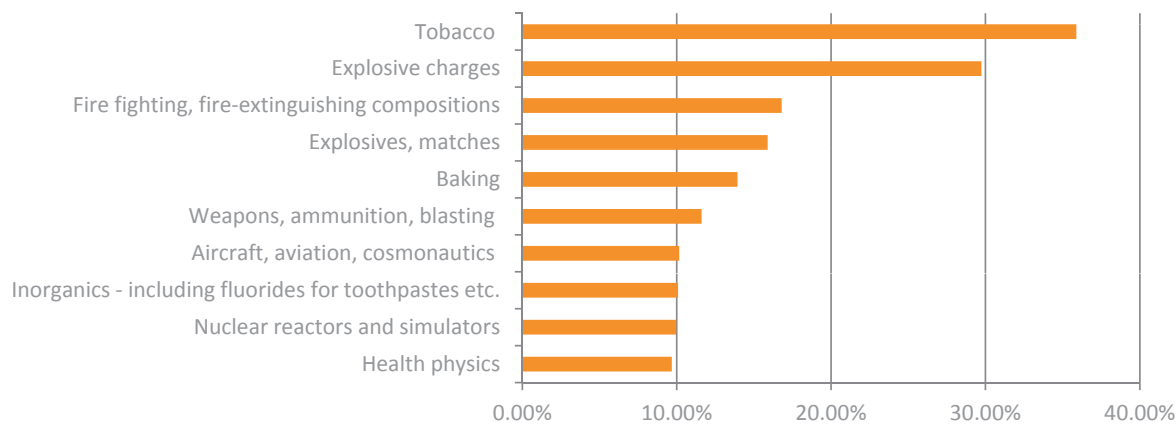
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL RU INVENTIONS 2012
NUCLEAR ENERGY	483
UNIV PEOPLES'S FRIENDSHIP	296
UNIV URALS FEDERAL ELTSIN	293
TATNEFT STOCK CO	217
RUSSIAN FEDERATION MIN IND&TRADE	198
UNIV VOLGA TECHNOLOGICAL	168
UNIV KAZAN POWER ENG	167
EYE MICROSURGERY FEDOROV	160
UNIV KUBAN AGRIC	153
NOVCH POLY	141

COMPANY - RESIDENT	RU INVENTIONS WITH RU PRIORITY 2012
NUCLEAR ENERGY	483
UNIV PEOPLES'S FRIENDSHIP	296
UNIV URALS FEDERAL ELTSIN	293
TATNEFT STOCK CO	217
RUSSIAN FEDERATION MIN IND&TRADE	198
UNIV VOLGA TECHNOLOGICAL	168
UNIV KAZAN POWER ENG	167
EYE MICROSURGERY FEDOROV	160
UNIV KUBAN AGRIC	153
NOVCH POLY	141

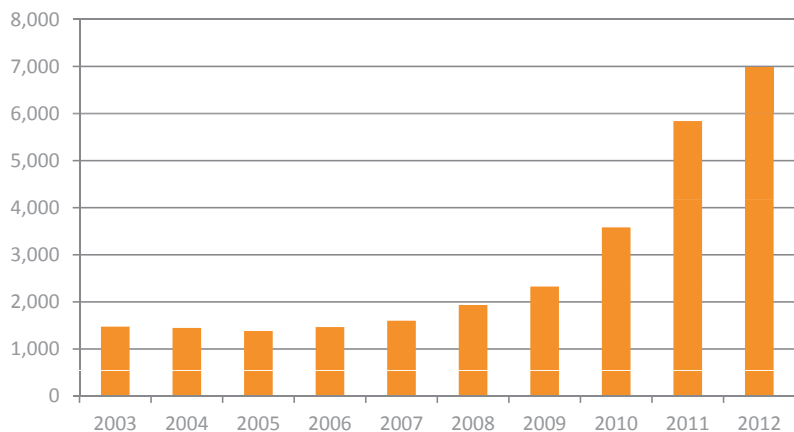
Domestic innovation, as measured by RU published patent applications originating from Russia, in Russia is at a substantially higher level than fellow BRIC nations Brazil and India although only a fraction of China's dominant output. In European terms, the patenting level falls somewhere between France and Germany and higher than the United Kingdom or Italy. It has grown significantly during the decade to a current level of around 25,000 p.a. Much of the patenting in Russia is from domestic concerns although the proportion fell from 85% in 2003 to less than 65% in 2012. That is reflected in the Top

10 company lists which comprise exclusively Russian entities. Russia's share of the Top 10 global technologies is highest in scientific instrumentation (3.06%), natural products (2.63%) and engineering instrumentation (2.21%). In terms of indigenous innovation relative to global patenting, activities are focused on tobacco, explosives and fire-fighting technologies.

SAUDI ARABIA

Scientific and Scholarly Research

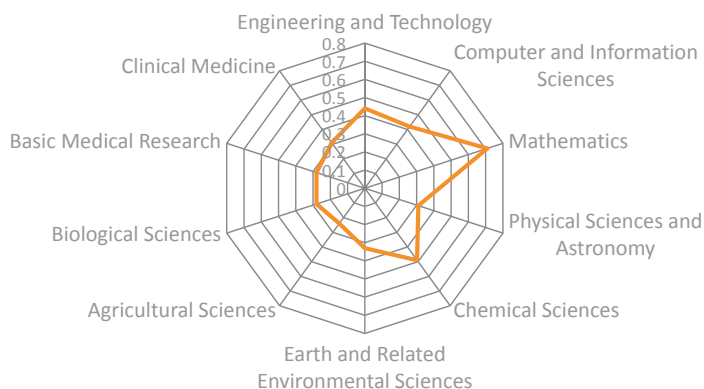
Output of Papers Indexed in Web of Science (2003 - 2012)



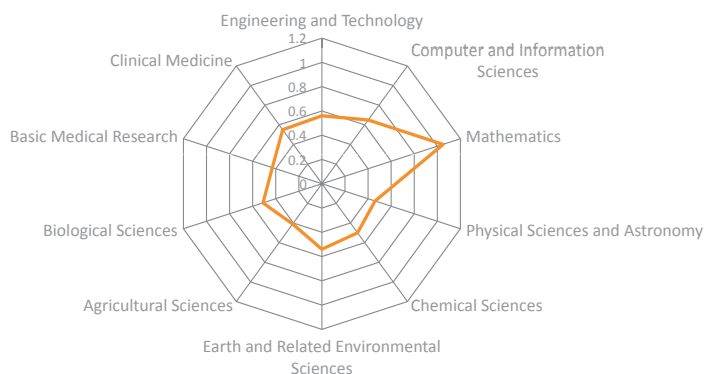
Population: 29.2 million (est. 2012, Central Department of Statistics and Information, Kingdom of Saudi Arabia)

GDP (PPP): 907 billion \$ (est. 2012, International Monetary Fund)

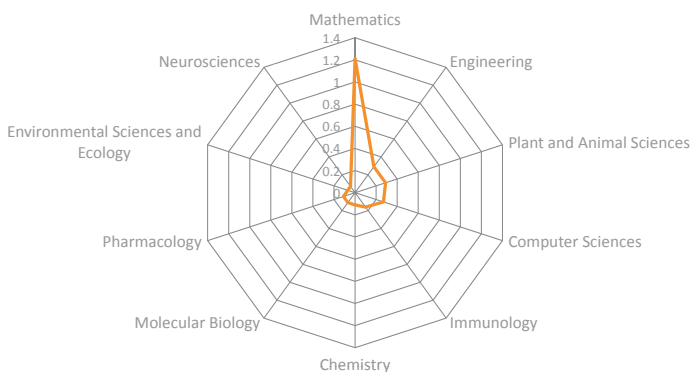
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



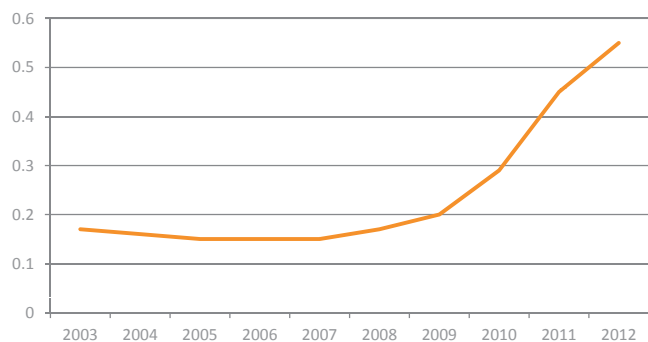
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



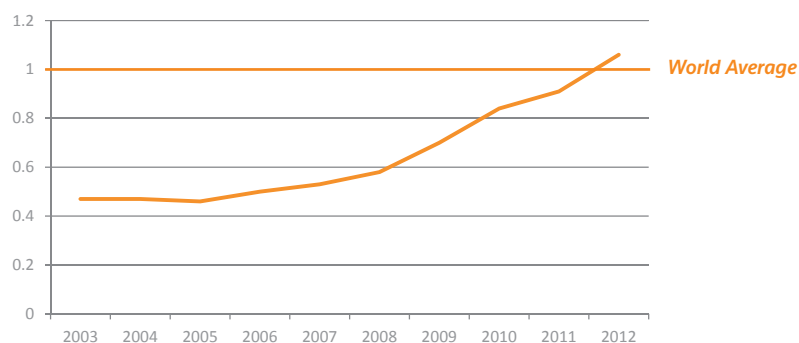
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



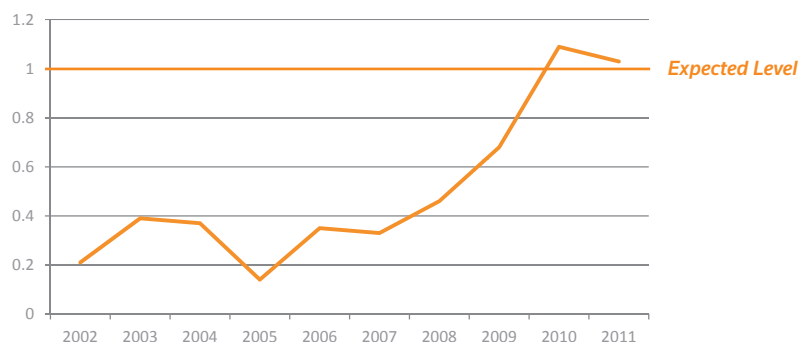
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)



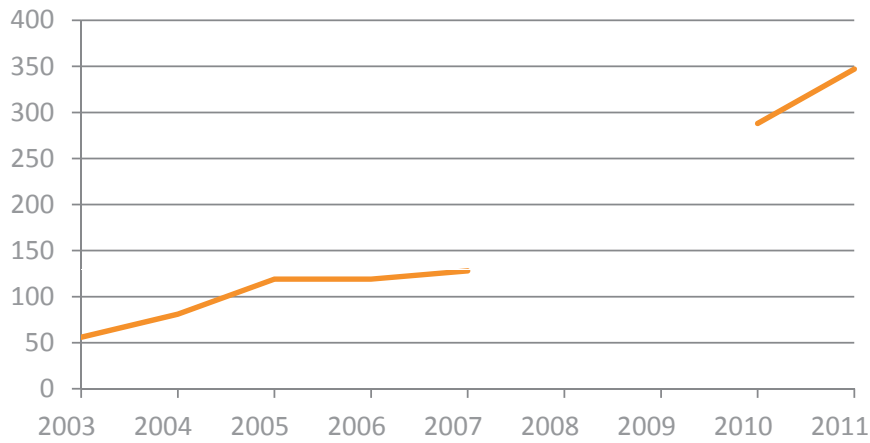
From a low base of only 1,474 Web of Science papers in 2003, Saudi Arabia achieved the highest percentage of growth in output during the last decade among the G20 members: 373%. Its 6,978 papers in 2012 were good for a .6% world share, up from .2% at the beginning of the period. Much of this growth has been recent, specifically since 2009. With such dynamic growth it is remarkable that the nation also tallied a strong increase in citation impact, from about only half the world average to 6% above world average by 2012 – remarkable in the sense that racing productivity does not often add publications of the same, let alone better, quality, as suggested by citation measures. World shares in all fields remained low given Saudi Arabia’s still small publication output, but mathematics ranked first for the nation, with a .7% share during 2008 to 2012. It was also in mathematics that Saudi Arabia posted its highest citation impact, 5% greater than world average. Finally, mathematics earned for the nation its highest share of highly cited papers, some 1.2%. Engineering, plant and animal sciences, and computer sciences were tied at a distant second place, with just a .3% share each of the world’s highly cited papers in those three fields from 2002 to 2011.

Also see: J. Adams, C. King, D. Pendlebury, D. Hook, and J. Wilsdon, Global Research Report: Middle East. Exploring the Changing Landscape of Arabian, Persian, and Turkish Research, February 2011 <http://sciencewatch.com/sites/sw/files/sw-article/media/globalresearchreport-aptme.pdf>

SAUDI ARABIA

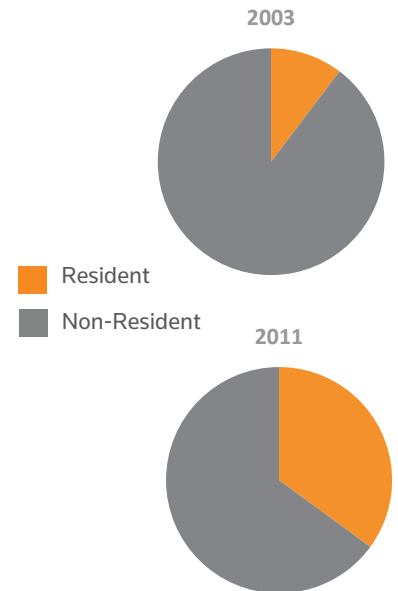
Intellectual Property Research

SA Patent Applications with SA Priority 2003-2012



Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



Source: Thomson Reuters Derwent World Patents Index

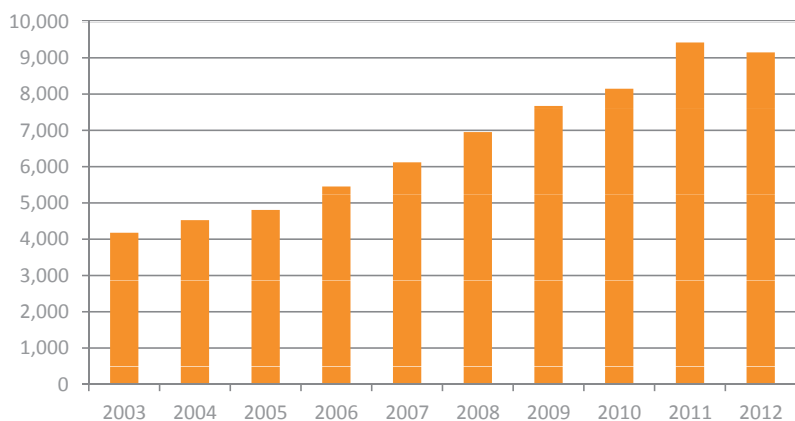
Data for Saudi Arabia is incomplete. Domestic filings are growing rapidly in Saudi Arabia although still at a relatively low level compared to the other G20 regions. Of the total filings in Saudi Arabia, the majority of these originate from abroad although the proportion of domestic filings grew significantly from 10% in 2003 to 35% in 2011 (the last year for which complete data is available).

No data concerning technology breakdown or patenting organizations is available.

SOUTH AFRICA

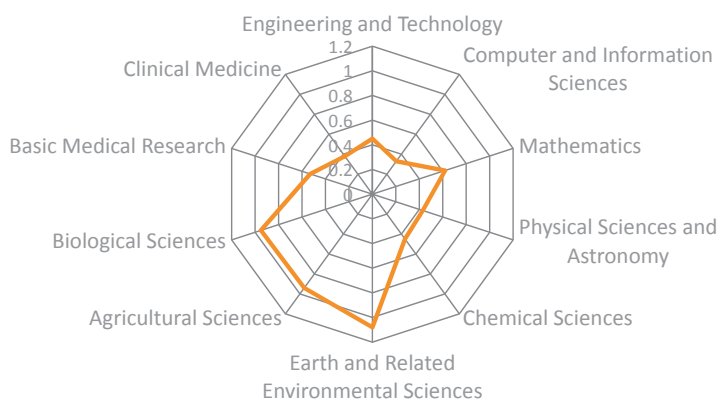
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

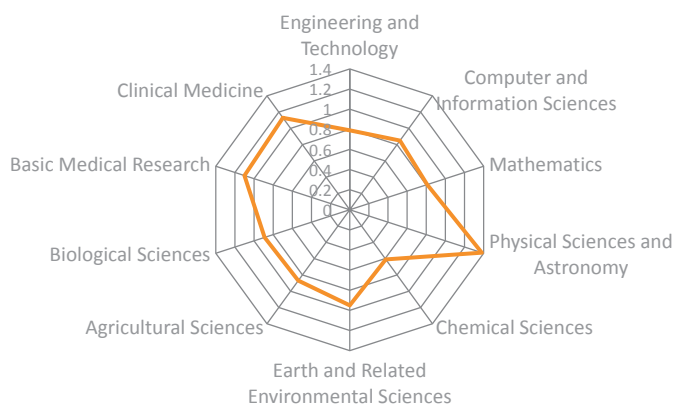


Population: 53.0 million (est. 2013, Statistics South Africa)
 GDP (PPP): 609 billion \$ (est. 2013, International Monetary Fund)
 GERD (billion current PPP\$): 4.4 (2009, MSTI, OECD)
 GERD as % of GDP: .87 (2009, MSTI, OECD)
 BERD as % of GDP: .37 (2009, MSTI, OECD)
 Researchers (FTE) thousands: 19.8 (2009, MSTI, OECD)
 R&D personnel per thousand labor force: 1.76 (2009, MSTI, OECD)

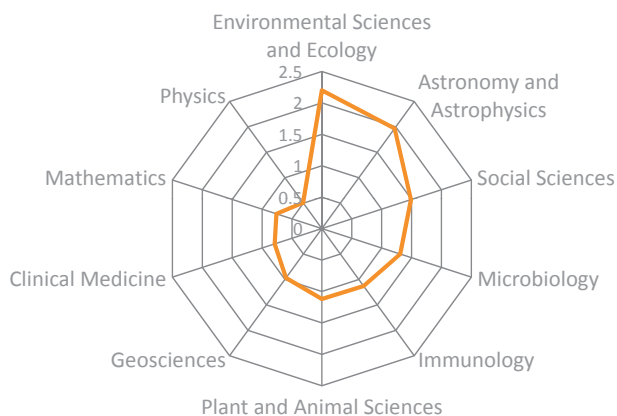
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



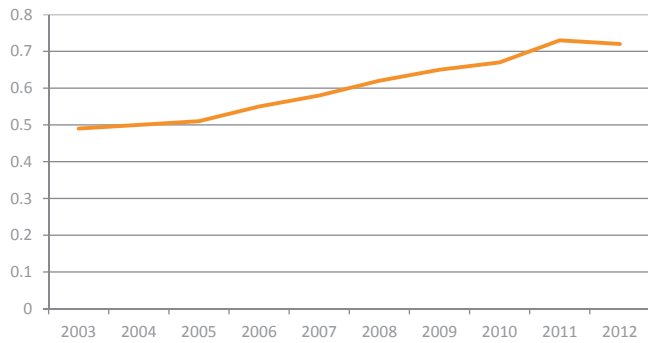
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



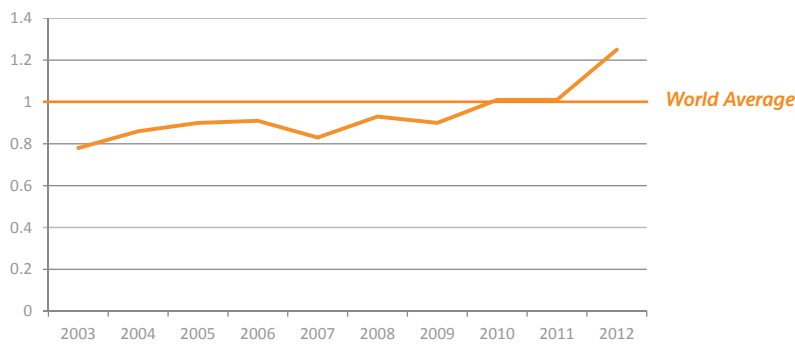
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



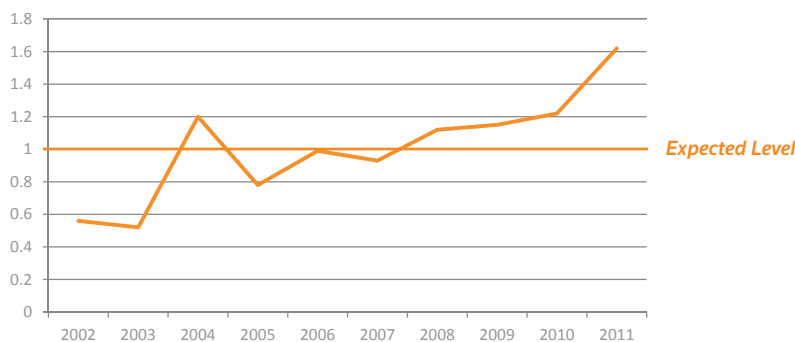
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)



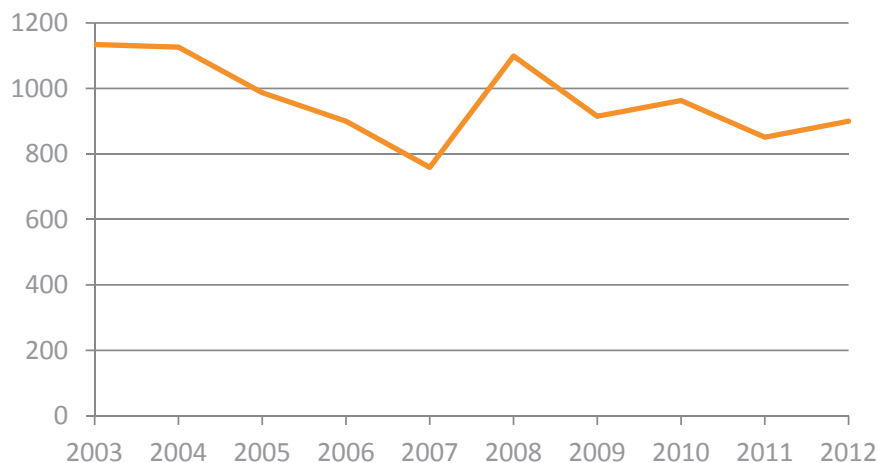
According to the indicator of relative citation impact, or citations per paper for a nation compared with the world average, South Africa has come far during the last decade. In 2003, its papers were attracting only three quarters of the expected number of citations compared with the world, whereas by 2012 they were collecting a quarter more than the global baseline. From 2002 to 2011, the nation’s output of highly cited papers—those ranked in the top 1% according to their field and year—increased more than fivefold, from 23 in 2002 (.6% of its annual output) to 134 (1.6% of output and far above the 1% that is expected according to the definition of highly cited papers). Like Australia, South Africa’s unique geography and natural resources have contributed to certain focus areas for its scientists. For example, during 2008 to 2012 South Africa held some of its largest world shares in earth and related environmental sciences (1.1%) and in agricultural sciences (.9%). Environmental sciences and ecology was also the highest ranked Essential Science Indicators field for the nation in world share of highly cited papers (2.2%). As might be anticipated, performance in astronomy shined brightly thanks to South Africa’s position in the field and observatories: during 2008 to 2012, physics and astronomy exhibited the highest citation impact for the nation, at 38% above world average, and astronomy was second-highest-ranked field for South Africa in world share of highly cited papers. Social science deserves special mention, since the nation is represented on a significant number of highly cited papers in this area (a 1.5% world share). Many of these deal with early man and also with health care studies concerning the treatment and management of AIDS/HIV, two subjects of substantial worldwide interest.

Also see: J. Adams, C. King, and D. Hook, Global Research Report: Africa, April 2010 <http://sciencewatch.com/sites/sw/files/sw-article/media/globalresearchreport-africa.pdf>

SOUTH AFRICA

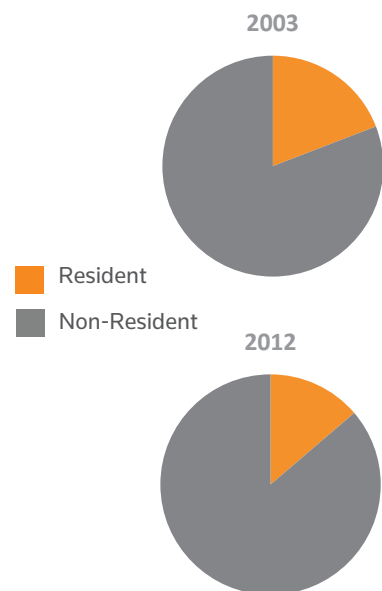
Intellectual Property Research

ZA Patent Applications with ZA Priority 2003-2012



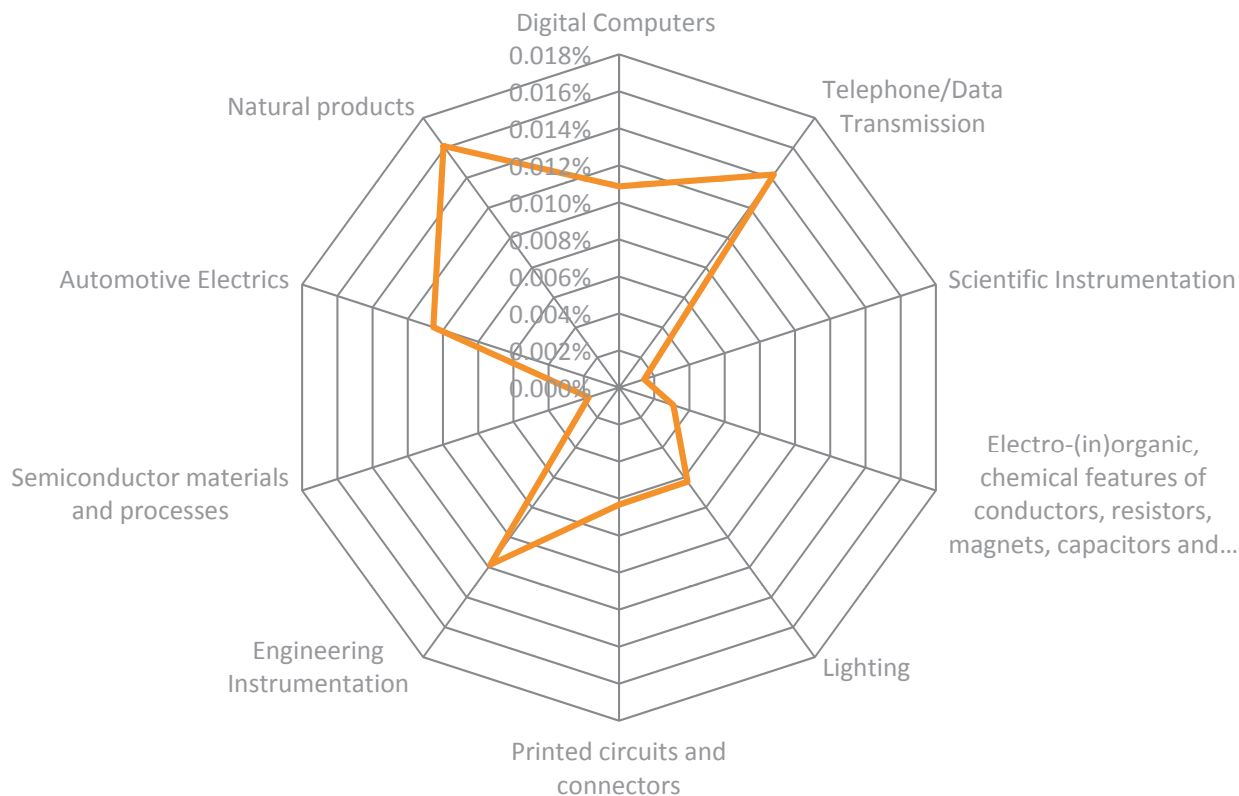
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



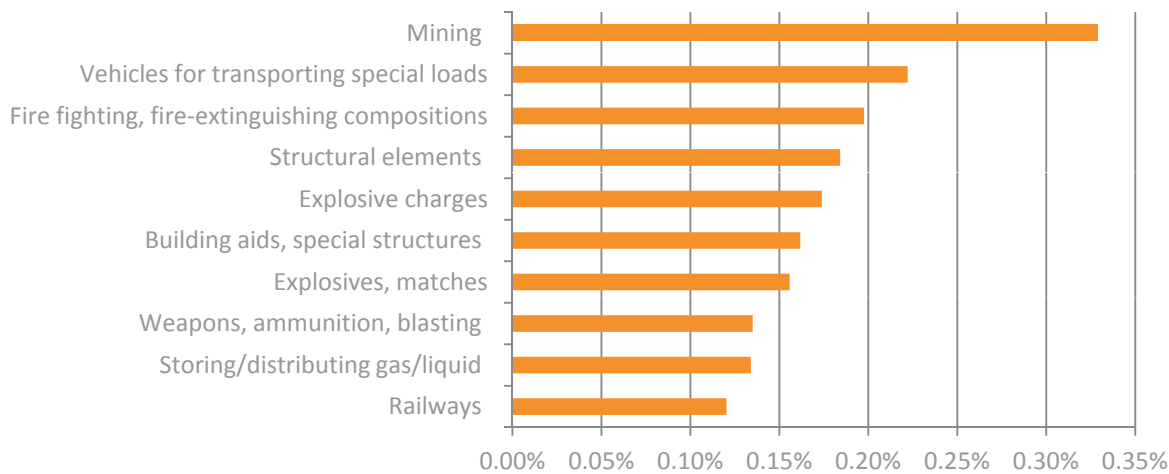
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL ZA INVENTIONS 2012
HYDRO POWER EQUIP PTY LTD	15
PHARMATHEN SA	9
STITCH WISE PTY LTD	6
AVENG AFRICA LTD	4
GOSSAMER STRUCTURES PTY LTD	4
M PROPS PTY LTD	4
TELEFONAKTIEBOLAGET ERICSSON L M	4
UNIV FREE STATE	4
IFLEET PTY LTD	3
INNOVATIVE MINING PROD PTY LTD	3

COMPANY - RESIDENT	ZA INVENTIONS WITH ZA PRIORITY 2012
HYDRO POWER EQUIP PTY LTD	15
STITCH WISE PTY LTD	6
AVENG AFRICA LTD	4
GOSSAMER STRUCTURES PTY LTD	4
M PROPS PTY LTD	4
UNIV FREE STATE	4
IFLEET PTY LTD	3
INNOVATIVE MINING PROD PTY LTD	3
MURRAY&ROBERTS STEEL PTY LTD	3
UNIV MANDELA METROPOLITAN NELSON	3

South African innovation over the last decade as measured by published priority patent applications has declined from just over 1,100 in 2003 to around 900 in 2012, recovering slightly from its lowest level of less than 800 in 2007. The majority of applications for South African patents come from outside South Africa although most of these are for existing inventions. The list of Top 10 companies innovating in South Africa is largely

comprised of South African concerns with the exception of Pharmathen (Greek) and Ericsson (Swedish). South Africa's share of the Top 10 global technologies is small at around 0.016% for natural products and less for the other technology areas. Relative to global patenting, South Africa's strengths are in mining, vehicles for transporting and fire-fighting.

SOUTH KOREA

Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)



Population: 50.0 million (est. 2012, National Statistics Office, South Korea)

GDP (PPP): 1,687 billion \$ (est. 2013, International Monetary Fund)

GERD (billion current PPP\$): 59.9 (2011, MSTI, OECD)

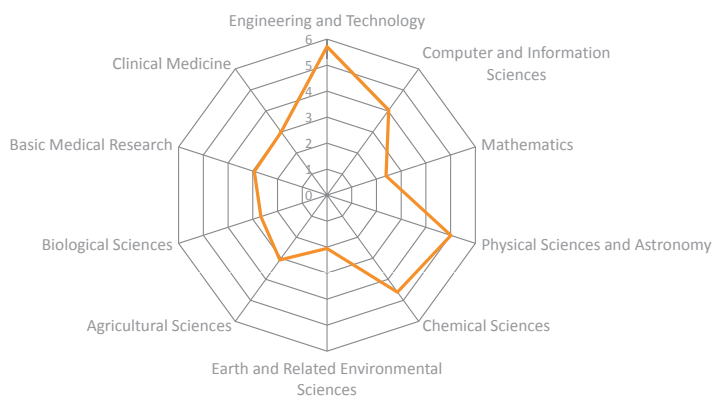
GERD as % of GDP: 4.03 (2011, MSTI, OECD)

BERD as % of GDP: 2.97 (2011, MSTI, OECD)

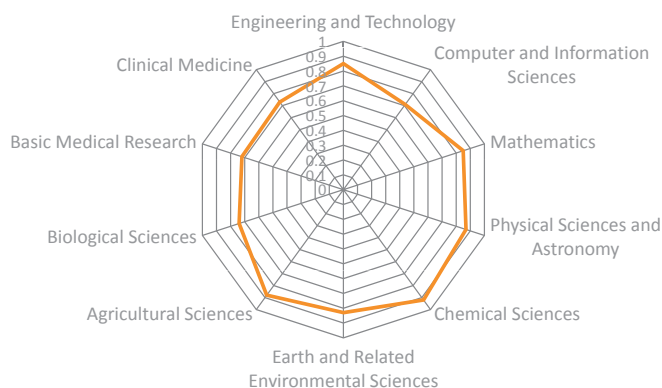
Researchers (FTE) thousands: 288.9 (2011, MSTI, OECD)

R&D personnel per thousand labor force: 14.40 (2011, MSTI, OECD)

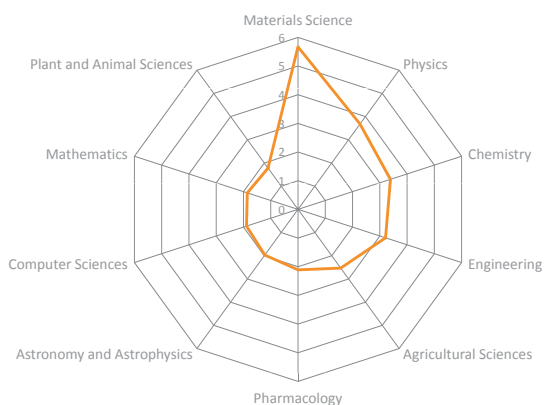
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



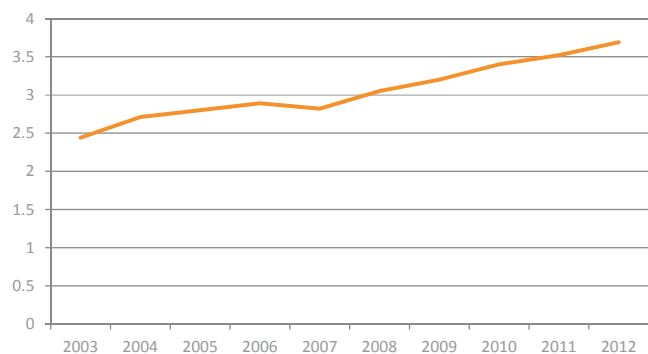
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



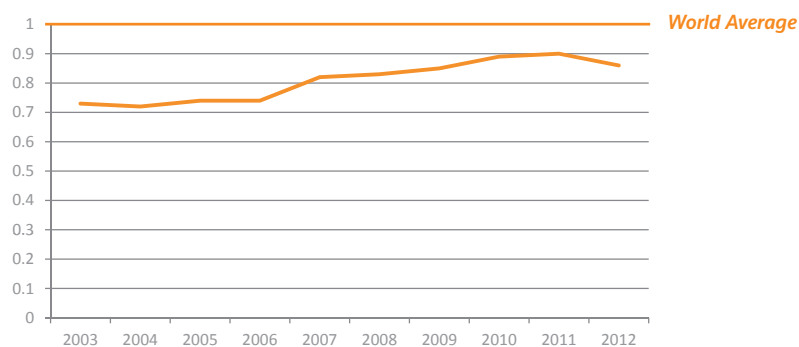
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



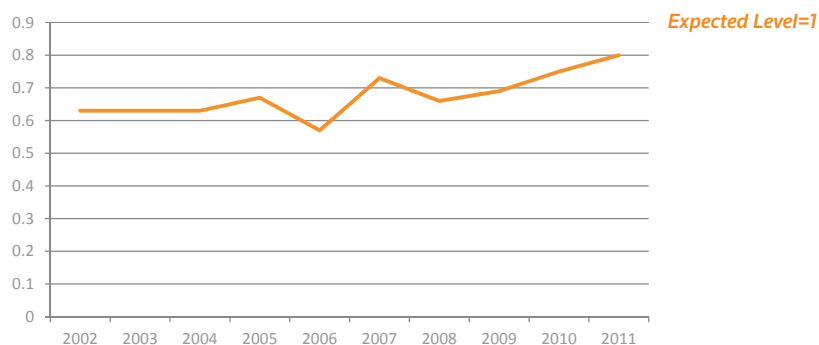
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)



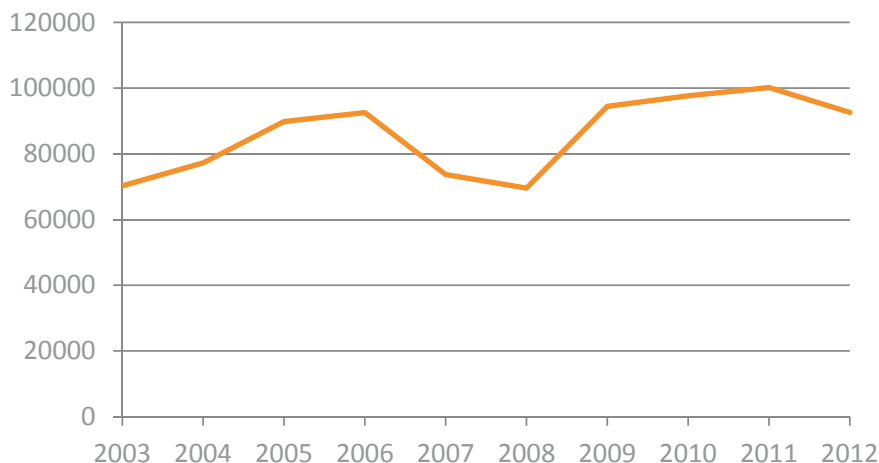
South Korea’s production of papers indexed in Web of Science has grown rapidly in the last three decades and continues to do so but at a slower pace recently than that of China, India and Brazil. Still, with an increase of 127% from 2003 to 2012—from 20,755 to 47,066 papers—output increased substantially more than the database as a whole (50%). Citation impact improved from 27% to 14% below world average by 2012. Physical sciences and engineering are dominant sectors in South Korea’s research portfolio. From 2008 to 2012, the nation’s largest world share was in engineering and technology (5.7%), followed by physical sciences and astronomy (5%), chemical sciences (4.6%), and computer and information sciences (4%). This compares with an overall share of 3.4% for the country during the same five-year period. The first three fields earned citations per paper scores around 10% below world average, as did mathematics and agricultural sciences. South Korea’s percentage of highly cited papers based on output increased from .6% to .8% from 2002 to 2011, which is still 20% below the expected mark. According to Essential Science Indicators fields, the nation exhibited its largest shares of the world’s highly cited papers in materials sciences (5.7%), physics (3.7%), chemistry (3.4%) and engineering (3.2%), which reinforces the view of South Korea’s greater concentration on research in the physical over the biological sciences.

Also see: J. Adams, D. Pendlebury, and B. Stembridge, Building BRICKS: Exploring the Global Research and Innovation Impact of Brazil, Russia, India, China, and South Korea, February 2013 <http://sciencewatch.com/sites/sw/files/sw-article/media/grr-brick.pdf>

SOUTH KOREA

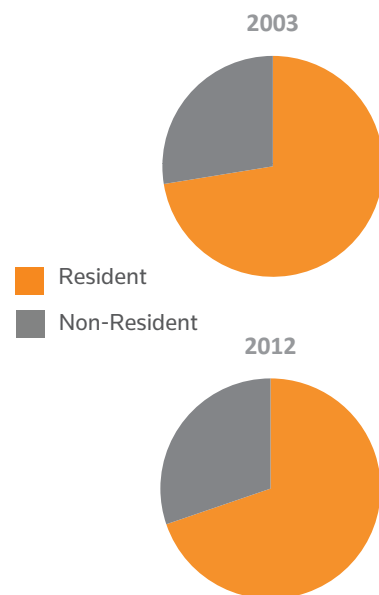
Intellectual Property Research

KR Patent Applications with KR Priority 2003-2012



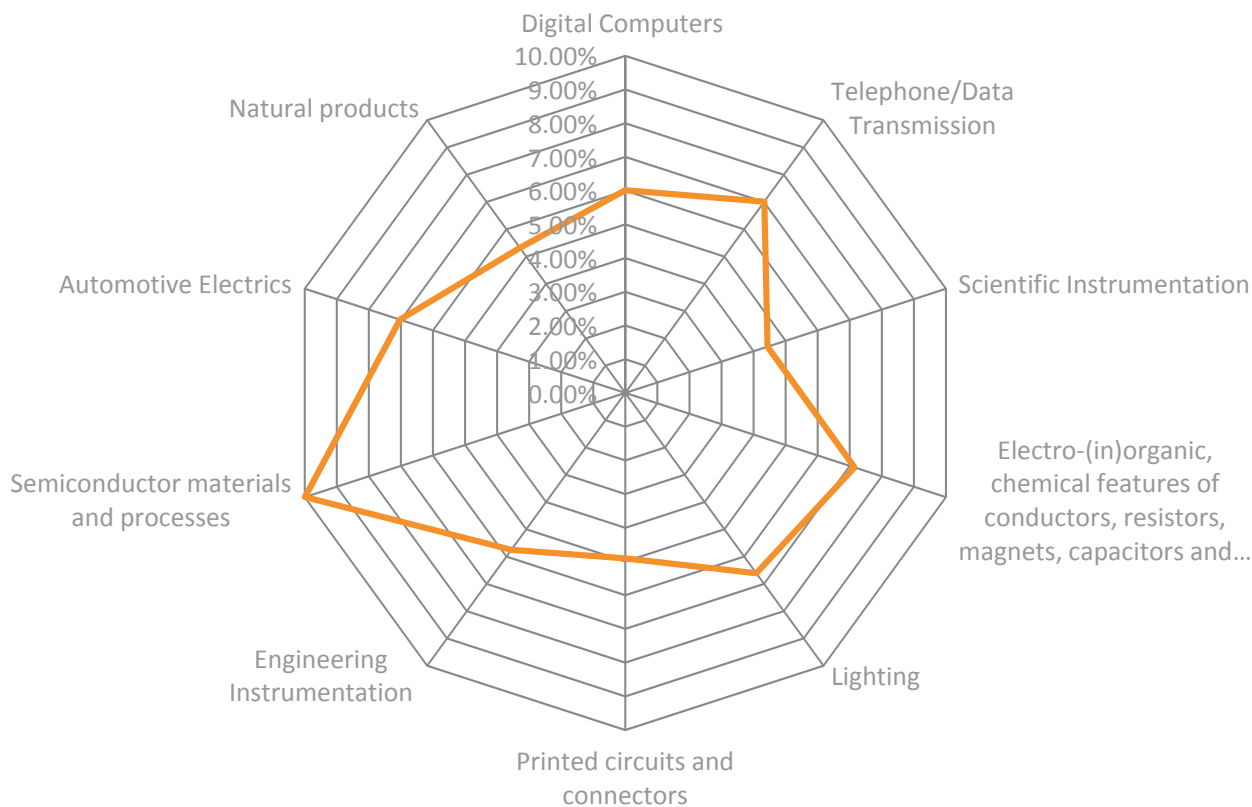
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



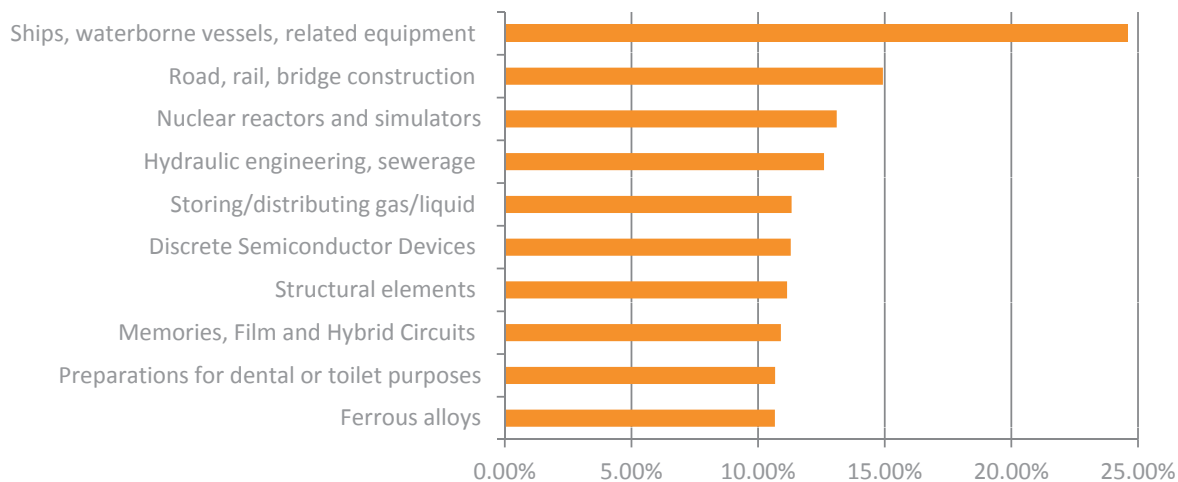
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL KR INVENTIONS 2012
LG ELECTRONICS INC	6009
SAMSUNG IND CO LTD	3669
HYUNDAI MOTOR CO LTD	1729
POSCO	1498
HYUNDAI STEEL CO	1031
HYUNDAI HEAVY IND CO LTD	974
ELECTRONICS&TELECOM RES INST	848
KOREA ADV INST SCI&TECHNOLOGY	845
SK HYNIX INC	787
HYUNDAI MOBIS CO LTD	732

COMPANY - RESIDENT	KR INVENTIONS WITH KR PRIORITY 2012
LG ELECTRONICS INC	6009
SAMSUNG IND CO LTD	3669
HYUNDAI MOTOR CO LTD	1729
POSCO	1498
HYUNDAI STEEL CO	1031
HYUNDAI HEAVY IND CO LTD	974
ELECTRONICS&TELECOM RES INST	848
KOREA ADV INST SCI&TECHNOLOGY	845
SK HYNIX INC	787
HYUNDAI MOBIS CO LTD	732

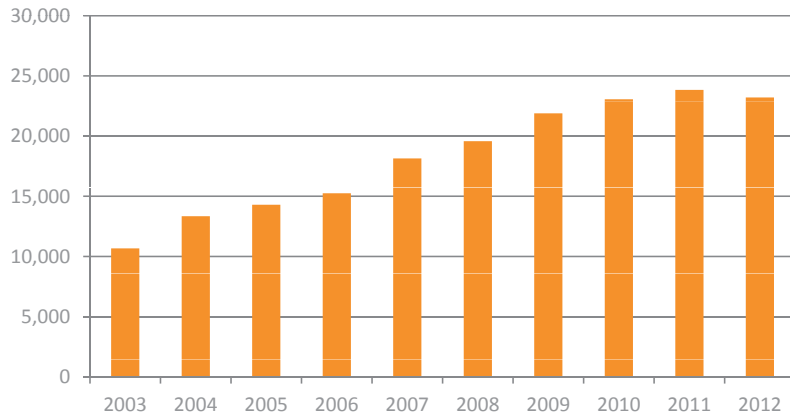
From 2003 to 2012, the rate of domestic South Korean innovation as measured by published priority applications has grown steadily at 3.2% p.a. from around 70,000 in 2003 to just under 100,000 in 2012. The proportion of non-resident applications has also grown during that time, but applications remain predominantly domestic at around 70%. This is borne out also by the Top 10 company lists which are populated exclusively with South Korean companies and one academic organization. Three of these organizations (LG, Samsung and KAIST) were recognized by Thomson Reuters among the Top

100 global innovators for 2012. In terms of the Top 10 global technologies, South Korea contributes significantly in most areas, from 10% of global share of semiconductor material technology to nearly 4.5% share in scientific instrumentation. South Korean innovation relative to global patenting, however, shows a strong focus on shipping with just less than 25% of global innovation in ships and waterborne technology, and significant global shares in construction and nuclear energy technology.

TURKEY

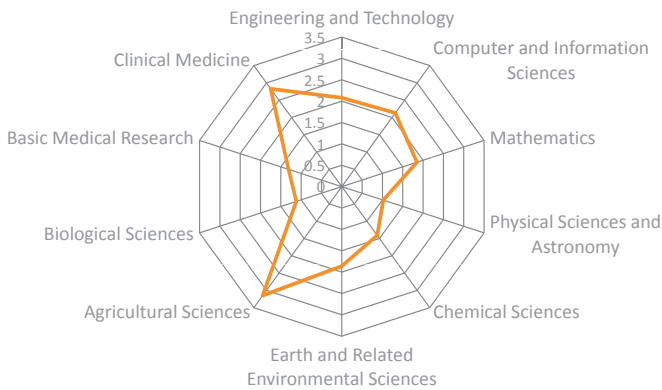
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

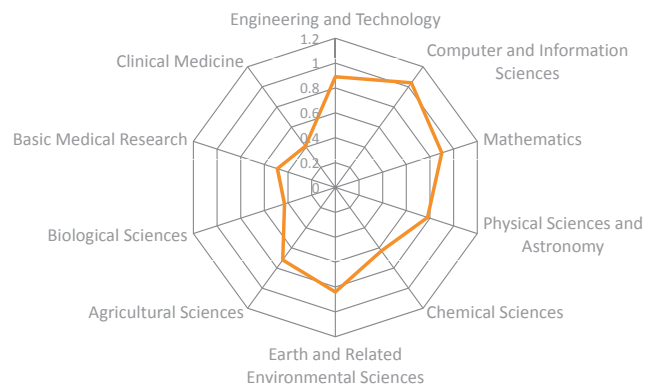


Population: 75.6 million (est. 2013, Turkstat)
 GDP (PPP): 1,358 billion \$ (est. 2012, World Bank)
 GERD (billion current PPP\$): 10.8 (2011, MSTI, OECD)
 GERD as % of GDP: .86 (2011, MSTI, OECD)
 BERD as % of GDP: .39 (2011, MSTI, OECD)
 Researchers (FTE) thousands: 72.1 (2011, MSTI, OECD)
 R&D personnel per thousand labor force: 3.41 (2011, MSTI, OECD)

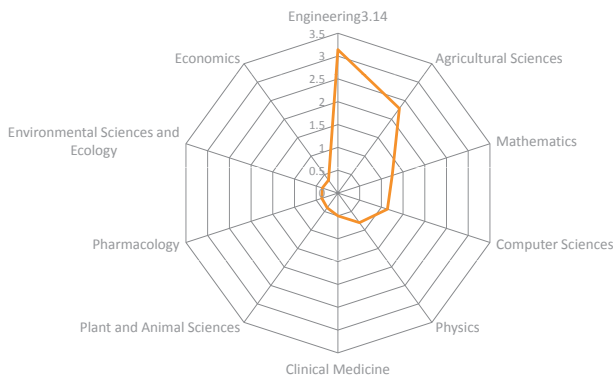
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



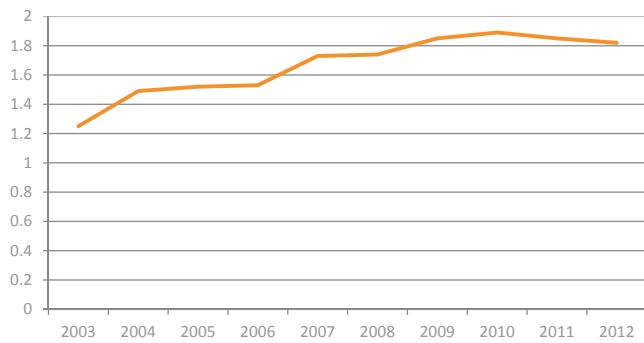
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



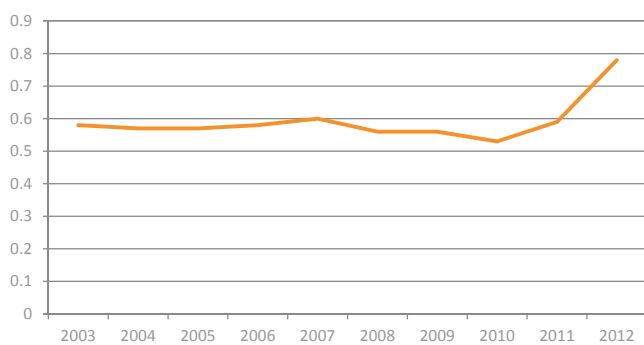
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002 - 2011)



Percent World Share of Papers in Web of Science (2003 - 2012)

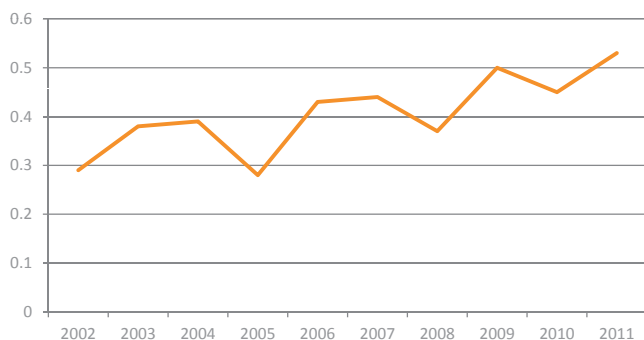


Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



World Average=1

Percent of Highly Cited Papers Based on National Output (2002 - 2011)



Expected Level=1

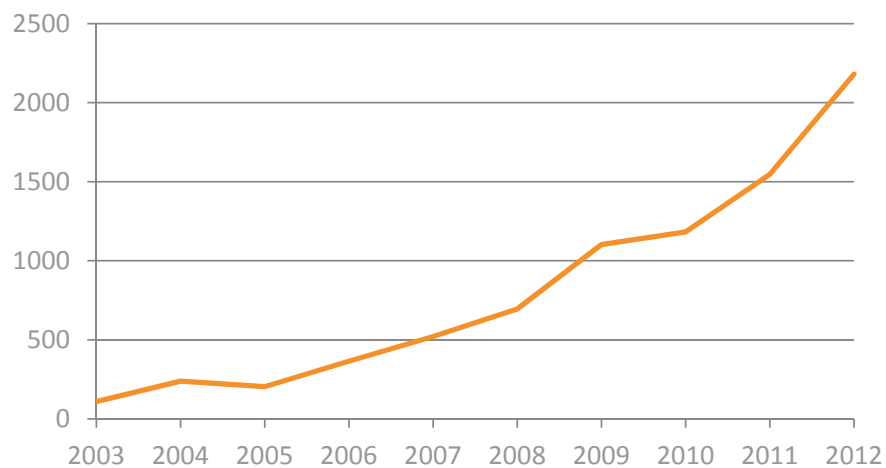
In a 2011 Global Research Report, Thomson Reuters analyzed the publication output and citation impact of Middle Eastern nations and noted that about half of the region's recent output of Web of Science papers was contributed by Turkey. While Turkey remains the dominant regional player, Iran has made rapid strides lately and is closing the gap. During the last decade, Turkey's production grew by 118%, from 10,668 papers in 2003 to 23,209 in 2012. That was more than double the world average and increased Turkey's world share from 1.3% to 1.8% of global output. Citation impact for the nation rose from 42% to 22% below the world average. For 2008 to 2012, Turkey's largest world share of papers came in agricultural sciences (3.2%), followed by clinical medicine (2.8%), and engineering and technology as well as computer and information sciences (both 2.1%). Computer and information sciences was the only OECD-defined field in which Turkey scored higher than world average in citation impact (4% above the global benchmark). Engineering and technology was next best in impact, at 11% below world average. In terms of world share of highly cited papers during 2002 to 2011, engineering and agricultural sciences were the top two fields for Turkey, at 3.1% and 2.3%, respectively. Highly cited papers from Turkish researchers have grown nearly fivefold, from 25 in 2002 to 120 in 2011, but still represent only .5% of the nation's output rather than the 1% expected.

Also see: J. Adams, C. King, D. Pendlebury, D. Hook, and J. Wilsdon, Global Research Report: Middle East. Exploring the Changing Landscape of Arabian, Persian, and Turkish Research, February 2011 <http://sciencewatch.com/sites/sw/files/sw-article/media/globalresearchreport-aptme.pdf>

TURKEY

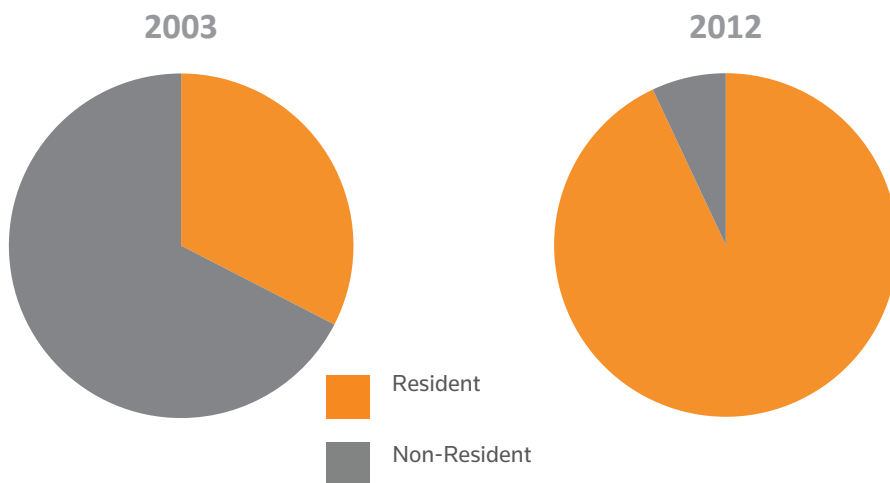
Intellectual Property Research

TR Patent Applications with TR Priority 2003-2012



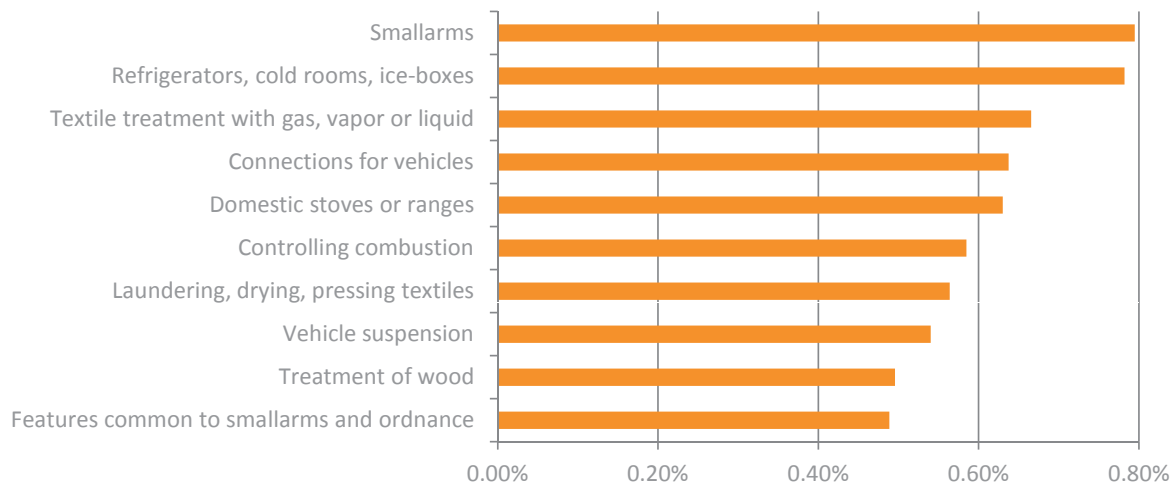
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL TR PATENTS 2012
OYAK RENAULT OTOMOBIL FAB AS	122
VESTEL BEYAZ ESYA SANAYI VE TICARET ANONIM SIRKETI	93
BSH EV ALETLERI SAN VE TIC AS	60
FORD OTOMOTIV SANAYI AS	49
TURKCELL TEKNOLOJI ARASTIRMA VE GELISTIRME A S	31
ARCELIK AS	21
VESTEL ELEKT SANAYI VE TICARET	21
TURAS GAZ ARMATUERLERI SAN VE TIC A S	21
DURMAZLAR MAKINA SANAYI VE TICARET ANONIM SIRKETI	17
TUERK TRAKTOER VE ZIRAAT MAKINELERI A S	17

COMPANY - RESIDENT	TR PATENTS WITH TR PRIORITY 2012
OYAK RENAULT OTOMOBIL FAB AS	122
VESTEL BEYAZ ESYA SANAYI VE TICARET ANONIM SIRKETI	93
BSH EV ALETLERI SAN VE TIC AS	60
FORD OTOMOTIV SANAYI AS	49
TURKCELL TEKNOLOJI ARASTIRMA VE GELISTIRME A S	31
ARCELIK AS	21
TURAS GAZ ARMATUERLERI SAN VE TIC A S	21
VESTEL ELEKT SANAYI VE TICARET	21
DURMAZLAR MAKINA SANAYI VE TICARET ANONIM SIRKETI	17
TUERK TRAKTOER VE ZIRAAT MAKINELERI A S	17

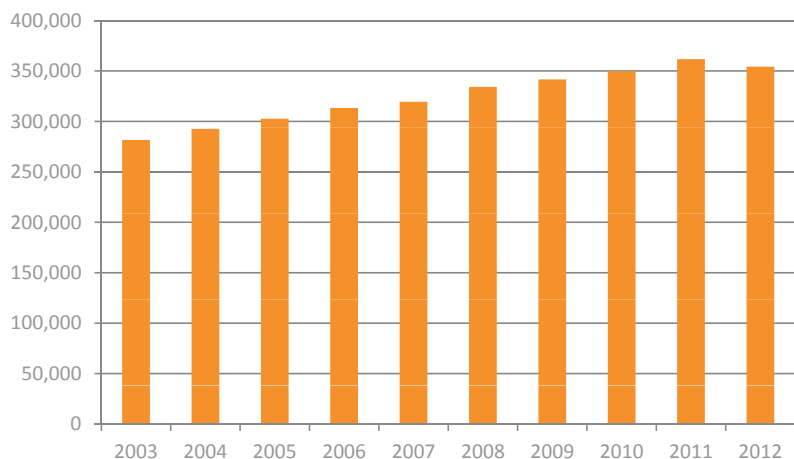
Over the decade from 2003 to 2012, inventions originating from Turkey, as measured by TR published priority patent applications, have grown over 18 times from around 100 in 2003 to over 2000 in 2012. Also during that time, the proportion of domestic applications has changed dramatically from 70% in 2003 to a dominant 97% in 2012. This is reflected in the Top 10 patent applicants for 2012, all of whom are

domestic. Since DWPI data is not available for Turkey, analysis of the Top 10 technologies relative to global innovation is based on the WIPO's 35 technology field classifications. This shows the prominence of small arms technology followed by refrigerators, textile treatment, connections for vehicles and other diverse technology areas.

UNITED STATES

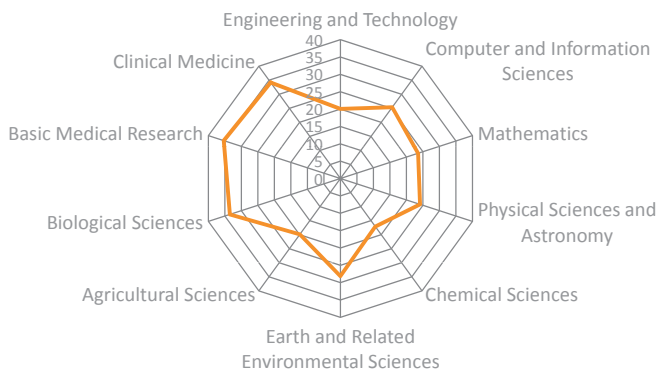
Scientific and Scholarly Research

Output of Papers Indexed in Web of Science (2003 - 2012)

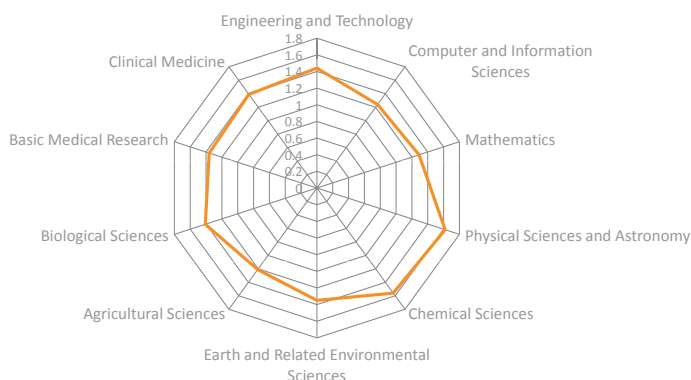


Population: 316.7 million (est 2013, US Census Bureau)
 GDP (PPP): 15,685 billion \$ (est. 2012, International Monetary Fund)
 GERD (billion current PPP\$): 415.2 (2011, MSTI, OECD)
 GERD as % of GDP: 2.77 (2011, MSTI, OECD)
 BERD as % of GDP: 1.66 (2011, MSTI, OECD)
 Researchers (FTE) thousands: 1,412.6 (2007, MSTI, OECD)

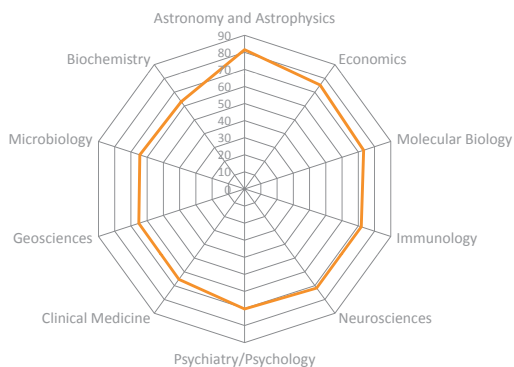
Percent World Share of Papers in Select OECD Science Fields (2008 - 2012)



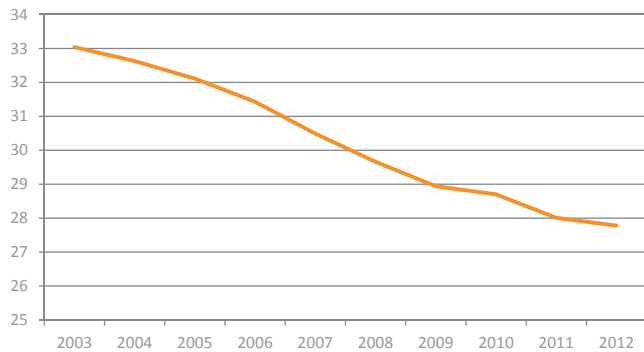
Relative Citation Impact of Papers in Select OECD Science Fields (2008 - 2012)



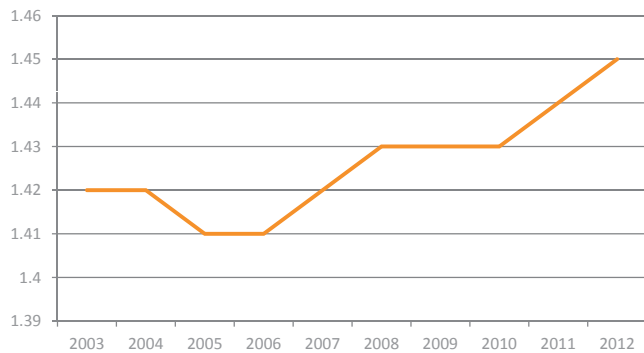
Top 10 ESI Fields by Percent World Share of Highly Cited Papers (2002-2011)



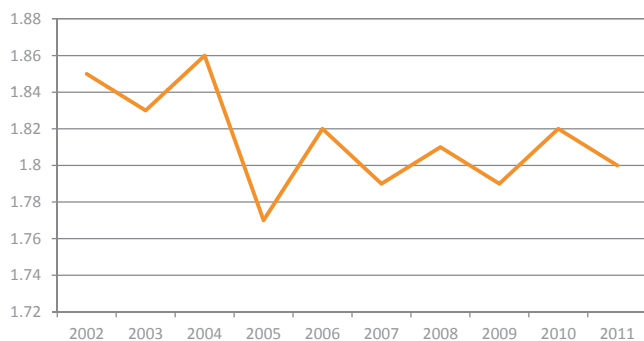
Percent World Share of Papers in Web of Science (2003 - 2012)



Relative Citation Impact of Papers Indexed in Web of Science (2003 - 2012)



Percent of Highly Cited Papers Based on National Output (2002 - 2011)



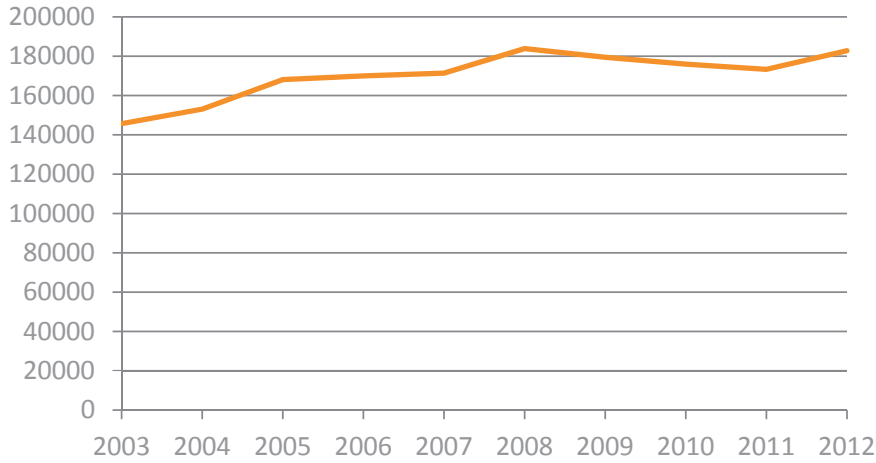
The United States is no longer the towering giant of global research casting its long shadow over all others. That was the position and status for the nation in the second half of the 20th century. Now, it finds the federation of the European Community a strong competitor and in some fields with some of its member states superior players. In the late 1990s, the group of EU nations surpassed the United States in output and world share. China, as noted, is developing so quickly that its production of Web of Science papers, now about half that of the United States and second globally, may exceed that of American scientists within another decade. While US output rose 26% over the last decade, papers in the Web of Science grew twice as fast thanks to increased output by others. As a consequence, world share for the United States fell from 33% in 2003 to 27.8% in 2012. Citation impact remains strong and well above the world average: between 41% and 45% during the last decade. But this indicator is flat whereas the general trend among many nations featured in this report is one of advancement. Highly cited papers for the United States, as a percentage of its output, have decreased albeit marginally, from 1.9% to also 1.8%. What we are witnessing is a globalization of research capacity and performance, and the emergence of three regional and more evenly matched actors – Europe, North America and Asia. The research portfolio of the United States tilts strongly in favor of the biological and biomedical sciences. Its largest world shares during 2008 to 2012 were in the OECD-defined disciplines of basic medical research (35.3%), clinical medicine (34.2%) and biological sciences (33.5%). Despite this, the nation’s highest relative citation impact scores were in physical sciences fields. The United States took its largest world share of highly cited papers in astronomy and astrophysics, in which its researchers appeared on eight of ten such papers, and in economics, where it was nearly as dominant. Of the next eight fields in the top ten for the United States, seven represent biological rather than physical sciences fields.

Also see: J. Adams and D. Pendlebury, Global Research Report: United States, November 2010 <http://sciencewatch.com/sites/sw/files/sw-article/media/globalresearchreport-usa.pdf>

UNITED STATES

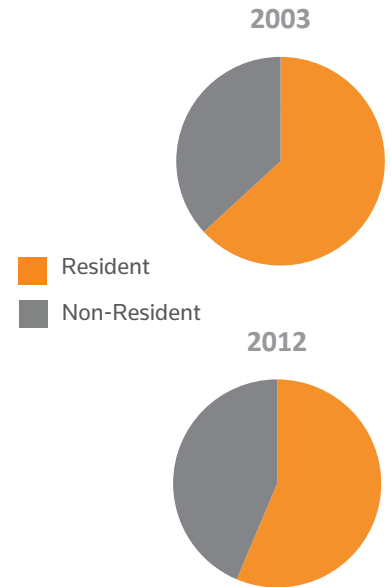
Intellectual Property Research

US Patent Applications with US Priority 2003-2012



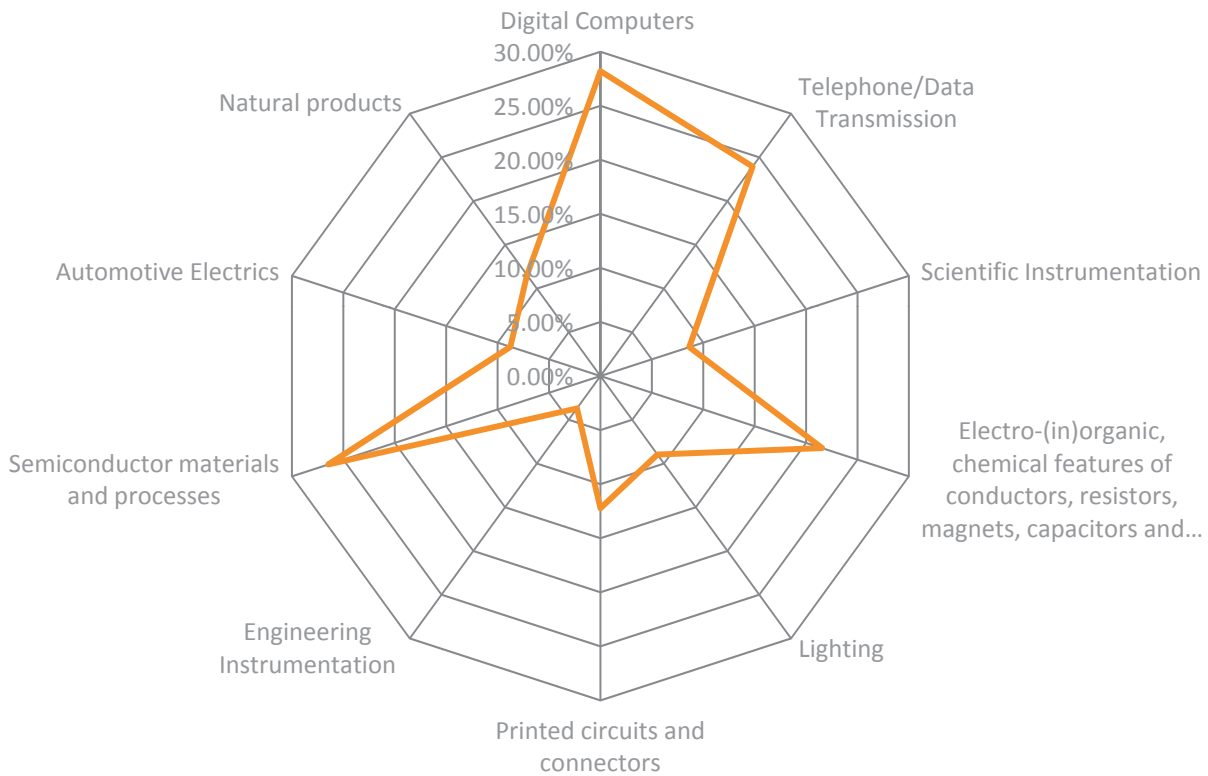
Source: Thomson Reuters Derwent World Patents Index

Resident vs. Non-Resident



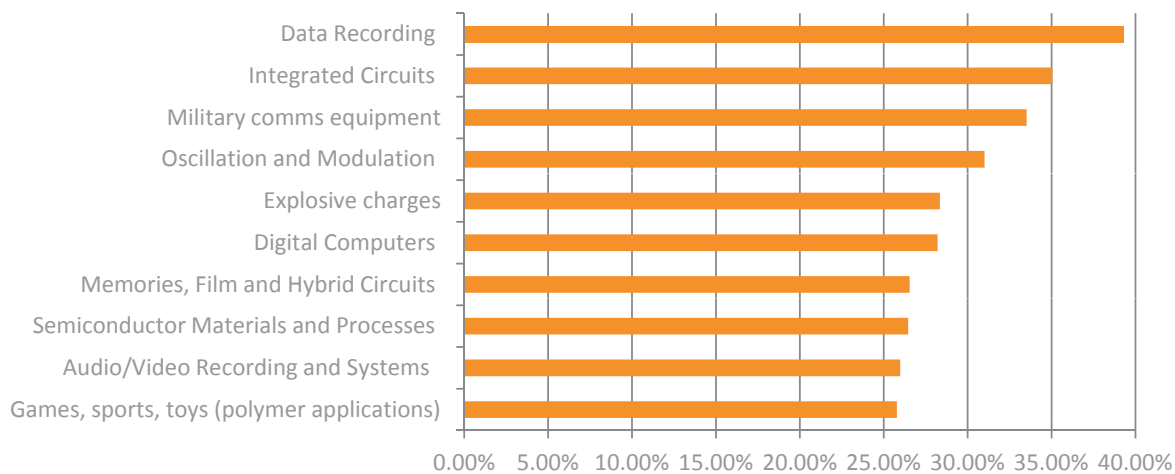
Source: Thomson Reuters Derwent World Patents Index

Share of Top 10 Global Technologies 2012



Source: Thomson Reuters Derwent World Patents Index

Share of Global Inventions 2012



Source: Thomson Reuters Derwent World Patents Index

COMPANY - FOREIGN & RESIDENT	ALL US INVENTIONS 2012
INT BUSINESS MACHINES CORP	6584
SAMSUNG ELECTRONICS CO LTD	4223
HON HAI PRECISION IND CO LTD	3103
CANON KK	2916
MICROSOFT CORP	2748
TOSHIBA KK	2730
SONY CORP	2148
HONGFUJIN PRECISION IND SHENZHEN CO LTD	1810
GENERAL ELECTRIC CO	1394
SEIKO EPSON CORP	1368

COMPANY - RESIDENT	US INVENTIONS WITH US PRIORITY 2012
INT BUSINESS MACHINES CORP	6584
MICROSOFT CORP	2748
GENERAL ELECTRIC CO	1394
GOOGLE INC	1176
APPLE INC	1090
QUALCOMM INC	1018
AT&T CORP	959
TEXAS INSTR INC	742
MICRON TECHNOLOGY INC	728
XEROX CORP	699

Domestic innovation in the United States, as measured by priority published patent applications, has grown steadily over the last decade from less than 150,000 priority applications in 2003 to over 180,000 in 2012, an average annual growth rate of 2%. This compares to growth rates of the next three largest economies by GDP (Europe, China and Japan) of 1.3%, 29.7% and minus 3.3%, respectively. That domestic innovation accounts for around 56% of all US patent applications in 2012, which is down from 63% in 2003. Foreign concerns are seeking to protect their inventions in the US market faster than domestic inventors are protecting theirs. This is reflected in the Top 10 list

of all companies innovating in the United States, which lists only three US companies alongside the seven remaining companies who are all headquartered in Asia (four Japanese, two Chinese and one Korean). The United States holds a significant share of the Top 10 global technologies leading with high-tech areas of digital computers (28.2%), semiconductor materials (26.5%), and telephone and data transmission (24.0%). Relative to global patenting, US indigenous innovation is focused on data recording, integrated circuits and military comms equipment.

ABOUT THOMSON REUTERS

Thomson Reuters is the world's leading source of intelligent information for businesses and professionals. We combine industry expertise with innovative technology to deliver critical information to leading decision makers in the financial and risk, legal, tax and accounting, intellectual property and science and media markets, powered by the world's most trusted news organization. With headquarters in New York and major operations in London and Eagan, Minnesota, Thomson Reuters employs approximately 60,000 people and operates in over 100 countries. For more information, go to thomsonreuters.com.

To find out more about the Intellectual Property and Science business of Thomson Reuters, visit:

ip-science.thomsonreuters.com.

Note to press:

To request further information, please contact:

Laura Gaze

Thomson Reuters

+1 203 868 3340

laura.gaze@thomsonreuters.com

Jen Breen

Thomson Reuters

+1 215 823 1791

jennifer.breen@thomsonreuters.com

1004556

122013