



Innovation Landscape For Mauritius

NRFE draft Working Paper 12/11

1.0 How does Mauritius fare?

Mauritius is classified as an upper middle income country with a per capita income of US\$ 7250 in 2009 (US, 2009). To keep upgrading, Mauritius needs to innovate; it is thus important to assess the current state of the innovation environment. The methodology adopted here takes this aspect into consideration and draws on existing secondary data to map the innovation space. We have borrowed from the World Bank's Knowledge Economy Index (KEI) and Knowledge Indexes (KI) and adopted the definition of National Productivity and Competitiveness Council (NPCC) to define an innovation landscape. For this reason, data from World Bank notably on knowledge based index was assessed to benchmark Mauritius with the innovation performance system of two countries namely; Malaysia (ranked just before Mauritius) and Finland (ranked 1st on innovation performance). The knowledge based index (<http://info.worldbank.org/>) is built on four pillars and these are Economic Incentive regime, Innovation system, education and information Infrastructure (*see figure 1*).

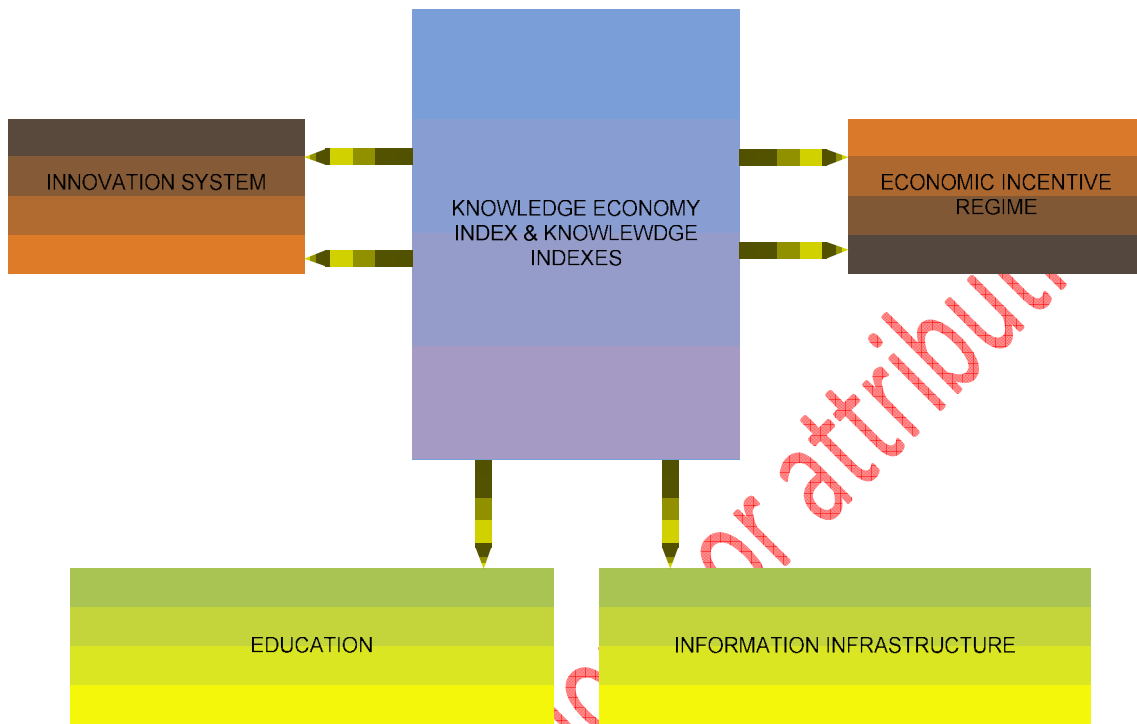


Figure 1: KEI & KI indexes structure (source: info.worldbank.org, 2009)

Table 1: Variables for Mapping out Innovation landscape for Malaysia, Finland and Mauritius (Most recent data 2003-2009)

Variable	Malaysia		Finland		Mauritius	
	actual	normalized	actual	normalized	actual	Normalized
Economic Performance						
Average Annual GDP growth (%)	6	6.69	3.6	2.55	4.4	3.66
Human Development index	0.81	6.15	0.95	9.37	0.8	6.08
Economic Regime						
Tariff & nontariff barriers	78.2	4.83	85.8	9.02	86.8	9.44
Intellectual Property is well protected	4.8	7.68	6.2	9.84	4.1	6.64
Soundness of banks	5.9	6.4	6.6	9.52	6.2	7.84
Innovation System						
Gross Foreign Direct Investment as% of GDP	3.46	5.04	2.12	3.26	1.62	2.41
Royalty and license fees payments (\$ mil)	1195	7.93	1219.1	8.02	472	2.24
Royalty and license fees payments / mil pop.	45.01	7.41	230.51	9.57	3.79	4.57
Royalty and license fees receipts(\$ mil)	36.44	5.82	1,134.49	9.09	0.03	1.73
Royalty and license fees receipts/ mil.pop.	1.37	5.36	214.51	9.45	0.03	2.55
Science & engineering enrolment ratio (% of tertiary level students)	37.78	9.9	37.36	9.7	24.27	7.2
Researchers in R&D	12,669.49	5.56	40,410.91	7.68	231	0.71
Researchers in R&D/ mil.pop	502.93	4.34	7,680.87	10	184.29	3.23
Total expenditure for R&D as % of GNP	0.6	5.59	3.41	9.8	0.38	4.12
Manuf.trade as % of GDP	126.04	9.69	51.68	6.49	55.31	7.25
University-company research collaboration	4.8	8.64	5.5	9.76	3.1	4.72
Entrepreneurship among managers	6.73	8.63	6.27	6.08	n/a	n/a
Scientific and technical journal articles	614.55	6.74	4,813.12	8.4	15.43	1.67
Scientific and technical journal articles/mil.pop.	23.96	5.14	917.47	9.79	12.41	4.24
Admin. Burden for Start-Ups	5.4	8.57	5.8	9.35	4.5	5.97
Availability of Venture capital	4.2	8.64	4.9	9.84	3.4	6.72
Patent applications granted by the USPTO	111.6	8.01	919.4	9.04	0	2.47
Patent applications granted by the USPTO/mil pop.	4.32	8.01	175.17	9.73	0	2.47
High-Tech exports as % of manuf.exports	52	9.85	21	8.55	8	6.41
Private sector spending on R&D	4.6	8.72	5.3	9.36	3	4.8
Education						
Adult literacy rate (% age 15 and above)	91.9	4.73	100	10	87.41	3.49
Secondary enrollment	69.07	3.13	111.64	9.44	87.81	5.63

Tertiary enrollment	30.24	4.78	93.81	9.86	13.96	2.96
ICT						
Telephones per 1,000 (mainlines + mobiles)	1040	5.62	1392.3	9.01	1030	5.55
Computers per 1,000	230	7.32	441.7	8.96	180	7.04
Internet hosts per 10,000	560	8.49	2343.12	9.75	270	6.1

Source: <http://info.worldbank.org>

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2.0 RESULTS

Chart 1: Innovation Landscape for Mauritius

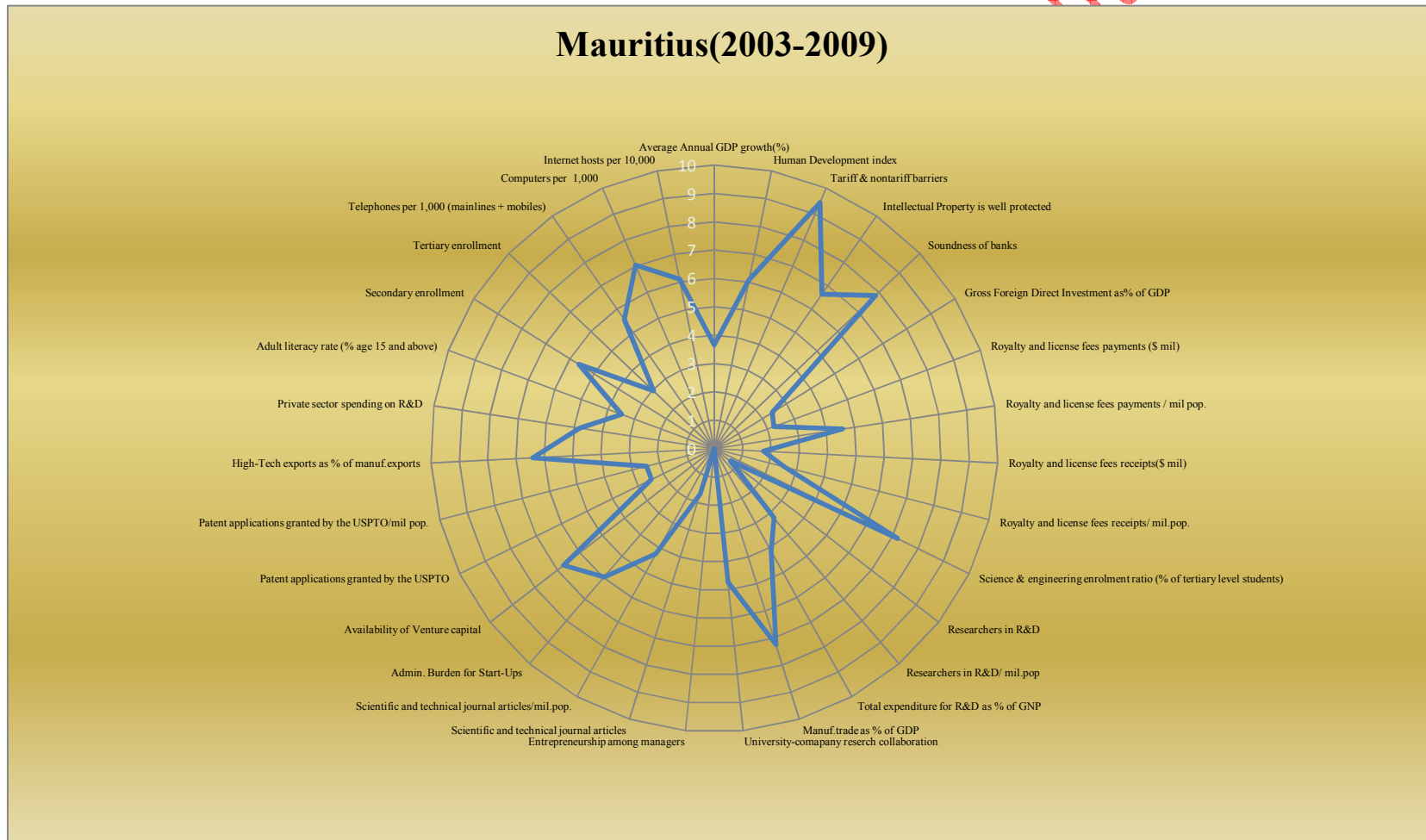
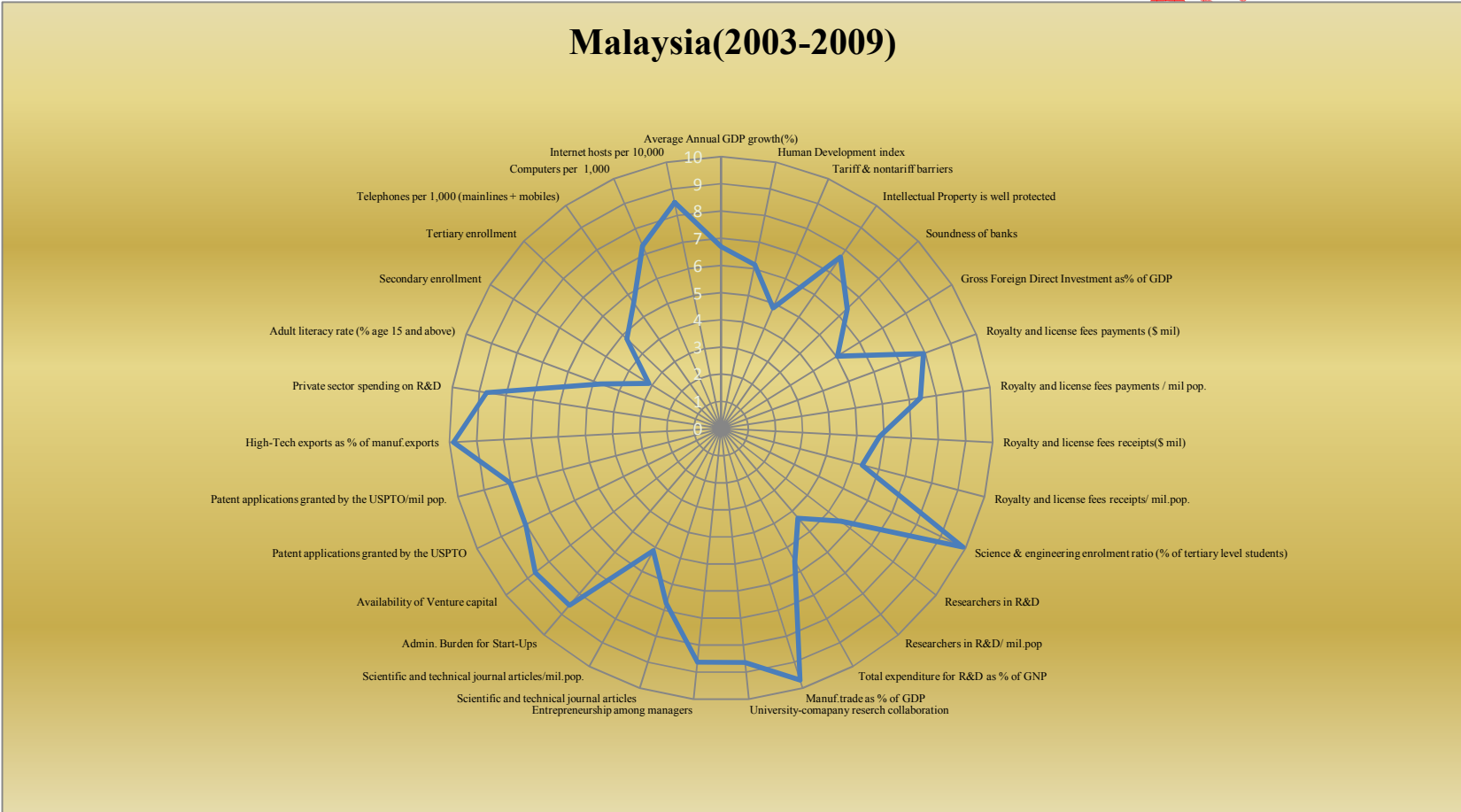
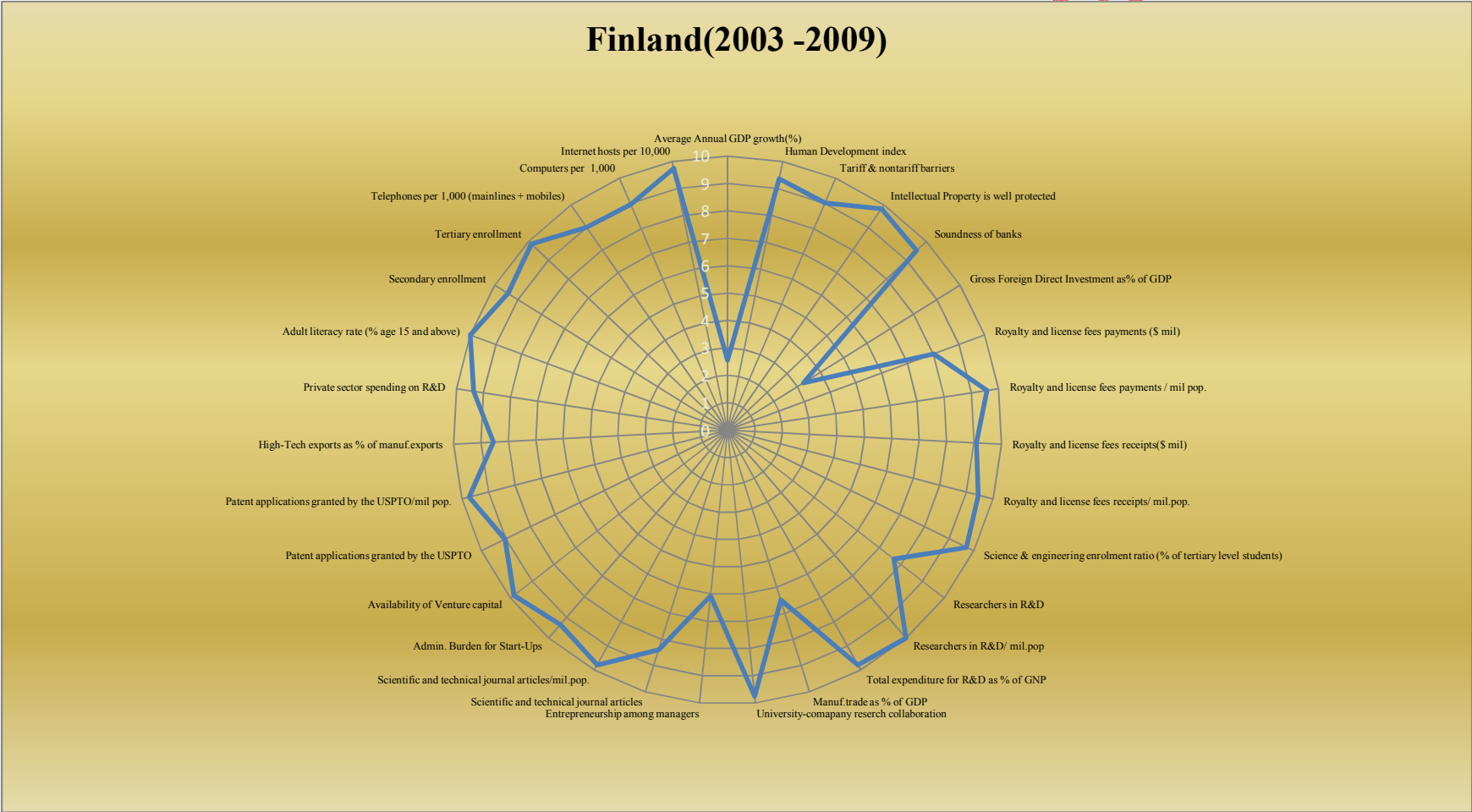


Chart 2: Innovation Landscape for Malaysia



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Chart 3: Innovation Landscape for Finland



3.0 DATA SOURCE

For the study, various data source were considered namely World Economic forum, UNESCO, World Bank and Nation Master. Based on existing literatures, it was found that data from World Bank was more comprehensive for mapping out innovation landscape. Hence, for the innovation index, data from the World Bank notably knowledge based index was used to analyse the performance of innovation for the different countries. The sub indices were taken from World Bank and were classified under the following input of the economy: economic performance, economic regime, innovation system, education and ICT.

Table 2: Comparison of selected variables for Innovation Systems for Mauritius

VARIABLES	1993-2002	2003-2009
Science & Engineering enrolment ratio	0.46	7.2
High Tech export as % of manuf. export	0.79	6.41
Tariff & non-Tariff barriers	0	9.44
University-company research in collaboration	1.3	4.72
Average Annual GDP growth (%)	8.6	3.66
Manufacture trade as % GDP	8.21	7.25

3.1 DISCUSSION ON CHARTS

The innovation picture for Mauritius is that of a small butterfly with very high normalized value on tariff and non-tariff barriers. The Finland innovation picture is fully open with all the dimensions almost on the edge of the chart. In the case of Malaysia, the innovation performance is much better than that of Mauritius with high ratio of science and engineering enrolment and high tech export.

Somehow, the radar chart below provides a very clear objective of Mauritius government in terms of innovation performance. The innovation picture for Mauritius has grown in size during the period 2003 to 2009. The number of student enrolling for science and engineering and the percentage of high tech export have increased tremendously. While on the other hand the manufacture trade and annual GDP indicators are not as good as it was in year 1998 to 2002.

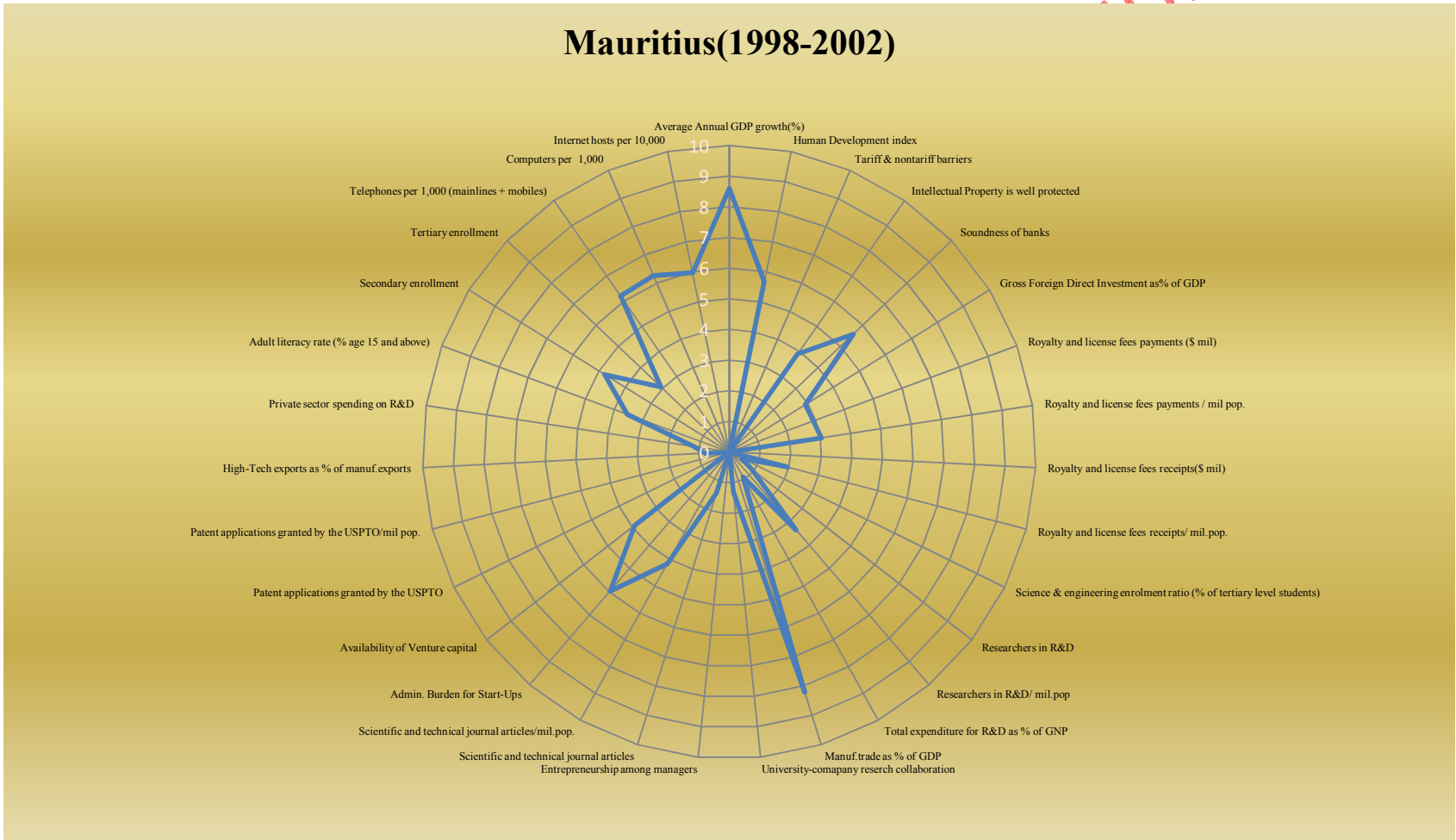
- The average annual GDP growth is considered as one of the main indicator for determining the overall economic development of a country. It has been found that during the past 16 years the annual GDP growth has decreased from 8.6 to 3.66. For the same period, the total volume of manufactured exports and imports decreased from 8.21 to 7.25.
- The private sector has shown much interest in R&D for promoting their business activities. As a result, the normalized value for spending in R&D has increased slightly from 1.17 to 4.8.
- The education system in Mauritius has greatly improved since our independence. The government is encouraging student to take science subject at the secondary level. As a result, the ratio for science and engineering enrollment at the tertiary level has increased from 0.46 to 7.2.
- Mauritius has made great improvement in terms of exporting technology product. Since 1993 to 2003 the high tech export as a % of manufactured product was nearly 0.79. However, during 2003 to 2009 the high tech export as a % of manufactured product has increased from 0.79 to 6.41.
- The total expenditure of R&D as % of GDP is fundamental for applied research and experimental development that lead to new devices, products and processes.

In this context, the normalized score for total expenditure of R&D has increased from 0.93 to 4.12.

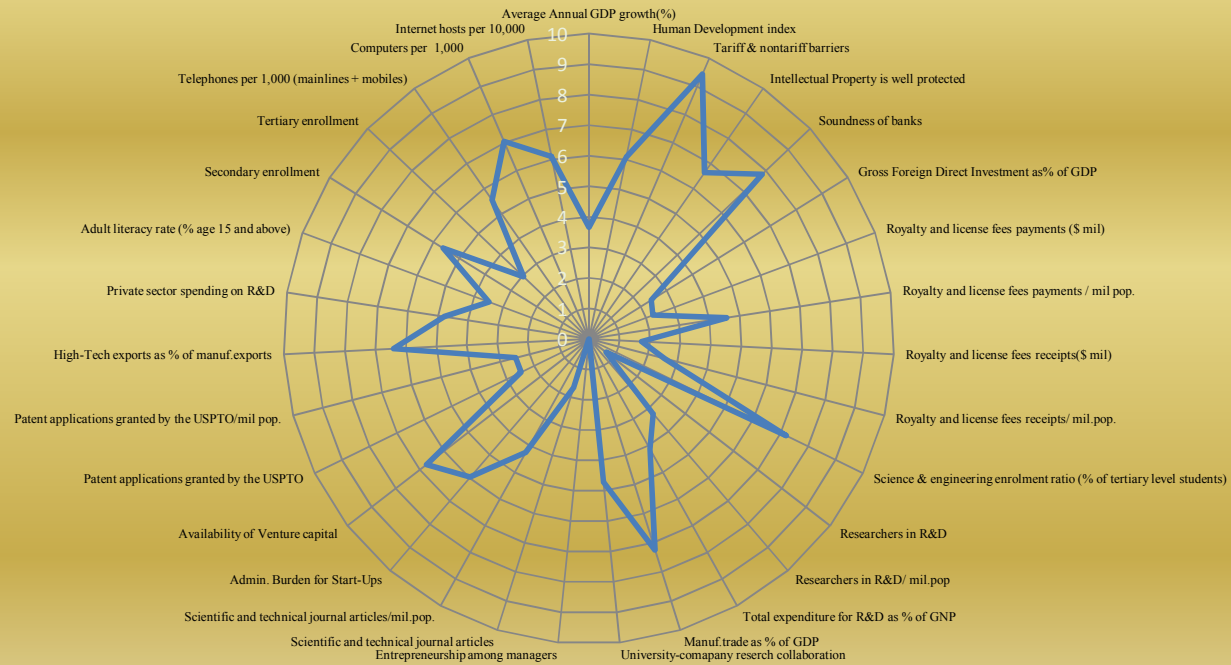
- University-company research collaboration [4.72]:- this is based on an executive opinion survey of the world economic forum in 2008-2009. The objective of the survey was to determine to what extent do business and universities collaborate on research and development?
- Scientific and technical journal articles [1.67]:- The indicator was developed by the National Science Foundation and is referred to articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences.

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Chart 4: Comparison of Innovation Landscape for Mauritius (1998-2002) to (2003 to 2009)



Mauritius(2003-2009)



Notes: The knowledge assessment methodology was prepared to proxy a country's preparedness to compete in the knowledge economy using 109 structural and qualitative variables. The comparison was made for a group of 149 countries where most of the countries are OECD economies and about 90 are developing countries. The score of each index have been normalized on a scale of 0-10 relatives to other countries.

5.0 Reference

1. US, Department 2011. "Background Notes on Mauritius". online
Available at: <http://www.state.gov/r/pa/ei/bgn/2833.htm> (Accessed on 16th September 2010)
2. World Bank, 2009. "Custom Scorecards - Selections". Online
Available at: http://info.worldbank.org/etools/kam2/kam_page3.asp (Accessed on 18th September 2010)

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APPENDIX

Description of indices

OVERALL PERFORMANCE OF THE ECONOMY

- **Average Annual Gross Domestic Product (GDP) Growth, 1993-97 and 2003-2007 (%)** (DDP) Annual GDP growth is a good indicator of a country's overall economic development. World Bank and OECD national accounts data.
- **Gross Domestic Product (GDP) Per Capita, 2007** (international current PPP \$) (DDP) World Bank and OECD national accounts data.
- **Gross Domestic Product (GDP) (current US\$ bill.), 2007** (DDP) World Bank and OECD national accounts data.
- **Human Development Index (HDI), 2005** ([UNDP Human Development Report 2007/2008](#)) Table 1. The HDI provides information on the human development aspect of economic growth. The HDI is based on three indicators: longevity, as measured by life expectancy at birth; educational attainment, as measured by a combination of adult literacy rate and the combined gross primary, secondary and tertiary enrollment ratio; and standard of living, as measured by GDP per capita (Purchasing Power Parity US\$).
- **Poverty Index, 2005** ([UNDP Human Development Report 2007/2008](#)) Tables 3 & 4. The Index for developing countries concentrates on deprivations in three essential dimensions of human life – longevity, literacy and a decent standard of living (as measured by percentage of population without sustainable access to an improved water resource and children under weight for age).
- The Index for developed countries, Eastern Europe and CIS concentrates on deprivations in three essential dimensions of human life - longevity, literacy and a decent standard of living (as measured by percentage of population below income poverty line). In addition, it captures social exclusion, as measured by the rate of long-term unemployment. Income poverty refers to the percentage of the population living on less than 50% of the median disposable household income.
- **Composite Risk Rating, Aug 2007- July 2008** (monthly average) ([International Country Risk Guide](#)) The rating is an overall index, ranging from 0 to 100, based on 22 components of political, financial and economic risk: very high risk (00.0 to 49.9), high risk (50.0 to 59.9), moderate risk (60.0 to 69.9), low risk (70.0 to 79.9), and very low risk (80.0 to 100).

THE ECONOMIC REGIME

- **Gross Capital Formation as % of GDP (Average), 2003-2007** (DDP) GCF consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. World Bank and OECD national accounts data.
- **Trade as % of GDP, 2007** (DDP) The sum of exports and imports of goods and services, measured as a share of GDP. World Bank and OECD national accounts data.
- **Tariff & Nontariff Barriers, 2009** ([Heritage Foundation](#)) This is a score assigned to each country based on the analysis of its tariff and non-tariff barriers to trade, such as import bans and quotas as well as strict labeling and licensing requirements. The score is based on the Heritage Foundation's Trade Freedom score.

- **Intellectual Property Protection, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 1.02. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether intellectual property protection is strong in their country (1= weak or nonexistent, 7 = is equal to the world's most stringent).
- **Soundness of Banks, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 8.07. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether "banks are generally sound" in their country. (1= insolvent and may require government bailout, 7= generally healthy with sound balance sheets).
- **Exports of Goods and Services as % of GDP, 2007** (DDP) This includes the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. This excludes labor and property income as well as transfer payments. World Bank and OECD national accounts data.
- **Interest Rate Spread (lending rate minus deposit rate), 2007** (DDP) The interest rate charged by banks on loans to prime customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits. International Monetary Fund, International Financial Statistics and data files.
- **Intensity of Local Competition, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 6.01. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether competition in the local markets is intense in their country. (1= limited in most industries and price-cutting is rare, 7 = intense and market leadership changes over time).
- **Domestic Credit to Private Sector (% of GDP), 2007** (DDP) Indicator refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable that establish a claim for repayment. For some countries these claims include credit to public enterprises. International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates.
- **Cost to Register a Business (% of GNI per capita), 2009** ([Doing Business](#)) Official costs of business registration.
- **Days Required Starting a Business, 2009** ([Doing Business](#)) Duration of all procedures required to register a firm.
- **Cost to Enforce a Contract (% of debt), 2009** ([Doing Business](#)) Cost in court fees and attorney fees, where the use of attorneys is mandatory or common, expressed as a percentage of the debt value.

GOVERNANCE

- **Regulatory Quality, 2007** ([Governance Indicators, World Bank](#)) This indicator measures the incidence of market-unfriendly policies such as price controls or inadequate bank supervision, as well as perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development.
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- **Rule of Law, 2007** ([Governance Indicators, World Bank](#)) This indicator includes several indicators which measure the extent to which agents have confidence in and abide by the rules of society. These include perceptions of the incidence of both violent and non-violent crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts.
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- **Government Effectiveness, 2007** ([Governance Indicators, World Bank](#)) This indicator combines into one grouping perceptions of the quality of public service provision, the quality of the bureaucracy, the

competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government's commitment to policies.

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- **Voice and Accountability, 2007** ([Governance Indicators, World Bank](#)) This is a composite indicator and comprises a number of individual indicators measuring various aspects of the political process, civil liberties and political rights. This index measures the extent to which citizens of a country are able to participate in the selection of governments. Also, included are indicators measuring the independence of the media, which serves an important role in monitoring those in authority and holding them accountable for their actions.
- **Political Stability, 2007** ([Governance Indicators, World Bank](#)) This index combines several indicators which measure perceptions of the likelihood that the government in power will be destabilized or overthrown by possibly unconstitutional means and/or violent means. This index captures the idea that the quality of governance in a country is compromised by the likelihood of wrenching changes in government, which not only has a direct effect on the continuity of policies, but also at a deeper level undermines the ability of the citizens to peacefully select and replace those in power.
- **Control of Corruption, 2007** ([Governance Indicators, World Bank](#)) This indicator corresponds to "graft" measures of corruption. Notably, corruption measured by the frequency of "additional payments to get things done" and the effects of corruption on the business environment.
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- **Press Freedom, 2008** ([Freedom House](#)) The cumulative score of the degree of press freedom in a country. Countries scoring 0 to 30 are regarded as having "Free" media, 31-60, "Partly Free" media and 61 to 100, "Not Free" media.

• **THE INNOVATION SYSTEM**

- **FDI Outflows as % of GDP, 2003-07** (average) ([UNCTAD](#)) Outflows of FDI in the reporting economy comprise capital provided (either directly or through other related enterprises) by a company resident in the economy (foreign direct investor) to an enterprise resident in another country.
- **FDI Inflows as % of GDP, 2003-07** (average) ([UNCTAD](#)) Inflows of FDI in the reporting economy comprise capital provided (either directly or through other related enterprises) by a foreign direct investor to an enterprise resident in the economy.
- **Royalty and License Fees Payments, (US\$ millions), 2007** (DDP) These are payments between residents and nonresidents for the authorized use of intangible, non-produced, non-financial assets and proprietary rights (such as patents, copyrights, trademarks, industrial processes, and franchises) and for the use, through licensing agreements, of produced originals of prototypes, such as manuscripts and films. International Monetary Fund, Balance of Payments Statistics Yearbook and data files.
- **Royalty and License Fees Payments (US\$ millions) Per Million Population, 2007** (DDP) This is the variable above, weighted by million population per country.
- **Royalty and License Fees Receipts (US\$ millions), 2007** (DDP) These are receipts between residents and nonresidents for the authorized use of intangible, non-produced, non-financial assets and proprietary rights (such as patents, copyrights, trademarks, industrial processes, and franchises) and for the use, through licensing agreements, of produced originals of prototypes (such as manuscripts and films). International Monetary Fund, Balance of Payments Statistics Yearbook and data files.
- **Royalty and License Fees Receipts (US\$ millions) Per Million Population, 2007** (DDP) This is the variable above, weighted by million population.

- **Royalty and License Fees Payments and Receipts (US\$ millions), 2007** Royalty and License Fees Payments (US\$ mil.) + Royalty and License Fees Receipts (US\$ mil.).
 - **Royalty and License Fees Payments and Receipts (US\$ millions) Per Million Population, 2007**, Royalty and License Fees Payments (per mil pop.) + Royalty and License Fees Receipts (per mil pop.).
 - **Science and Engineering Enrollment Ratio, 2007** (as % of tertiary enrollment students) ([UNESCO](#)) This includes the fields of science (except social science), engineering, manufacturing and construction.
 - **Science Enrollment Ratio, 2007** (as % of tertiary enrollment students) ([UNESCO](#)) This includes the field of science only, except social science.
 - **Researchers in R&D, 2006** ([UNESCO](#)) The total number of researchers engaged in R&D, as reported in the selected R&D indicators section of the UNESCO yearbook.
 - **Researchers in R&D Per Million Population, 2006** ([UNESCO](#)) This is the variable above weighted by million population.
 - **Total Expenditure for R&D as % of GDP, 2006** ([UNESCO](#)) Included are fundamental and applied research and experimental development work leading to new devices, products, and processes.
 - **Manufacturing Trade as Percentage of GDP, 2006** (DDP) The total volume of manufactured exports and imports over the total GDP. World Trade Organization, International Monetary Fund, Balance of Payments Statistics Yearbook and data files.
 - **University-Company Research Collaboration, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 12.04. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether companies' collaboration with local universities in research and development activities in their country is (1= minimal or nonexistent, 7= intensive and ongoing).
 - **Scientific and Technical Journal Articles, 2005** (DDP) This refers to scientific and engineering articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences. National Science Foundation, Science and Engineering Indicators
 - **Scientific and Technical Journal Articles Per Million Population, 2005** (DDP) This is the variable above, weighted by million population.
 - **Availability of Venture Capital, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 8.04. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether entrepreneurs with innovative but risky projects can generally find venture capital in their country. (1= not true, 7= true).
 - **Patent Applications Granted by the USPTO, average for 2003-07** ([USPTO](#)) Shows the number of U.S. patent documents (i.e., utility patents, design patents, plant patents, reissue patents, defensive publications, and statutory invention registrations) granted.
- Patent Applications Granted by the USPTO Per Million People, average for 2003-07** ([USPTO](#)) This is the variable above weighted by million population.
- **High-Technology Exports as % of Manufactured Exports, 2006** (DDP) High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.

- **Private Sector Spending on R&D, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 12.03. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether companies spend heavily on research in their country. (1= do not spend, 7 = spend heavily relative to international peers).
- **Firm-Level Technology Absorption, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 9.02. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether the companies in your country are (1= not able to absorb new technology, 7 = aggressive in absorbing new technology)
- **Value Chain Presence, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 11.05. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether exporting companies in your country are (1 = primarily involved in resource extraction or production, 7 = not only produce but also perform product design, marketing sales, logistics, and after-sales services)
- **Capital Goods Gross Imports (US\$ million), 2003-07 avg** ([World Integrated Trade Solution](#)) The indicator can be derived from disaggregated international trade statistic within section 7 of the Standard Trade Classification(SITC). One can usually excludes consumer goods such as domestic appliances, television receivers, radios and broadcast receivers, passenger motor cars and chassis, and motor cycles and bicycles.
- **Capital Goods Gross Exports (US\$ million), 2003-07 avg** ([World Integrated Trade Solution](#)) The indicator can be derived from disaggregated international trade statistic within section 7 of the Standard Trade Classification(SITC). One can usually excludes consumer goods such as domestic appliances, television receivers, radios and broadcast receivers, passenger motor cars and chassis, and motor cycles and bicycles.
- **S&E articles with foreign coauthorship (%), 2005** This refers to the share of published S&E articles which have foreign coauthors. It is calculated by dividing the number of papers a specific country participated in with 1 or more foreign institutional authors by the total number of papers the specific country participated in. Article counts from the set of journals covered by the Science Citation Index (SCI) and Social Sciences Citation Index (SSCI). Articles classified by tape year (the year they entered the database), rather than the year of publication, and assigned to region/country/economy on basis of institutional address(es) listed on article. Articles on whole-count basis, i.e., each collaborating region/country/economy credited one count. Sources: Thomson Reuters, SCI and SSCI; The Patent Board; and National Science Foundation, Division of Science Resources Statistics, special tabulations.
- **Average number of citations per S&E article, 2005** Citation counts from set of journals covered by Science Citation Index (SCI) and Social Sciences Citation Index (SSCI). Articles classified by tape year (the year they entered the database), rather than the year of publication, and assigned to region/country/economy on basis of institutional address(es) listed on the article. Citations on fractional-count basis, i.e., for articles with collaborating institutions from multiple countries/economies, each country/economy receives fractional credit on basis of proportion of its participating institutions. Citation counts based on 3-year period with 2-year lag, e.g., citations for 2005 are references made in articles in 2005 data tape to articles in 2001-03 data tapes. The average number of citations per published S&E article for 2005 is the total number of citations referred in S&E articles in 2005 tape year divided by the number of S&E articles in 2001, 2002 and 2003 tape year. Source: Thomson Reuters, SCI and SSCI; The Patent Board; and National Science Foundation, Division of Science Resources Statistics, special tabulations.

EDUCATION

- **Adult Literacy Rate (% age 15 and above), 2007** ([UNESCO](#)) Adult literacy rate is the percentage of people ages 15 and above who can, with understanding, read and write a short, simple statement on their everyday life.
- **Average Years of Schooling, 2000** (15 years old and above) ([2007 WDI](#)) Table 2.13. This variable is used as an aggregate measure of the educational stock in a country.
Secondary Enrollment (% gross), 2007 ([UNESCO](#)) The ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.
- **Tertiary Enrollment (% gross), 2007** ([UNESCO](#)) The ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.
- **Life Expectancy at Birth, 2007** (DDP) The number of years a newborn infant would live if prevailing patterns of mortality at its time of birth were to stay the same throughout its life.
- **Internet Access in Schools, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 5.06. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether internet access in schools in their country is (1= very limited, 7= pervasive-most children have frequent access).
- **Public Spending on Education as % of GDP, 2006** (DDP) This consists of public spending on public education plus subsidies to private education at the primary, secondary, and tertiary levels.
- **4th Grade Achievement in Mathematics, 2007** ([Trends in International Mathematics and Science Study, TIMSS](#)) This is based on the score assigned to the performance of 4th grade students on a standardized mathematics test.
- **4th Grade Achievement in Science, 2007** ([Trends in International Mathematics and Science Study, TIMSS](#)) This is based on the score assigned to the performance of 4th grade students on a standardized science test.
- **8th Grade Achievement in Mathematics, 2007** ([Trends in International Mathematics and Science Study, TIMSS](#)) This is based on the score assigned to the performance of 8th grade students on a standardized mathematics test.
- **8th Grade Achievement in Science, 2007** ([Trends in International Mathematics and Science Study, TIMSS](#)) This is based on the score assigned to the performance of 8th grade students on a standardized science test.
- **Quality of Science and Math Education, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 5.04. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether math and science education in your country's schools (1 = lag far behind most of the countries, 7 = are among the best in the world).
- **Quality of Management Education, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 5.05. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country asked to rate the "quality of local management schools". (1= limited or of poor quality, 7 = among the world's best).
- **15-year-olds' math literacy, 2006** ([OECD Program for International Student Assessment, PISA](#)) Scores of 15-year-old students in mathematics literacy in 2006.
- **15-year-olds' science literacy, 2006** ([OECD Program for International Student Assessment, PISA](#)) Scores of 15-year-old students in science literacy in 2006.

LABOR

- **Unemployment Rate (% of total labor force), 2007 (DDP)** The share of the labor force that is without work but available for and seeking employment. International Labour Organization.
- **Employment in Industry (% of total employment), 2005 (DDP)** The proportion of total employment recorded as working in the industrial sector. Industry includes mining and quarrying (including oil production), manufacturing, electricity, gas and water, and construction.
- **Employment in Services (% of total employment), 2005 (DDP)** The proportion of total employment recorded as working in the services sector. Services include wholesale and retail trade and restaurants and hotels; transport, storage, and communications; financing, insurance, real estate, and business services; and community, social, and personal services.
- **Professional and Technical Workers as % of the Labor Force, 2007** ([2009 ILO Yearbook of Labor Statistics](#)) This involves calculation of total number of technical and professional workers as a percentage of the labor force. Data were obtained from Table 2C - Total employment, by occupation.
- **Extent of Staff Training, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 5.08. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether "in your country, the general approach to human resources is to invest" (1= little in training and development, 7 = heavily to attract, train, and retain staff).
- **Brain Drain, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Table 7.09. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country asked to rate whether the country's talented people (1= normally leave to pursue opportunities in other countries, 7= almost always remain in the country).
- **Cooperation in labor-employer relations, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Labor-employer relations in your country are (1 = generally confrontational, 7 = generally cooperative).
- **Flexibility of wage determination, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) In your country, wages are (1 = set by a centralized bargaining process, 7 = up to each individual company).
- **Pay and productivity, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) In your country, pay is (1 = not related to worker productivity, 7 = strongly related to worker productivity).
- **Reliance on professional management, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) Senior management positions in your country are (1 = usually held by relatives or friends without regard to merit, 7 = mostly held by professional managers chosen for their superior qualification).
- **Local availability of specialized research and training services, 2008** ([WEF Global Competitiveness Report 2008-2009](#)) In your country, specialized research and training services are (1 = not available, 7 = available from world-class local institutions).
- **Difficulty of hiring index, 2009** ([Doing Business](#)) Applicability and maximum duration of fixed-term contracts and minimum wage for trainee or first-time employee. Higher values indicate more rigid regulations.

- **Rigidity of hours index, 2009** ([Doing Business](#)) Scheduling of nonstandard work hours and annual paid leave.
- **Difficulty of firing index, 2009** ([Doing Business](#)) Notification and approval requirements for termination of a redundant worker or a group of redundant workers, obligation to reassign or retrain and priority rules for redundancy and reemployment.
- **Firing cost, 2009** ([Doing Business](#)) Notice requirements, severance payments and penalties due when terminating a redundant worker, expressed in weeks of salary.
- **Labor tax and contributions (%), 2009** ([Doing Business](#)) amount of taxes and mandatory contributions on labor paid by the business as a percentage of commercial profits. This amount include mandatory social security contributions paid by the employer both to public and private entities, as well as other taxes or contributions related to employing workers.
- **Employment to population ratio, 15+, total (%), 2007** (DDP) the proportion of a country's population that is employed. Ages 15 and older are generally considered the working-age population.
- **Employment to population ratio, ages 15-24, total (%), 2007** (DDP) Employment to population ratio is the proportion of a country's population that is employed. Ages 15-24 are generally considered the youth population.
- **Unemployment with tertiary education, total (% of total unemployment), 2007** (DDP) Unemployment by level of educational attainment shows the unemployed by level of educational attainment, as a percentage of the unemployed.
- **Unemployment with secondary education, total (% of total unemployment), 2007** (DDP) Unemployment by level of educational attainment shows the unemployed by level of educational attainment, as a percentage of the unemployed.
- **Labor force participation rate, total (% of total population, age 15-64), 2007** (DDP) Labor force participation rate is the proportion of the population ages 15-64 that is economically active: all people who supply labor for the production of goods and services during a specified period.
- **Labor force with tertiary education (% of total), 2005** (DDP) Labor force with tertiary education is the proportion of labor force that has a tertiary education, as a percentage of the total labor force.
- **Labor force with secondary education (% of total), 2005** (DDP) Labor force with secondary education is the proportion of the labor force that has a secondary education, as a percentage of the total labor force.
- **Firms offering formal training (% of firms) , 2007** (DDP) Firms offering formal training are the percentage of firms offering formal training programs for their permanent, full-time employees.
- **GENDER**
- **Gender Development Index, 2005** ([UNDP Human Development Report 2007/2008](#)) Table 28. The Index uses the same variables as the Human Development Index. The difference is that the GDI adjusts the average achievement of each country in life expectancy, educational attainment and income in accordance with the disparity in achievement between women and men.

- **Females in Labor Force (% of total labor force), 2007** (DDP) Labor force comprises all people who meet the International Labor Organization's definition of the economically active population. International Labour Organization.
- **Seats in Parliament Held by Women (as % of total), 2007** ([UNDP Human Development Report 2007/2008](#)) Table 29. This refers held by women in a lower or single house or an upper house or senate, where relevant.
- **School Enrollment, Secondary, Female (% gross), 2007** ([UNESCO](#)) The ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.
- **School Enrollment, Tertiary, Female (% gross), 2007** ([UNESCO](#)) The ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.

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- **Telephones Per 1,000 People, 2007** (telephone mainlines + mobile phones) ([ITU](#))
- **Telephone Mainlines Per 1,000 People, 2007** ([ITU](#)) Telephone mainlines are telephone lines connecting a customer's equipment to the public switched telephone network.
- **Mobile Phones Per 1,000 People, 2007** ([ITU](#)) Mobile telephone subscribers are subscribers to a public mobile telephone service using cellular technology.
- **Computers Per 1,000 Persons, 2007** ([ITU](#)) Personal computers are self-contained computers designed to be used by a single individual.
- **TV Households with Television, 2006** (DDP) are the share of households with a television set. Some countries report only the number of households with a color television set, and therefore the true number may be higher than reported. International Telecommunication Union, World Telecommunication Development Report and database, and World Bank estimates.
- **Daily Newspapers Per 1,000 People, 2004** (total average circulation or copies printed) (DDP) Table 5.11. Daily newspapers refer to those published at least four times a week.
- **International Internet Bandwidth, 2007** (WDI) This is the contracted capacity of international connections between countries for transmitting Internet traffic. International Telecommunication Union, World Telecommunication Development Report and database, and World Bank estimates.
- **Internet Users Per 1,000 people, 2007** ([ITU](#)) The indicator relies on nationally reported data. In some cases, it is based on national surveys (they differ across countries in the age and frequency of use they cover), in others it is derived from reported Internet Service Provider subscriber counts.
- **Price basket for Internet, US\$ per month, 2006** (WDI) This is calculated based on the cheapest available tariff for accessing the Internet 20 hours a month (10 hours peak and 10 hours off-peak). The basket does not include the telephone line rental but does include telephone usage charges if applicable. International Telecommunication Union, World Telecommunication Development Report and database.
- **Availability of e-Government Services, 2008** ([WEF The Global Information Technology Report 2008/2009](#)) Table 9.02. This is based on a large sample group in a particular country responding to the question of whether the "online government services, such as personal tax, car registration, passport, business permit, and e-procurement are (1 = not available, 7 = extensively available) (1= low, 7 = high).

- **Extent of Business Internet Use, 2006** ([WEF Global Competitiveness Report 2006/2007](#)) Table 3.16. This is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether Internet use by businesses in your country to buy/or sell products and services (1 = very low, 7 = very widespread).
- **ICT Expenditure as % of GDP, 2007** (DDP) Information and communications technology (ICT) expenditures include external spending on information technology ("tangible" spending on information technology products purchased by businesses, households, governments, and education institutions from vendors or organizations outside the purchasing entity), internal spending on information technology ("intangible" spending on internally customized software, capital depreciation, and the like), and spending on telecommunications and other office equipment. World Information Technology and Services Alliance, Digital Planet 2004: The Global Information Economy, and Global Insight, Inc.

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