



	Researchers in R&D	Technicians in R&D	Scientific and technical journal articles	Expenditures for R&D	High-technology exports		Royalty and license fees		Patent applications filed ^{a,b}		Trademark applications filed ^a	
	per million people 2000–06 ^c	per million people 2000–06 ^c	2005	% of GDP 2000–06 ^c	\$ millions 2007	% of manu- factured exports 2007	\$ millions Receipts 2007	\$ millions Payments 2007	Residents 2007	Non- residents 2007	Residents 2007	Non- residents 2007
Afghanistan	..	..	..	..	..	..	..	..	..	..	..	..
Albania	..	..	..	..	8	12	5	8	..	..	186	809
Algeria	170	35	350	0.07	11	2	..	..	84	765	2,235	1,415
Angola	..	..	..	..	..	..	12	1	..	..	..	..
Argentina	895	366	3,058	0.49	1,144	7	85	1,036	0	0	55,252	18,465
Armenia	..	..	180	0.21	9	2	..	..	192	1	883	594
Australia	4,053	904	15,957	1.78	3,541	14	686	2,821	2,717	24,626	40,001	11,176
Austria	3,657	1,462	4,566	2.46	14,566	11	757	1,471	2,271	378	7,844	820
Azerbaijan	..	..	116	0.22	15	4	0	5	281	6	751	1,025
Bangladesh	..	..	193	..	..	..	0	8	22	288	..	..
Belarus	..	..	490	0.68	346	3	7	69	1,188	337	3,666	1,409
Belgium	3,252	1,447	6,841	1.85	25,178	7	1,640	1,867	454	163	22,964 ^d	1,695 ^d
Benin	..	..	..	..	0	0	0	2	..	..	..	..
Bolivia	120	6	..	0.28	15	5	2	16	..	..	1,873	4,208
Bosnia and Herzegovina	..	..	..	..	76	3	..	..	55	162	320	870
Botswana	..	..	..	0.39	16	0	0	11	..	..	..	..
Brazil	461	394	9,889	0.82	9,295	12	319	2,259	3,810	20,264	76,827	17,842
Bulgaria	1,344	488	764	0.48	618	6	10	73	211	28	6,868	674
Burkina Faso	22	16	..	0.17	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	1	4	0	..	..	..	..	..
Cambodia	17	13	..	0.05	..	..	0	10	..	..	467	1,847
Cameroon	26	..	131	..	3	3	0	6	..	..	..	..
Canada	3,922	1,467	25,836	1.97	29,593	14	3,635	7,552	4,998	35,133	21,101	26,657
Central African Republic	..	..	..	..	0	0	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..
Chile	833	302	1,559	0.67	401	7	61	434	291	2,924	30,847	13,473
China	926	..	41,596	1.42	336,988	30	343	8,192	153,060	92,101	669,276	56,840
Hong Kong, China	2,090	416	..	0.74	2,370	19	259	1,357	160	13,606	7,902	15,627
Colombia	127	97	400	0.17	338	3	17	188	121	1,860	14,118	9,876
Congo, Dem. Rep.	..	..	..	0.48	..	..	..	..	..	..	..	..
Congo, Rep.	32	35	..	..	..	..	..	..	..	..	..	..
Costa Rica	122	..	105	0.37	2,088	45	0	53	..	..	5,872	5,882
Côte d'Ivoire	68	..	..	..	460	32	0	10	..	..	..	..
Croatia	1,148	538	953	0.87	769	9	40	214	344	93	1,486	946
Cuba	..	..	261	0.51	248	35	..	..	74	210	454	602
Czech Republic	2,578	1,555	3,169	1.54	15,410	14	35	653	716	192	9,156	1,006
Denmark	5,277	1,990	5,040	2.44	11,247	17	..	..	1,660	197	4,444	662
Dominican Republic	..	..	..	..	..	..	0	32	0	0	..	..
Ecuador	51	..	..	0.06	73	7	0	45	0	794	6,078	6,527
Egypt, Arab Rep.	..	..	1,658	0.19	5	0	122	241	516	1,589	..	..
El Salvador	47	..	..	..	42	4	1	24	..	..	..	..
Eritrea	..	..	..	..	..	..	..	..	..	..	..	..
Estonia	2,622	579	439	1.15	840	12	10	40	44	19	1,537	443
Ethiopia	20	10	88	0.20	4	3	0	2	..	..	..	..
Finland	7,681	..	4,811	3.43	15,565	21	1,216	1,326	1,804	211	3,504	629
France	3,353	1,746	30,309	2.12	80,465	19	8,827	4,603	14,722	2,387	70,432	3,151
Gabon	..	..	..	..	71	32	..	..	..	..	..	..
Gambia, The	28	17	..	..	0	2	..	..	..	..	..	..
Georgia	..	..	145	0.18	39	7	11	5	83	79	554	605
Germany	3,386	1,144	44,145	2.52	155,922	14	7,249	9,698	47,853	13,139	72,788	3,377
Ghana	..	..	81	..	5	1	0	..	..	..	..	..
Greece	1,790	795	4,291	0.50	1,005	8	52	600	772	3,889	6,416	889
Guatemala	31	11	..	0.03	119	3	9	79	9	99	5,955	5,048
Guinea	..	..	..	..	..	..	0	0	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..
Haiti	..	..	..	..	..	..	3	0	..	..	..	..

Science and technology

	Researchers in R&D	Technicians in R&D	Scientific and technical journal articles	Expenditures for R&D	High-technology exports		Royalty and license fees		Patent applications filed ^{a,b}		Trademark applications filed ^a	
	per million people 2000–06 ^c	per million people 2000–06 ^c	2005	% of GDP 2000–06 ^c	\$ millions 2007	% of manu- factured exports 2007	\$ millions Receipts 2007	Payments 2007	Residents 2007	Non- residents 2007	Residents 2007	Non- residents 2007
Honduras	..	..	..	0.05	8	1	..	25	..	..	2,369	5,034
Hungary	1,745	491	2,614	1.00	19,349	25	841	1,596	689	102	3,615	631
India	111	86	14,608	0.69	4,944	5	112	949	4,521	19,984	73,308	12,361
Indonesia	199	..	205	0.05	5,225	11	31	1,052	282	4,324	36,644	16,005
Iran, Islamic Rep.	..	..	2,635	0.59	375	6	..	..	..	..	..	..
Iraq	..	..	..	..	0	0	0	29	..	..	..	..
Ireland	2,882	740	2,120	1.31	28,720	28	1,110	24,669	847	78	1,905	1,116
Israel	..	..	6,309	4.53	3,088	8	784	946	257	7,239	3,293	7,285
Italy	1,407	..	24,645	1.10	27,817	7	1,050	1,680	9,255	870	50,604	4,490
Jamaica	..	..	..	0.07	2	2	15	60	21	132	594	1,114
Japan	5,546	561	55,471	3.40	121,425	19	23,229	16,678	333,498	62,793	118,130	12,796
Jordan	..	..	275	0.34	38	1	0	0	..	..	..	..
Kazakhstan	783	83	96	0.28	1,470	23	0	68	1,433	124	..	..
Kenya	..	..	226	..	81	5	23	24	38	33	1,451	1,187
Korea, Dem. Rep.	..	..	..	..	..	..	..	..	..	..	..	..
Korea, Rep.	4,162	583	16,396	3.23	110,633	33	1,920	5,075	128,701	43,768	112,157	20,131
Kuwait	74	94	233	0.18	..	..	0	0	..	..	..	..
Kyrgyz Republic	..	..	..	0.20	8	2	2	12	155	3	191	424
Lao PDR	..	..	..	..	..	..	..	..	..	..	..	..
Latvia	1,758	648	134	0.69	353	7	13	40	114	37	1,398	479
Lebanon	..	..	234	..	..	..	..	..	..	..	..	..
Lesotho	10	11	..	0.06	..	..	20	..	..	..	..	..
Liberia	..	..	..	..	..	..	..	..	..	..	..	..
Libya	361	493	..	..	..	..	..	0	..	..	..	..
Lithuania	2,358	411	406	0.80	1,214	11	0	22	62	20	2,218	431
Macedonia, FYR	547	83	..	24.77	21	1	3	9	..	..	..	..
Madagascar	43	6	..	0.16	7	1	2	9	4	40	445	432
Malawi	..	..	..	..	2	2	..	..	..	..	222	582
Malaysia	503	63	615	0.60	64,584	52	36	1,195	531	4,269	12,289	13,605
Mali	..	..	..	..	3	7	0	1	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	..	..	..	0.38	112	8	0	6	..	..	..	..
Mexico	464	260	3,902	0.50	33,314	17	120	503	629	15,970	54,610	28,606
Moldova	..	..	89	..	14	5	6	7	333	14	1,262	717
Mongolia	..	..	..	0.26	7	8	..	..	103	110	339	277
Morocco	..	..	443	0.66	858	9	4	36	178	732	5,637	1,365
Mozambique	..	..	..	0.50	3	2	0	2	..	..	553	943
Myanmar	18	139	..	0.16	..	..	..	..	..	..	..	..
Namibia	..	..	..	..	83	5	..	2	..	..	..	..
Nepal	59	137	..	..	..	..	..	..	..	..	..	..
Netherlands	2,524	1,863	13,885	1.69	74,369	26	4,322	3,662	2,079	367	..	..
New Zealand	4,207	768	2,983	1.17	628	10	141	553	1,892	5,952	9,665	9,945
Nicaragua	..	..	..	0.05	5	4	0	..	..	..	1,195	4,780
Niger	8	10	..	..	4	14	0	0	..	..	..	..
Nigeria	..	..	362	..	62	8	..	174	..	..	..	..
Norway	4,668	..	3,644	1.49	4,391	18	700	622	1,223	5,431	3,326	3,286
Oman	..	..	111	..	8	0	..	..	..	..	..	..
Pakistan	80	41	492	0.44	188	1	37	107	0	0	9,033	4,952
Panama	87	206	..	0.25	0	0	0	47	..	..	3,530	6,079
Papua New Guinea	..	..	..	..	..	..	..	..	..	..	76	536
Paraguay	71	122	..	0.09	24	6	206	6	..	..	..	..
Peru	..	..	133	0.15	69	2	2	90	28	1,331	12,778	8,867
Philippines	..	..	178	0.14	13,792	54	5	364	231	3,034	8,398	6,335
Poland	1,562	227	6,844	0.56	4,177	4	108	1,575	2,392	361	13,951	1,100
Portugal	2,007	277	2,910	0.83	3,285	9	105	451	250	31	15,288	959
Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..



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	per million people 2000–06 ^c	per million people 2000–06 ^c	2005	% of GDP 2000–06 ^c	\$ millions 2007	% of manu- factured exports 2007	\$ millions Receipts 2007	\$ millions Payments 2007	Residents 2007	Non- residents 2007	Residents 2007	Non- residents 2007
Romania	952	209	887	0.46	1,178	4	41	242	827	59	10,988	883
Russian Federation	3,255	574	14,412	1.08	4,144	7	396	2,806	27,505	11,934	31,502	10,372
Rwanda	..	..	..	..	1	16	0	1	..	..	..	..
Saudi Arabia	..	..	575	..	121	1	0	0	128	642	..	..
Senegal	..	..	83	0.09	22	4	0	5	..	..	..	..
Serbia	..	..	849	1.65	176	4	..	..	395	121	2,102	2,030
Sierra Leone	..	..	..	..	..	..	..	2	..	..	..	..
Singapore	5,713	549	3,609	2.39	105,549	46	716	9,905	696	9,255	5,383	11,170
Slovak Republic	2,186	424	919	0.49	2,517	5	149	124	239	106	2,889	1,031
Slovenia	2,924	1,476	1,035	1.63	1,246	5	18	169	331	15	1,493	428
Somalia	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	361	109	2,392	0.92	1,859	6	53	1,596	0	5,781	17,106	12,811
Spain	2,639	919	18,336	1.21	9,916	5	536	3,402	3,267	265	55,909	1,924
Sri Lanka	141	77	136	0.19	99	2	0	0	151	279	3,382	2,835
Sudan	..	..	..	0.28	0	1	..	..	..	..	..	..
Swaziland	..	..	..	..	0	0	0	121	..	..	..	..
Sweden	6,139	..	10,012	3.82	20,369	16	4,753	1,810	2,527	398	10,510	800
Switzerland	3,436	2,317	8,749	2.93	33,655	22	..	..	1,692	342	11,723	4,670
Syrian Arab Republic	..	..	77	..	29	1	0	20	124	133	..	..
Tajikistan	..	..	..	0.10	..	..	1	1	26	0	170	612
Tanzania	..	..	107	..	5	1	0	5	..	..	..	..
Thailand	292	211	1,249	0.26	30,925	27	54	2,287	877	511	20,140	13,415
Timor-Leste	..	..	..	..	..	..	..	..	..	..	..	..
Togo	..	..	..	..	0	0	0	7	..	..	..	..
Trinidad and Tobago	..	..	..	0.12	60	2	..	..	0	551	..	..
Tunisia	1,450	41	571	1.03	565	5	15	10	56	282	..	..
Turkey	577	65	7,815	0.76	328	0	..	647	1,810	211	59,028	4,020
Turkmenistan	..	..	..	..	..	..	..	..	..	..	146	380
Uganda	..	..	93	0.19	24	11	1	5	6	1	..	..
Ukraine	..	..	2,105	1.03	1,314	4	53	577	3,474	2,416	19,888	3,858
United Arab Emirates	..	..	229	..	23	1	..	..	..	..	..	..
United Kingdom	3,033	..	45,572	1.80	63,066	19	15,108	10,121	17,375	7,624	28,976	4,999
United States	4,651	..	205,320	2.61	228,655	28	82,614	25,047	241,347	214,807	256,429	33,065
Uruguay	373	51	204	0.26	41	3	0	7	..	..	3,804	8,991
Uzbekistan	..	..	157	..	..	..	..	..	324	198	1,382	680
Venezuela, RB	86	2	534	0.23	80	3	0	276	..	..	..	..
Vietnam	115	..	221	0.19	1,273	6	..	..	180	1,767	12,884	5,134
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	..	..	..	..	1	1	149	9	..	..	..	..
Zambia	..	..	..	0.03	9	2	0	1	..	..	..	..
Zimbabwe	..	..	..	..	48	3	..	..	..	..	..	..
World	1,173 w	.. w	708,086 s	2.30 w	1,807,189 s	18 w	165,115 s	164,279 s	1,012,033 s	575,469 s	1,381,943 s	405,931 s
Low income	..	..	2,103	..	..	7	68	362	485	202	10,852	7,204
Middle income	510	..	123,683	0.94	466,128	19	2,270	26,188	189,511	128,440	408,371	199,853
Lower middle income	336	..	67,280	1.00	339,542	23	964	13,441	155,262	99,433	90,521	66,626
Upper middle income	1,107	304	56,403	0.73	126,586	14	1,306	12,747	34,249	29,007	317,850	133,227
Low & middle income	..	..	125,786	0.92	391,161	19	2,337	26,550	189,996	128,642	419,223	207,057
East Asia & Pacific	926	..	44,064	1.42	..	31	469	13,100	153,937	92,623	32,534	27,686
Europe & Central Asia	2,014	330	36,442	0.86	16,092	6	693	6,369	34,441	13,121	157,537	29,834
Latin America & Carib.	429	283	20,045	0.61	48,714	12	880	4,710	861	20,264	199,614	128,807
Middle East & N. Africa	..	..	6,243	..	..	4	141	296	600	2,354	7,872	2,780
South Asia	111	86	15,429	0.68	..	5	44	115	151	279	12,432	7,919
Sub-Saharan Africa	..	..	3,563	..	2,717	8	110	1,960	6	1	17,106	12,811
High income	3,890	..	582,300	2.48	1,312,001	18	162,778	137,730	822,037	446,827	962,720	198,874
Euro area	2,767	1,237	158,066	2.01	440,779	14	27,601	54,216	81,901	21,591	312,991	21,892

a. Original information was provided by the World Intellectual Property Organization (WIPO). The International Bureau of WIPO assumes no responsibility with respect to the transformation of these data. b. Excludes applications filed under the auspices of the European Patent Office (140,763 by nonresidents) and the Eurasian Patent Organization (2,293 by nonresidents). c. Data are for the most recent year available. d. Includes Luxembourg and the Netherlands.

About the data

Technological innovation, often fueled by government-led research and development (R&D), has been the driving force for industrial growth. The best opportunities to improve living standards, including new ways of reducing poverty, will come from science and technology. Countries able to access, generate, and apply scientific knowledge will have a competitive edge. And there is greater appreciation of the need for high-quality scientific input into public policy issues such as regional and global environmental concerns.

Science and technology cover a range of issues too broad and complex to be quantified by a single set of indicators, but those in the table shed light on countries' technology base.

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics collects data on researchers, technicians, and expenditure on R&D from around the world, through questionnaires and surveys and from other international sources. R&D covers basic research, applied research, and experimental development. Data on researchers and technicians are normally calculated as full-time equivalents.

Scientific and technical article counts are from a set of journals classified and covered by the Institute for Scientific Information's Science Citation Index (SCI) and Social Sciences Citation Index (SSCI). Counts are based on fractional assignments; for example, an article with two authors from different countries is counted as one-half of an article for each country (see *Definitions* for fields covered). The SCI and SSCI databases cover the core set of scientific journals but may exclude some of regional or local importance. They may also reflect some bias toward English-language journals.

R&D expenditures include all expenditures for R&D performed within a country, including capital expenditures and current costs (annual wages and salaries and all associated costs of researchers, technicians, and supporting staff and other current costs, including noncapital purchases of materials, supplies, and R&D equipment such as utilities, books, journals, reference materials, subscriptions to libraries and scientific societies, and materials for laboratories).

The method for determining a country's high-technology exports was developed by the Organisation for Economic Co-operation and Development in collaboration with Eurostat. Termed the "product approach" to distinguish it from a "sectoral approach," the method is based on R&D intensity (R&D expenditure divided by total sales) for groups of products from Germany, Italy, Japan, the Netherlands, Sweden, and the United States. Because industrial sectors specializing in a few high-technology products may also produce

many low-technology products, the product approach is more appropriate than the sectoral approach for analyzing international trade. This method takes only R&D intensity into account, but other characteristics of high technology are also important, such as know-how, scientific and technical personnel, and technology embodied in patents. Considering these characteristics would yield a different list (see Hatzichronoglou 1997). Moreover, the R&D for high-technology exports may not have occurred in the reporting country.

A patent is an exclusive right granted for an invention (a product or process that provides a new way of doing something or a new technical solution to a problem). The invention must be of practical use and display a characteristic unknown in the body of existing knowledge in its technical field. A patent grants protection for a specified period, generally 20 years.

Most countries have systems to protect patentable inventions. The Patent Cooperation Treaty provides a system for filing patent applications. It consists of an international phase followed by a national or regional phase. An applicant files an international application and designates the countries in which patent protection is sought (since 2004 all eligible countries are automatically designated in every application under the treaty). The application is searched and published, and, optionally, an international preliminary examination is conducted. In the national (or regional) phase the applicant requests national processing of the application, pays additional fees, and initiates the national search and granting procedure. International applications under the treaty provide for a national patent grant only—there is no international patent. The national phase filing represents the applicant's seeking of patent protection for a given territory, whereas international filings, while they represent a legal right, do not accurately reflect where patent protection is eventually sought. Resident filings are those from residents of the country or region concerned. Nonresident filings are from applicants outside the country or region. For regional offices such as the European Patent Office, applications from residents of any member state of the regional patent convention are considered a resident filing. Some offices (notably the U.S. Patent and Trademark Office) use the residence of the inventor rather than the applicant to classify resident and nonresident filings. A trademark protects its owner by ensuring exclusive right to use it to identify goods or services or to authorize another to use it in return for payment. The period of protection varies, but a trademark can be renewed indefinitely. Trademarks help consumers identify a product or service whose nature and quality meet their needs.

Definitions

- **Researchers in R&D** are professionals engaged in conceiving of or creating new knowledge, products, processes, methods, and systems and in managing the projects concerned. Postgraduate doctoral students (ISCED97 level 6) engaged in R&D are considered researchers.
- **Technicians in R&D** and equivalent staff are people whose main tasks require technical knowledge and experience in engineering, physical and life sciences (technicians), and social sciences and humanities (equivalent staff). They engage in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under researcher supervision.
- **Scientific and technical journal articles** are published articles in physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences.
- **Expenditures for R&D** are current and capital expenditures on creative work undertaken to increase the stock of knowledge, including on humanity, culture, and society, and the use of knowledge to devise new applications.
- **High-technology exports** are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.
- **Royalty and license fees** are payments and receipts between residents and nonresidents for authorized use of intangible, nonproduced, nonfinancial assets and proprietary rights (such as patents, copyrights, trademarks, and industrial processes) and for the use, through licensing, of produced originals of prototypes (such as films and manuscripts).
- **Patent applications filed** are worldwide patent applications filed through the Patent Cooperation Treaty procedure or with a national patent office.
- **Trademark applications filed** are applications to register a trademark with a national or regional trademark office.

Data sources

Data on R&D are provided by the UNESCO Institute for Statistics. Data on scientific and technical journal articles are from the U.S. National Science Board's *Science and Engineering Indicators 2008*. Data on high-technology exports are from the United Nations Statistics Division's Commodity Trade (Comtrade) database. Data on royalty and license fees are from the International Monetary Fund's *Balance of Payments Statistics Yearbook*. Data on patents and trademarks are from the World Intellectual Property Organization's *WIPO Patent Report: Statistics on Worldwide Patent Activity* (2008) and www.wipo.int.