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OECD Review of Innovation in Southeast Asia

Country Profile of Innovation: Malaysia

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This draft prepared by the OECD Secretariat will be used in Part 2 of the report of the *OECD Review of Innovation in Southeast Asia* which consists of *Country Profiles*. It draws upon a country background note prepared by K. Thiruchelvam, V.G.R. Chandran, Ng Boon Kwee and Wong Chan Yuan. Full acknowledgements will be provided in the published report.

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COUNTRY PROFILE OF INNOVATION: MALAYSIA

PRELIMINARY DRAFT

Summary

1. An industrial sector based on manufacture and export of the technology-based products of multinational enterprises has fueled Malaysia's growth into a middle-income country. Electronics, particularly semiconductors, account for 40% of exports followed by automobiles and parts. Its fast-growing services sector features tourism as well as Islamic banking and finance. Among Southeast Asian countries, Malaysia's economic competitiveness is generally ranked second after Singapore.

2. However, multinational enterprises in Malaysia confine themselves mostly to manufacture and assembly activities rather than research and development (R&D). There is little technology transfer or technical spillover from foreign to domestic firms who suffer from a continuing shortage of skilled labor. Following the global economic crisis, the domestic economy has been marked by declining private investment and stagnating productivity growth coupled with a lack of competition in sectors such as services.

3. The 10th Malaysia Plan (2011-2015) and the New Economic Model (NEM) both stress human capital development and improvements in innovation capacity. Substantial investments have been made in telecommunications infrastructure such as the Multimedia Super Corridor (MSC). However, streamlining of science and technology governance and public research is essential. There is a need to reform the secondary and tertiary school system, and intensify research activities and outputs from universities and public research institutes and their links to private companies to maximize commercialization opportunities. Local content, R&D and technology transfer provisions for multinationals should be strengthened as well as incentives for firm training. The positive implications for growth of the NEM structural reform agenda are threatened by an increasing brain drain and the fiercely competitive regional environment for trade and foreign investment.

SWOT Malaysia

Strengths	Weaknesses
• Large presence of multinational enterprises in electronics and automotive sectors • Research capabilities in agricultural commodities • High competitiveness ranking • Relatively young population	• Poor quality education and inadequate supply of skilled labor • Stagnant R&D and innovative capacity • Low absorptive capacity of SMEs • Few industry links to public research • Uncoordinated national S&T policy • Little entrepreneurship and venture capital
Opportunities	**Threats**
• High-technology exports • Islamic banking and finance center • Growing tourism industry • Sizeable Malaysian Diaspora	• Competition from other Asian economies • Impacts of regional and global economic downturns • Increasing brain drain

1. Macroeconomic performance and framework conditions for innovation

1.1. Performance and structure of the economy

4. Since independence in 1957, Malaysia has moved from an economy based on primary commodities to one fuelled by manufacturing and services based on foreign investment. Malaysia consistently achieved more than 7% annual growth in gross domestic product (GDP) along with low inflation in the 1980s and the 1990s. However, following the Asian financial crisis of 1997, Malaysia lost ground to many Southeast Asian economies as economic growth fell to 4.3%. Again in 2009, the global financial crisis hit the country particularly hard with the reduction in GDP growth the steepest among middle-income countries in the region. A fiscal stimulus is helping to put the economy back on track with economic growth forecast at 5.3% in 2011 and 5.6% in 2012.

5. The 1970s witnessed aggressive efforts by the government to bring in foreign direct investment (FDI) to spur the nation's industrialization efforts. These included generous incentives, tax relief and subsidized investment loans and succeeded in attracting a number of multinational enterprises (MNEs) to locate in Malaysia. Based on foreign investment, the predominantly mining and agriculture-based Malaysian economy began a transition towards a more diverse production profile including both heavy manufacturing and services. However the 1997 Asian financial crisis caused significant outflows of both foreign portfolio investment and foreign direct investment, which also dipped during the global recession of 2008-2009.

6. Since the 1980s, the industrial sector has led Malaysia's growth. The government's industrialization programme targeted large-scale and capital-intensive projects including steel, machinery and equipment, petrochemicals, cement, and automobile manufacturing. As a result, industry grew from 14% of GDP in 1970 to about 42% at present, while agriculture and mining which together had accounted for 43% of GDP in 1970 dropped to 10-15% (Table 1.1). The remainder of GDP is contributed by the fast-growing services sector, particularly trade, utilities and finance. Malaysia is the world's largest Islamic banking and financial centre. Tourism has become Malaysia's third largest source of foreign exchange income, although it is threatened by pollution and deforestation resulting from the growing industrial economy.

Table 1.1. Structural Change of Malaysia's Economy, % of GDP, 2000-2010

Sector/Year	2000	2004	2008	2009	2010
Agriculture	8.33	7.97	7.32	7.45	7.08
Mining and Quarrying	10.23	9.73	7.69	7.50	7.02
Manufacturing	29.90	29.93	28.17	25.87	26.92
Construction	3.80	3.40	3.01	3.23	3.17
Electricity, Gas and Water	2.89	2.99	2.84	2.89	2.92
Wholesale and Retail Trade	10.86	10.71	12.63	12.95	13.06
Accommodation and Restaurant	2.17	2.17	2.33	2.42	2.38
Transport and Storage	3.77	3.56	3.74	3.68	3.68
Communication	3.00	3.51	3.75	4.03	4.09
Finance and Insurance	8.87	9.68	10.71	11.41	11.31
Real Estates and Business Services	4.26	4.19	5.09	5.28	5.31
Government Services	6.14	6.45	7.15	7.39	7.35
Other Services	5.80	5.71	5.56	5.89	5.72

Source: Thiruchelvam et al., (2011) *calculation based on Monthly Statistical Bulletin, January 2011*.

7. Exports have became the country's primary growth engine. Export-led industrialization transformed Malaysia into Asia's third-most open economy, with trade at its peak reaching twice the value of GDP. At one time, Malaysia was one of the world's largest producers and exporters of tin, rubber and palm oil. Over the last four decades, electrical goods and appliances and electronic goods, particularly semiconductor devices came to represent some 40% of all exports. This was accompanied by a parallel diminishing importance of the resource-based sector, which initially accounted for some 95% of all exports and declined to 30% in recent years

8. Malaysia is at the top of the world league when measured by the share of high-technology exports to total exports. Table 1.2 shows that electronics and electrical products account for 56 % of the manufactured exports from Malaysia, although this share decreased from 65% in 2005. But comparison of domestic value-added to total output value suggests that Malaysia remains highly reliant on low- and semi-skill intensive assembly-type manufacturing. The global economic crisis caused exports to decline by 17% in 2009 with the trade surplus falling by a similar proportion. Malaysia's technology-based export products have high import content, so the fall in export orders from advanced economies resulted in a sudden drop in intermediate imports. At present, Malaysian exports continue their climb out of one of their most severe slumps in history, driven by regional and, increasingly, global demand. As growth prospects improved, firms in China resumed stocking parts and components from regional suppliers, particularly electronics from Malaysia. Demand from Japan, the United States and the European Union remains weak in comparison to pre-crisis levels.

Table 1.2. Share of Electronics and Electrical in Manufactured Exports and Value Added, 2005-2010

Years	% of gross exports out of total manufactured exports							% of value added
	Semi-conductors	Electronic equipment & parts	Consumer electrical products	Industrial & commercial electrical products	Electrical industrial machinery & equipment	Household electrical appliances	Total (Electronics & electrical)	Value Added out of total manufacturing value added
2005	20.9	27.3	5.2	6.7	4.6	0.7	65.4	26.4
2006	19.8	27.0	4.0	7.3	4.7	0.7	63.5	24.7
2007	20.4	24.7	3.5	6.3	5.1	0.7	60.7	25.7
2008	18.3	21.6	4.0	6.7	5.0	0.7	56.4	20.7
2009	21.6	20.0	4.4	5.6	5.1	0.7	57.3	n/a
2010	20.1	19.9	5.3	4.6	5.1	0.7	55.8	n/a

Source: Thiruchelvam et al., (2011) calculation based on monthly statistical bulletin January 2011.

9. Capital accumulation and labour inputs have been the most important drivers of growth in Malaysia (Table 1.3), while technological progress and knowledge inputs have played a much smaller role. The manufacturing sector registered the highest productivity growth prior to 2003, but in recent years the services sector has led (Table 1.4). In the last ten years, trends in total factor productivity (TFP) suggest a weakening dynamism in key sectors of the economy. In industry, the slowdown in TFP was from 3.4% to 2.2%, masking an even larger drop in the manufacturing sector from 7.8% to 4.5%. The agriculture and services sectors on the other hand improved their productivity performance.

Table 1.3. Growths of Gross Domestic Product and Total Factor Productivity, 1999-2008

Period	Growth (%)			
	Labour	Capital	TFP	GDP
1999–2008	1.40	2.20	2.01	5.61
1999–2003	1.22	2.18	1.88	5.24
2004–2008	1.58	2.27	2.14	5.98

Source: MPC (2009).

Table 1.4. Growth of Total Factor Productivity by Sector, 1999-2008

Sector	TFP Growth (%)		
	1999–2008	1999–2003	2004–2008
Agriculture	1.01	1.03	1.26
Mining	1.26	1.48	0.41
Manufacturing	2.26	3.09	1.41
Utilities	1.63	1.13	2.13
Transport	1.36	1.27	1.44
Trade	2.12	0.40	3.82
Finance	1.87	1.72	2.02
Others	1.02	3.08	0.71

Source: MPC (2009).

10. Rapid economic growth in Malaysia has led to large per capita income increases, resulting in a reduction of aggregate poverty from 10% in 1995 to 3.8% in 2008. But Malaysia has experienced a rise in inequality over the same period. Income distribution and the incidence of poverty vary within Malaysia, resulting from regional and urban-rural disparities. Poverty is largely a rural problem with urban estimates at 2% and rural poverty nearing 8%. The export-oriented industrialization process, equity ownership restructuring, and the unevenness in access to education and training underlie the persistence of inequality in the country.

11. In 2010, Malaysia joined Singapore, the United States and Sweden in the top 10 of 58 countries on the IMD World Competitiveness Scoreboard. The advancement in the country's rating from 19th in 2009 to 9th in 2010 was based largely on improvements in government efficiency and efforts to enhance the business climate, fight corruption, and improve infrastructure. The same year Malaysia ranked 26th out of 139 countries on the Global Competitiveness Index of the World Economic Forum which was also an improvement on previous scores. Among the Southeast Asian countries, Malaysia's performance is generally ranked second after Singapore in most indices.

BOX 1.1. Malaysia's Economic Trajectory and National Innovation System Focus

	1960s	1970s	1980s	1990s	2000s	2010
Population & GDP (at current US$)	8.1 million/ $2.4 billion	10.9 million/ $4.3 billion	13.8 million/ $24.9 billion	18.1 million/ $44 billion	23.3 million/ $93.8 billion	28.3 million/ $192.8 billion
R&D budget as % of GDP	-	-	-	0.22	0.47	0.21
Development Stage of NIS	Primary commodities; agriculture; provision of basic infrastructure as well as developing operational capabilities		Investment driven stage; shift to manufacturing; focus on learning as well as developing duplicative imitation and adaptive capabilities		Focused towards knowledge based / innovation economy	
Major industrial policy direction	Heavy dependence on primary export commodities; decline of rubber prices, beginning of import substitutions	Move from net oil importer to exporter as petroleum prices rose sharply; free trade zones (FTZs) attracting multinational companies, export led industrialisation	Regulatory reforms that led to more liberalised private sector investment, gradual shift to heavy industries, Industrial Master Plan 1	Growth strategies favouring modernisation/ industrialisation, shift to new and emerging technologies e.g. ICT; Industrial Master Plan 2; promotion of clusters	Focus on productivity driven growth; stimulating knowledge based indigenous innovation, Industrial Master Plan 3, Knowledge-based Economy Master Plan	Greater emphasis on knowledge based, innovative economic growth
STI policy and role of government	Limited focus	Dedicated Ministry for Science established as well as the NCSRD	1st National S&T Policy; first chapter on STI in Malaysia Plans; IRPA grants established; double deduction incentives for R&D	Multimedia Super Corridor established; National IT Council; mega-projects era; Returning Scientist Programme	2nd National S&T Policy; National Innovation Council; Biotech strategy announced; IRPAs streamlined; Brain Gain Programme launched	Year of Innovation; Talent Corporation established; UNIK, PEMANDU
Macroeconomic policy framework/ conditions	1st Malaysia Plan (1966-1970) launched (to be followed by plans every five years). Substantial increases in public sector expenditure	New economic policy focused on national unity, restructuring society for greater Malay urbanisation and employment	Large investments in heavy industries; significant growth in FDI; major recession in mid-1980s	Vision 2020 announced; APITD; Asian economic crisis	NEAC, National Innovation Model; second phase of 2020, focused on key strategic thrusts for sustainable growth	New Economic Model; 10th Malaysian Plan (2011–2015) launched; Global economic Crisis; New Economic Programme
Education Policy	Becomes federal responsibility; focus on basic education for all	Focus on improving quality; system begins adjusting to economic needs	Continued focus on improving quality and access, National Vocational Training Council	Rapid transformation/ reform; Opening of private sector/ institutions; Human Resource Development Fund	Ministry of Higher Education established; National Higher Education Action Plan; creation of research universities; APEX university; University Grading System; Implementation of MQF; NDTS	Science and maths to be taught in Bahasa Malaysia (the official language of Malaysia) from 2012

Source: Adapted from Wong et al. (2007), Oyelaran-Oyeyinka & Rasiah (2009), and Day & Amran Muhammad (2011).

1.2. Framework conditions for innovation

12. The state plays a significant but declining role in guiding economic activity in Malaysia through macroeconomic five-year plans. The plans are largely aimed at accelerating the growth of the economy by investing in selective sectors and improving their supporting infrastructure. The overall effectiveness of the five-year plans is disputed as a large portion of the allocated funds remain undisbursed and industrial competitiveness and innovation tend to still be confined to export-oriented subsidiaries of multinational companies.

13. The current initiatives of the government are the New Economic Model (NEM) and the 10th Malaysia Plan (2011-2015) which both emphasize, among other priorities, the importance of improving innovation capability and human capital development as well as institutional efficiency. National income per capita is targeted to grow at 6% per year propelled by the service and manufacturing sectors. During the 10th Malaysia Plan, the government aims to increase the growth of private sector investment at a rate of 12.8% per year and reduce the fiscal deficit from 5.3% of GDP in 2010 to less than 3% in 2015.

14. Implementation of the productivity-enhancing structural reforms put forward in the New Economic Model is crucial to future growth. These range from improving the skills of the labour force to ensuring the inclusiveness and sustainability of the growth process. Other key features of the plan are an emphasis on quality rather than just quantity in the accumulation of capital and labour inputs; private rather than public endeavours in promoting more competition in the economy; bottom-up rather than top-down decision-making in more decentralized and participative processes; unbalanced rather than balanced regional growth with an emphasis on industrial clusters; selective and targeted incentives rather than sector-based approaches; and making better use of foreign skilled labour.

15. The NEM has identified growth drivers in the electrical and electronics industry, information technology (IT), nanotechnology, biotechnology and life sciences, palm oil-related downstream industries, high-end commercial agriculture, the oil and gas industry, medical and bio-tourism services, green technology industries and services, and integrated Islamic finance involving banking, capital markets and insurance. Specific incentives are being used to attract more multinational enterprises (MNEs) to locate their research and development (R&D) centres as well as advanced production and assembly operations in Malaysia.

16. Malaysia has made large investments in infrastructure development including telecommunications, transport, and power generation to meet the bottlenecks caused by rapid industrialization. Some of the more visible projects include the Kuala Lumpur International Airport, the Bakun hydroelectric dam, the national administrative city of Putrajaya, and the Multimedia Super Corridor (MSC). The MSC was designed to catapult the Malaysian economy into the digital age. Roughly equivalent in size to Singapore, this 20-year project was envisaged to attract large IT multinationals as well as local businesses, act as a test bed for digital invention and research, and support a large share of Malaysia's local ICT workforce. There are plans for other development corridors such as the Sarawak Corridor of Renewable Energy (SCORE). However, the corridors tend to act as tax havens for offshore production and call centers rather than part of the integrated R&D efforts of large multinationals.

17. Due to government investments, Malaysia's broadband infrastructure is more advanced than many of its regional neighbours. Malaysia's percentage of fixed broadband subscribers is around 5% which is about the same level as in Vietnam and Thailand. Household penetration rates improved significantly from 1% in 2004 to 32% in 2009, where access occurs mostly through fixed broadband. The Government has also undertaken measures to stimulate demand for broadband through the MSC plus Internet connections for government offices, schools, universities and healthcare facilities, and has considered fiscal incentives for increasing access to computers.

18. The venture capital market and level of entrepreneurship in Malaysia remain embryonic. Although the number of venture capital firms and the volume of venture capital appear to have increased in recent years due to fiscal incentives, investments and deals have not (Table 1.5). A lack of skilled personnel in managing the funds contributes to the dearth of support particularly for early stage financing, and a large share of finance continues to be channelled to government-linked firms. Despite numerous reforms to enhance the equity market including revamping of the Malaysian Exchange of Securities Dealing and Automated Quotation (MESDAQ) known as the ACE Market, financing for potentially innovative firms is limited. In recent years, 43% of innovating firms have reported that they considered lack of access to appropriate finance as significant in hampering innovation.

Table 1.5. Provision of Venture Capital in Malaysia, 1996-2008

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008
No of VC Firms	17	22	27	30	31	41	38	43	38	56
Investment (RM Million)	734.4	723.8	723.6	999.0	1,165.6	1,357.1	1,356.6	1,444.8	1,527.6	1,929.0
No of Investee Companies	231	259	277	194	159	235	183	298	332	450
Ratio of Investee to VC Firms	13.59	11.77	10.26	6.47	5.13	5.73	4.82	6.93	8.74	8.04

Source: Bank Negara; Department of Statistics; Malaysian VC & Private Equity Directory, 2009.

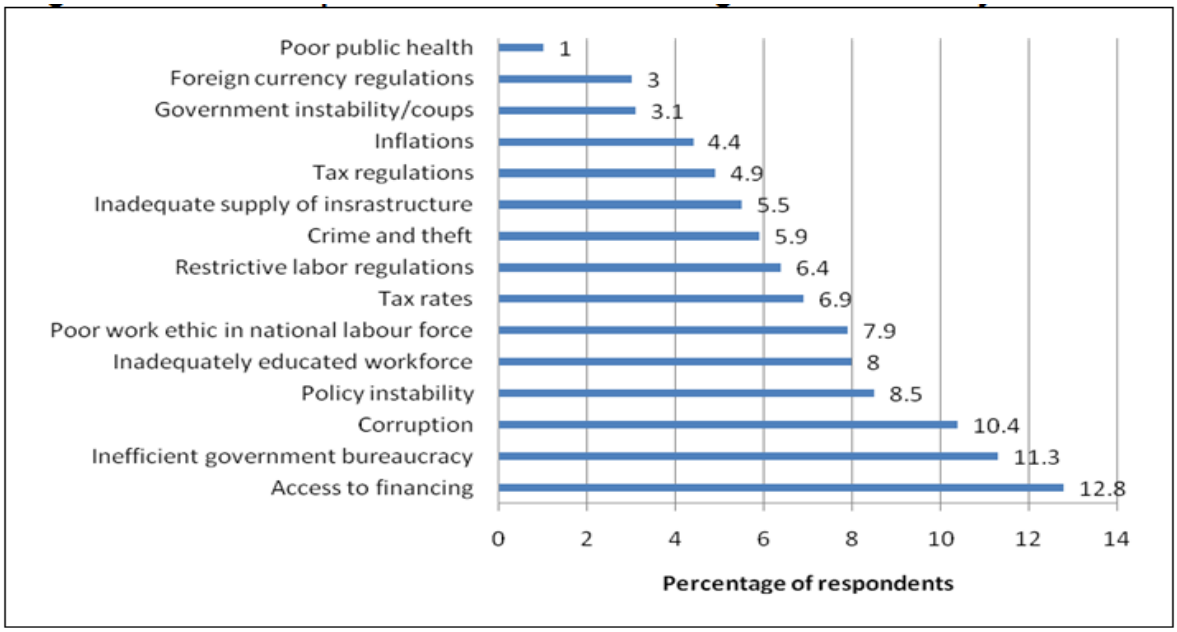
19. Other factors restricting entrepreneurial activity are access to financing, the relatively high regulatory burden of starting a business and a shortage of technical personnel to trigger innovative approaches and products (Table 1.6 and Figure 1.1). The current inability of Malaysia to foster domestic technological development or to convert research results into productive efforts is mainly due to poor educational levels and related difficulties in using information and skills efficiently. The failure to develop domestic human capital is undermining Malaysia's ambitions of becoming an innovation-driven economy; this goal is also being weakened by an exodus of large numbers of talented Malaysians to other countries.

Table 1.6. Doing Business Indicators for Business Start-ups, Malaysia V.S. Selected Economies

Country	Rank	Procedures (number)	Time (days)	Cost (% of income per capita)	Minimum capital (% of income per capita)
New Zealand	1	1	1	0.4	0
Australia	3	2	2	0.8	0
Singapore	4	3	3	0.7	0
Hong Kong, China	18	3	6	1.8	0
Chinese Taipei	29	6	23	3.9	0
Korea	53	8	14	7	0
Thailand	55	7	32	6.3	0
Malaysia	***88***	***9***	***11***	***11.9***	***0***
Japan	91	8	23	7.5	0
China, P. R. of,	151	14	37	4.9	130.9
Indonesia	161	9	60	26	59.7
India	169	13	30	66.1	210.9

Source: World Bank (2010).

Figure 1.1. The Most Problematic Factors for Doing Business in Malaysia



Source: Global Competitiveness Report, 2009-2010, World Economic Forum.

2. Innovation performance

20. Malaysia's innovation performance is in line with that of other middle-income countries in the Southeast Asian region, but shows a significant gap with high income countries (Table 2.1). Malaysia has yet to enter a stage of innovation-led growth and research performance has not significantly improved in the last decade. While there has been improvement in some dimensions such as patenting, this occurred from a relatively low base. The World Bank's Knowledge Economy Index (Table 2.2), which captures the ability to generate and diffuse knowledge, ranked Malaysia 48th out of 145 countries in 2009, roughly the same rank as a decade ago.

Table 2.1. Malaysia's Innovation Capacities in Global Ranking (2010-2011)

	Rank		Score	MEAN score
	Global	South-East Asia		
Capacity for innovation	25	2	4.1	3.2
Quality of scientific research institutions	32	2	4.7	3.8
Company spending on R&D	16	2	4.5	3.2
University-industry collaboration in R&D	22	2	4.7	3.7
Gov. procurement of advanced tech. products	8	2	4.7	3.7
Availability of scientists and engineers	33	3	4.7	4.1
Utility patents per million population	29	2	5.7	-

Source: Global Competitive Report, 2010-2011.

Table 2.2. Knowledge Economy Index, 2009, Malaysia V.S. Selected SEA Countries

Country	Rank	KEI	Economic Incentive Regime	Innovation	Education	ICT
Indonesia	103	3.29	3.66	3.19	3.59	2.72
Malaysia	***48***	***6.07***	***6.11***	***6.82***	***4.21***	***7.14***
Philippines	89	4.12	4.37	3.80	4.69	3.60
Singapore	19	8.44	9.68	9.58	5.29	9.22
Thailand	63	5.52	5.12	5.76	5.58	5.64
Vietnam	100	3.51	2.79	2.72	3.66	4.85

Source: World Bank.

21. Spending on research and development (R&D) in Malaysia rose over the last two decades but remains low when compared internationally. Gross expenditure on R&D (GERD) grew from 0.50% of GDP at the beginning of the decade to about 0.64% at present (Table 2.3). According to the 10th Malaysia Plan, gross expenditure on R&D dropped to just 0.21% of GDP in 2008 due to the global financial crisis and the rapid increase in oil prices which affected Malaysia's economy. The government now aims to ensure that investment in R&D reaches at least 1% of GDP by 2015, which is a decrease from the previous target of 1.5% of GDP by 2010 in the 9th Malaysia Plan.

Table 2.3. Malaysia's Gross Expenditure on R&D by Sector, 1996 – 2006

	1996	1998	2000	2002	2004	2006
R&D Expenditure (MYR Million)						
Total GERD	549.3	1127.0	1,671.5	2,500. 6	2,843.7	3,646.7
Ratio GERD/GDP	0.22	0.39	0.50	0.69	0.63	0.64
GRI	108.7	247.3	417.5	507.1	296.9	189.5
IHL	40.4	133.6	286.1	360.4	513.3	360.8
Public Sector	149.2	380.9	703.6	867.5	810.2	550.3
Private Sector	400.1	746.1	967.9	1,633.1	2,033.5	3,096.4
Proportion of R&D Expenditure (%)						
GRI	19.8	21.9	25.0	20.3	10.4	4.4
IHL	7.4	11.9	17.1	14.4	18.1	10.7
Public Sector	27.2	33.8	42.1	34.7	28.5	15.1
Private Sector	72.8	66.2	57.9	65.3	71.5	84.9

Source: MASTIC (2008).

22. The private sector share of R&D expenditures has increased to over 50% led by the large multinationals, although the overall level of their research spending is small by global standards. On the domestic side, firms in the automotive sector are the biggest R&D spenders followed by office equipment manufacturers. The national car manufacturer Proton spent 8% of sales on research in recent years, largely from government subsidies, which amounted to over three-quarters of research expenditures by the automotive sector. The oil and gas industry, thanks largely to the state-owned Petronas, makes the fourth largest research expenditures in Malaysia.

23. Private sector R&D statistics mirror those of other Southeast Asian countries with a large degree of dispersion across regions (with poorer regions performing less well), industries (with garments, wood, textiles and food processing scoring lowest), and firm characteristics (with SMEs, non-exporters and domestically-owned firms performing less well than multinational enterprises). Federal sources provide the vast majority of public research funding in Malaysia, with states having limited financial capacity. Most of

the national R&D budget is expended in the four most developed states of the country indicating a skewed distribution.

24. Small and medium-sized enterprises (SMEs) in Malaysia comprise 95% of firms and contribute about 32% of GDP but conduct little research or innovative activity. In terms of total national R&D expenditure, businesses with revenues under RM10 million account for only about 9% of research expenditures. This is partly because 86% of SMEs are concentrated in the services sector rather than in manufacturing or agriculture, but it also reflects inertia and the limited capabilities of smaller firms. Fewer than 20% of Malaysian SMEs had access to the internet in 2007.

25. The evolution in the number of personnel engaged in R&D in Malaysia (Table 2.4) has mirrored the developments in research spending. The number of researchers per 10,000 workers in the labour force increased to below 20 in the last decade and decreased significantly in 2008. The Malaysia Higher Education Plan (2007–2010) set an ambitious target of raising this to 100 researchers per 10,000 jobs in the labour force by 2020, but it seems unlikely that this will be achieved at the current rate of progress. In Malaysia unlike in most advanced scientific nations, the majority of R&D personnel work in universities (45%) or public research organizations (17%) rather than the industrial sector (38%).

Table2.4. Researchers to Labour Force/Population Ratios, Headcount & Full Time Equivalence, 1994-2004

	1996	1998	2000	2002	2004	2006
Total Population (Million)	21.17	22.18	23.27	24.53	25.62	26.90
Total Labour Force (' 000)	8,616.0	8,883.6	9,616.1	9,886.2	10,856.0	11,545.0
Researcher per 10,000 Labour Force	5.1	7.0	15.6	18.0	21.3	17.9
Researcher per 10,000 Population	2.0	2.8	6.4	7.3	9.0	7.1
Headcount (Researcher, Technician & Others)	9,233	12,127	23,262	24,937	30,983	24,588
Full Time Equivalence	4,437.30	6,656.33	10,059.67	10,730.95	17,886.55	14,800.00

Source: MASTIC (2008).

26. Malaysia's increasing scientific publication and patenting record, although second among Association of Southeast Asian Nations (ASEAN) countries, is poor when compared internationally (Table 2.5). Most patents granted in Malaysia have been to foreigners, and Malaysia's most patented technology class is that of active solid-state devices including transistors and solid-state diodes. Following the creation of the Intellectual Property Corporation of Malaysia (MyIPO), an increasing share of patents has gone to locals reaching about 8% of the total in 2009. Between 1995 and 2008, US patents issued to residents of Malaysia rose twenty-fold but from a very low base. Most US patents are granted to MNCs located in Malaysia. With the exception of individually-owned patents, only four Malaysian organizations — Silterra, Malaysian Palm Oil Board (MPOB), Harn Marketing, and Universiti Putra Malaysia (UPM) — were granted five or more patents each between 2003 and 2007. The patents issued domestically are mainly for chemistry and metallurgy, operational technology, electricity and physics.

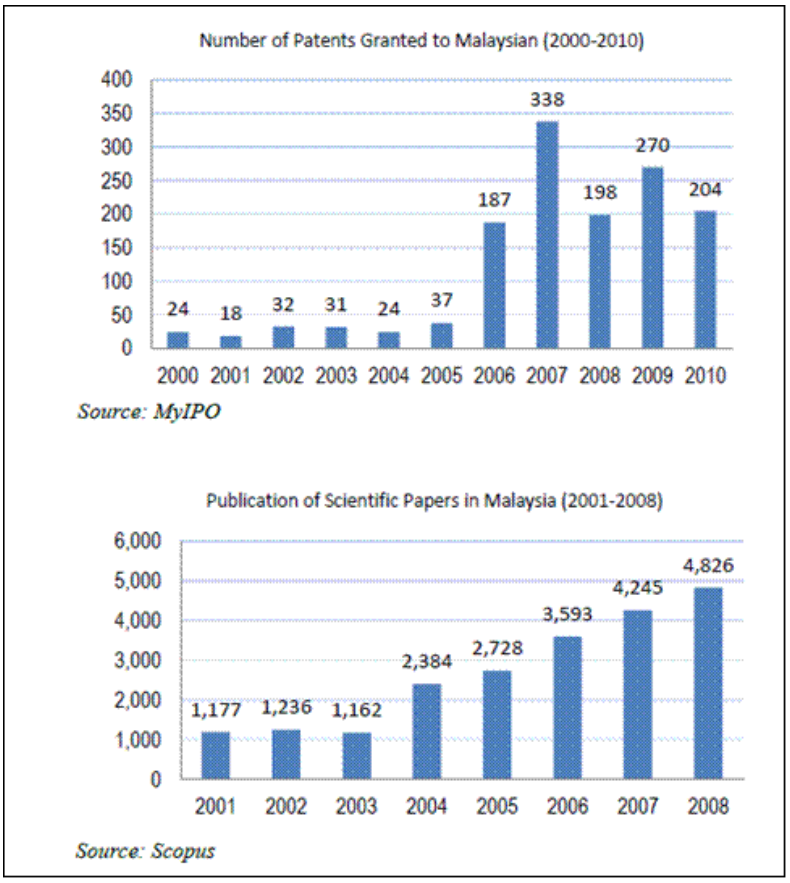
Table 2.5. Number of Patents Granted by USPTO (1977-2007), Malaysia V.S. Selected Countries

Country	No. of patents granted
China	5348
Germany	251597
Japan	682050
Malaysia	**949**
Singapore	4016
South Korea	54036
Sweden	33523
Thailand	440
USA	2004055

Source: US Patent and Trademark Office (USPTO).

27. The recent increase in domestic patents and publication rates (see Figure 2.1) is in part due to incentive schemes for patent research within universities and government research institutes. Still, Malaysia continues to rank behind Singapore and Thailand in the number of scientific publications and citations in any given year. A low proportion (about 2%) of papers published are in high impact scientific publications. Key fields for scientific articles include medicine, engineering, biochemistry, and computer science.

Figure 2.1.Increases in Patents Granted and Scientific Publications in Malaysia, 2000-10



3. Innovation policy frameworks

28. Science and technology has been a featured part of Malaysia's economic planning since 1986 when the First National Science and Technology Policy was formulated and included as a distinctive strand within the 5th Malaysia Plan (1986–1990). In 1991, Malaysia developed "Vision 2020," its blueprint to become a knowledge-based economy. The 10th Malaysia Plan (2011–2015) announced a new structure to streamline the governance of science and technology with a more prominent role for the Prime Minister's Office. The Unit Inovasi Khas (UNIK) was created to oversee an integrated innovation policy and entrusted with commercializing research findings from public research institutions and universities. UNIK is also responsible for drafting the National Innovation Policy for the country, while a statutory organization – the Malaysian Innovation Agency (AIM) – was established in 2011 to drive the nation's innovation agenda.

29. The Ministry of Science, Technology and Innovation (MOSTI), which was originally formed as the Ministry of Technology, Research and Local Government in 1973, is the general administrator of science and technology policy in Malaysia. MOSTI provides the bulk of grants for research through specialized schemes including the Science Fund, the Strategic Thrusts of Research Areas program and the TechnoFund. Its programs are currently clustered into five focus areas: biotechnology, information technology, industry, sea to space, and the science and technology core. In addition, a Nanotechnology Directorate was created in 2010 when the Prime Minister launched the National Nanotechnology Statement to promote research in this field.

30. Decisions on the allocation of the S&T budget, the integration of S&T plans with national development planning and the determination of manpower requirements to execute these plans rest with other agencies -- the Treasury, the Economic Planning Unit, and the Public Services Department respectively. A number of sectoral ministries have a role in S&T development through research institutions which come under their jurisdiction. These include the Malaysian Agricultural Research and Development Institute (MARDI) and the Malaysian Palm Oil Board (MPOB) which report to the Ministry of Agriculture and the Ministry of Plantation Industries, respectively. In addition, technology transfer comes under the purview of the Ministry of International Trade and Industry, while fiscal and financial incentives for R&D are administered by the Ministry of Finance.

31. Organizations under MOSTI such as the Malaysia-Industry High Technology Group (MIGHT) provide advisory services and engage in technology foresight and industry-specific activities. Other bodies include the Academy of Sciences Malaysia, inaugurated in 1995, which advances general science across Malaysia and administers certain schemes like "Brain Gain Malaysia". The Malaysian Science and Technology Information Centre (MASTIC) is the official reference centre for science and technology statistics and indicators. In 2011, a revamped National Science and Research Council (NSRC) was established to replace the National Council for Scientific Research and Development (NCSRD) formed in 1975.

32. The Ministry of Education (MOE) has oversight of the school system from pre-school to secondary level where students are streamed into academic, technical, vocational or religious studies. The Ministry of Higher Education is responsible for tertiary education and currently has targets of developing 20 Centers of Excellence that are internationally recognized in terms of research output; ensuring at least 75% of lecturers possess a PhD or equivalent and that 30% of lecturers in polytechnics and community colleges possess a Masters Degree; and attracting foreign students to form up to 10% of the total student population at university level.

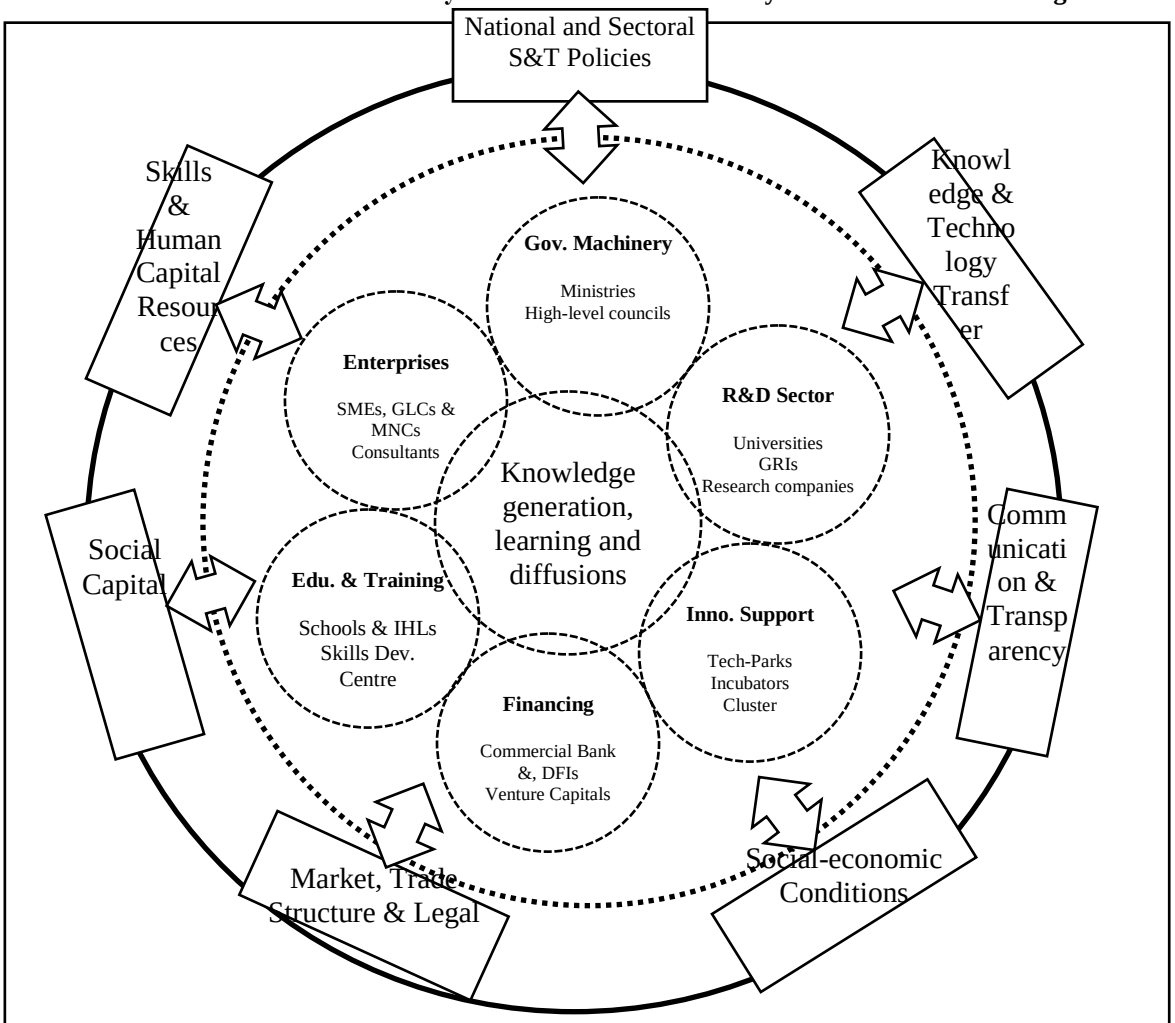
33. In recent years, Malaysia has introduced a range of measures – both fiscal and non-fiscal – to promote research and innovative activities by foreign and domestic firms. These include attracting foreign

knowledge-intensive companies and promoting technology acquisition and diffusion. Fiscal incentives are extended to spur greater research and development including a double deduction on non-capital expenses incurred for undertaking R&D activities. The fiscal relief also covers activities for export promotion and branding. Large firms had been the main beneficiaries of the R&D tax incentives while small firms find the procedures to access these incentives too cumbersome.

34. Malaysia has expanded its banking system and capital markets to promote the establishment of new companies although results to date have been disappointing. Under the national plans, funds have been channelled to various government-linked venture companies to promote and finance innovation, technology acquisition and commercialization of R&D findings. Recently, the Mudharabah Innovation Fund was formed to provide risk capital to government-backed enterprises. In 2009, the Securities Commission of Malaysia introduced new tax incentives guidelines whereby venture capital companies could be eligible for a five-year tax exemption if they invest at least 30% of their funds in the form of seed capital, start-up and/or early-stage financing.

35. Box 3.1 provides an illustration of the key actors of the Malaysian national innovation system and their relations.

BOX 3.1. A Bird's View Illustration of Malaysia's National Innovation System - Actors and Linkages



Government machinery, R&D sector, innovation support centres, financing sector, education and training institutions and enterprises are the main innovation actors in Malaysia. These actors are linked through formal and informal networks, and contribute to the generation and diffusion of knowledge.

The knowledge generation and diffusion process, as well as the networks and linkages among these innovation actors are supported by a wide spectrum of institutional framework, namely the S&T policies, knowledge and technology transfer, communication and transparency, social-economic condition, market, trade structure and legal, social capital, and skills and human capital resources. These institutional frameworks function as innovation-enablers of the NIS.

There is no central coordinating body that is orchestrating the whole of Malaysia's NIS.

Source: Illustration by Boon-Kwee, Ng.

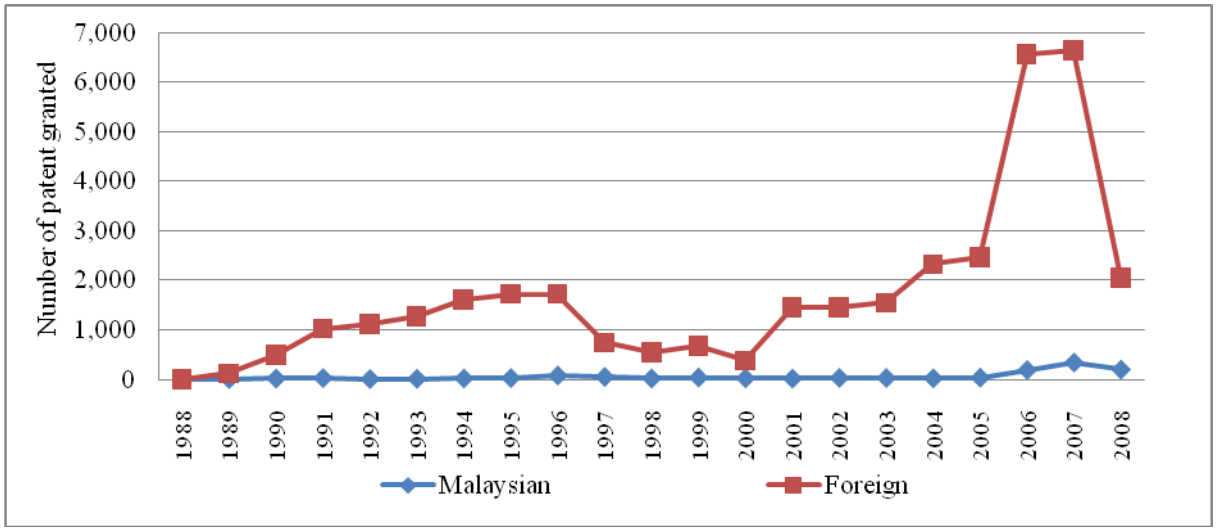
4. National innovation system

4.1. Business Sector

36. Malaysia's economy is dominated by large multinational firms which assemble and export electronics and other manufactured products. Large state-owned enterprises in automotive, oil and gas, and commodity sectors also feature on the economic landscape. Small and medium-sized enterprises (SMEs), which constitute almost 95% of the total population of firms, have minimal linkages with the larger companies. There are also few additions to the ranks of the largest business entities indicating limited dynamism in Malaysia's business environment.

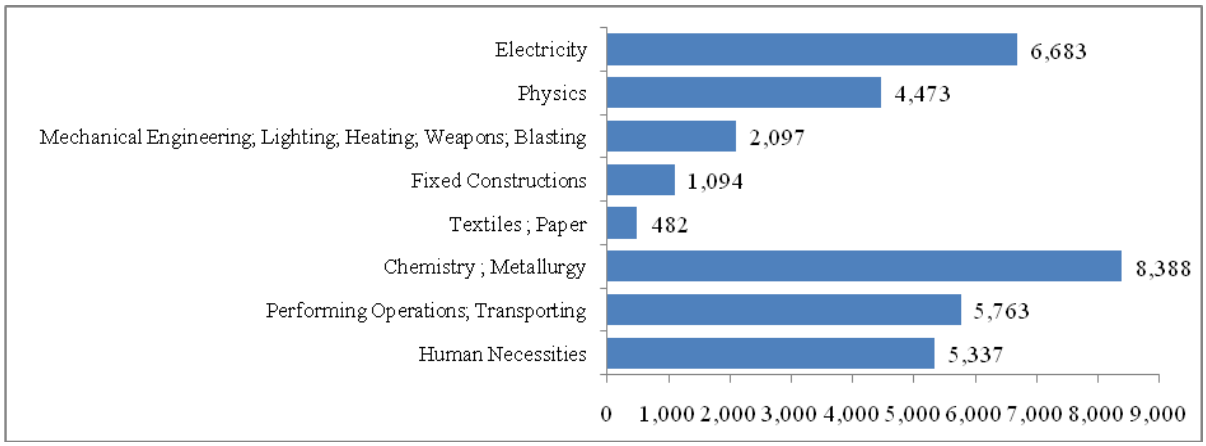
37. On average, only 5.5% of firms in Malaysia actively participate in R&D activities and these are mostly the multinational companies. Consequently, foreign firms were granted with more patents than Malaysian firms (Figure 4.1). There are a large number of MNEs which conduct high-end research who have a presence in Malaysia, including global brands like Hewlett Packard, Motorola, Intel, and Dyson. However, it is difficult to know what share of their activities in Malaysia is R&D-oriented as opposed to manufacturing or after-sales support and to ascertain the number of scientific personnel they employ. Research activity mostly involves the electrical and electronics (E&E), chemicals, food and beverages, rubber and plastics, and automotive sectors. The electronics sector alone accounts for 46% of total foreign R&D. In 2008, due to the global crisis, the number of firms involved in R&D significantly shrunk although there is a trend of increasing research investments per establishment. Chemistry, metallurgy and electricity are the industrial sectors that lead the numbers of patents granted (Figure 4.2).

Figure 4.1. Malaysian and U.S. Patents Granted to Malaysian Industry by Ownership of Firms, 1988-2008.



Source: Thiruchelvam et al, (2011).

Figure 4.2. Malaysian and U.S. Patents Granted to Malaysian Industry by Industrial Sector, 1988-2008.



Source: Thiruchelvam et al, (2011).

38. A number of factors account for the lack of internationalization of R&D activities in the Malaysian manufacturing sector, including reliance of research activities on the interest of MNE headquarters abroad, undemanding technological content activities as in the case of electronics assembly and testing, lack of public sector participation in industry-linked research, and poor organizational support in terms of skilled labour and infrastructure. The quality of human capital in Malaysia and low capacity to absorb new technology have also contributed to the limited transfer of knowledge from MNEs to domestic firms.

39. Among domestic firms, most R&D is conducted by the large state-owned enterprises including the automobile manufacturer Proton, the oil and gas company Petronas, and the large palm oil firms. These companies rely on government subsidies for their research investments. Unlike in the electronics sector where most R&D is conducted by foreign firms, the National Automotive Policy and local content requirements have concentrated automotive research with Proton. The state-owned automobile company accounts for nearly 76% of Malaysia's R&D expenditure in this sector, while foreign players like Honda and Toyota tend to maintain their research strongholds in Thailand.

40. The significant presence of multinational enterprises has provided the country with export-oriented platforms, but Malaysia has had limited success in transferring the technological capabilities of MNEs to indigenous companies and in multiplying the linkages of MNEs with the domestic economy. Clusters have developed around the MNE-led manufacturing core, but these are primarily logistical – deriving benefits from the reduction of supply chain costs -- rather than technological or knowledge-based groupings. For example, transfer of knowledge from Japanese subsidiaries in the electrical and electronics sector to their local suppliers is mostly in product and process technology. With regard to products, this involves physical and technical specifications for manufacturing, while process technology transfers primarily regard the supply of tools and input procurement. Technological learning by local firms via interaction with foreign subsidiaries is therefore limited in Malaysia.

4.2. Higher Education Institutes

41. The Ministry of Higher Education is entrusted with the oversight of the 20 public Higher Education Institutes (HEIs) in the country as well as private universities, foreign branch campuses and colleges. Prior to 1969, there was only one university in Malaysia and since then the number of public universities has risen to 20 at present (Table 4.1). Following the passage of the Private Higher Educational

Institutions Act, private universities were permitted to operate and presently there are 33 private institutions plus four branch campuses of foreign universities.

Table 4.1. Number of Higher Education Institutions in Malaysia

Type of Institution	Number
Public Higher Education Institutions	20
Private Universities	18
Private University Colleges	15
Foreign University Branch Campus	4
Private Colleges	488
Polytechnics	24
Community Colleges	37

Source: Ministry of Higher Education Malaysia website.

42. A Rating System for Malaysian Higher Education Institutions (SETARA) was introduced in 2007 to enhance quality and promote best practices among public universities. In order to intensify research and innovation activities, four universities were accorded Research University status by the government. As part of this process, universities were encouraged to participate in the competitive Accelerated Programme for Excellence (APEX). In 2008, the Universiti Sains Malaysia (USM) became the first APEX university. With this title comes greater autonomy in governance, finance, and admissions and prioritized infrastructure investments. In non-APEX institutions, the Ministry of Higher Education still tightly controls student admissions, course structure, remuneration and financial management, while academic mobility between universities is limited.

43. Despite the massive investments by the government in the higher education sector, the research outputs from the universities have been disappointing. About 53% of the nation's R&D personnel are found in higher education institutes, which account for about 10-15% of total R&D expenditures in Malaysia. The proportion of academic staff with PhD qualifications in public universities has slowly risen to 36% in 2009. The system of research assistants is not well established in Malaysia as many scientists go straight from their PhD to a university position where they have a heavy teaching load and lack the experienced assistance needed to do research. Malaysia would benefit from a post-doctoral scheme which enables early career scientists to strengthen their experience of research and teaching as part of their career development.

44. Nevertheless, there are some premier research institutes associated with universities. These include USAINS, the commercialization arm of Universiti Sains Malaysia, and the Institute of Bioscience associated with Universiti Putra Malaysia (UPM). This institute has five laboratories covering natural products, molecular biomedicine, industrial biotechnology, marine science and aquaculture, and cancer research. The Department of Pathology at the University of Malaysia has pioneered a number of scientific developments from laboratory information systems to microwave-stimulated antigen retrieval techniques. Closely aligned with the National Biotechnology Policy, research programs span plant biotechnology, drug discovery, vaccine technology, and immunotherapeutics.

45. The commercialization rate of universities funded under the grants for "Intensification of Research in Priority Areas" is only 5% of research results. The failure to improve the commercialization rate of university research is attributed to insufficient industry-relevant research projects and a lack of funding for the various stages of the commercialization process including pilot projects and marketing. Patents applied for and granted to universities are typically at an early stage of development characterized by a high degree of technical and market uncertainty. In recent years, the Malaysian Government introduced incentives for university researchers and inventors to publish, patent and commercialize their

research including cash rewards on disclosure of an invention and funding for initial development when a patent is granted.

4.3. Public Research Organizations

46. In general, Malaysia's public sector research is characterized by too many areas of funding and multiple institutes as well as being driven predominantly by the interests of researchers. Of the 29 public research organisations, one is a company under MOSTI and the remainder are departments or institutes of the sectoral ministries. Most of these institutions have a sector focus and MOSTI has no direct authority in determining their research agendas. Malaysia's public research organisations (PROs) perform mainly downstream or applied research, rather than basic or experimental research, in order to be relevant to their target customers or to satisfy their departmental remits.

47. The agricultural sciences dominate the work of the public research institutes while other areas of research include forestry, materials, engineering and biotechnology. In addition to the Malaysian Agricultural Research and Development Institute (MARDI), a large share of public funding goes to commodity research organisations such as the Malaysian Palm Oil Board (MPOB), Malaysian Rubber Board (MRB), Malaysian Cocoa Board (MCB) and Forest Research Institutions Malaysia (FRIM). These research institutes focused on agriculture and forestry tend to work closely with firms in the relevant sector.

48. In order to strengthen technological capability in the manufacturing sector, several PROs and complementary institutions have been established to provide research and services related to industry and engineering. These include the Malaysian Institute of Microelectronic Systems (MIMOS) for research on electronics and information technology development. The Standards and Industrial Research Institute of Malaysia (SIRIM) and the Malaysian Productivity Corporation (MPC) conduct research to help improve overall productivity. To spur advancement in selected fields, institutes have been created such as Nuclear Malaysia which provides nuclear technology research facilities; the Malaysian Remote Sensing Agency for the development of remote sensing technology in national planning and resource management; and the Malaysian Institute of Economic Research (MIER) which provides expertise in economic, financial and business related issues.

49. A number of PROs have been assigned to safeguard the quality of health care of Malaysians including the Institute for Medical Research (IMR) and the National Heart Institute (IJN). The Cancer Research Initiatives Foundation (CARIF) focuses on diseases most commonly found in Asian countries with a growing reputation in cell and molecular biology, gene expression, and drug discovery techniques. Individual and corporate donors such as Sime Darby and Petronas supplement government funding for CARIF. Biotechnology is another priority for investment, with a focus on pharmaceutical breakthroughs at the Agro-Biotechnology Institute, the Malaysia Genome Institute, and the Institute of Nutraceutical and Pharmaceuticals. In the 10th Malaysian Plan, the Government identified some broad areas of research in the public interest -- including tropical medicine, global warming, food security, infectious diseases, and water and energy security -- to be undertaken by public institutes.

4.4. Linkages

50. Despite numerous public research institutes and universities involved in R&D, their contribution to industrial development in Malaysia is limited due to poor linkages and collaboration. Bureaucratic procedures and the lack of relevance of university research to industry are cited as the main reasons deterring firms from collaborating with higher education institutes in the development of science and technology. The lack of industrial extension programmes and weak bridging organizations have hampered the transfer of research results and technology from the public research organisations. The exception is the

close linkages between the sector research institutes and industry in specific commodities such as rubber and palm oil.

51. Malaysia has had mixed success in facilitating technology transfers from multinational enterprises and in multiplying domestic linkages with them. The capabilities of indigenous firms are highly dispersed, creating room for the beneficial diffusion of knowledge through best practice programs, SME assistance and technology brokers. However, forward and backward linkages with multinational firms have not contributed significantly to technology learning or upgrading of indigenous suppliers. While technology transfer from MNEs to local businesses has been weak, state-owned companies such as Petronas have had more success in nurturing smaller enterprises. There is also potential in improving the productivity of upstream and downstream activities in the palm oil sector, since Malaysia is the world's second largest producer of palm oil after Indonesia.

52. There is presently a lack of dedicated institutions entrusted in the transfer of industrial technology from the universities and PROs to industry, particularly SMEs, as extension activities are poorly developed for the industrial sector. In addition to improving the teaching and research capabilities of universities, intermediary organizations are needed to facilitate matchmaking between universities and the private sector in specific fields. The technology support organizations in the country have failed to coordinate their roles to support the commercialization of R&D output from Malaysian public research.

53. There are numerous projects aimed at fostering high-technology clusters in Malaysia and the government has supported a number of science parks across the country. These benefit from strong government support, adequate funds for infrastructure, and tax incentives, yet university links are relatively weak. The first park established was the Kulim High Technology Park in 1993 which caters to high-technology manufacturing. Technology Park Malaysia (TPM), established in 1996, is targeted more at R&D-based businesses and is now home to over 160 firms. The third largest park is the ICT-focused cluster of Cyberjava located in the Multimedia Super Corridor which has attracted the international firms Dell, Hewlett-Packard, Motorola and Ericsson.

5. Human Resources

54. Malaysia lags behind OECD countries and advanced SEA economies such as Singapore and Hong Kong, China, in terms of the education and skill levels of its labour force (see Table 5.1) in Education is one of the main instruments used by the Malaysian government to improve the socioeconomic status of its population and fuel overall development. From the 1970s onwards, Malaysia has invested heavily in human capital. The government focused on primary and secondary education levels before embarking on a transformation of higher education to satisfy increased demand for skilled labour. In recent years, education expenditures have averaged 17% of total public expenditure and around 5% of GDP. Primary school enrollment is now nearly universal and 68% of students attend secondary school.

Table 5.1. Education and Skills Levels of Labour Force, Malaysia V.S. Selected Economies

Country	Labor Force with Tertiary Education (%) 2007	Skilled Labor Force (%) 2008
Malaysia	23.4	28.0
Singapore	35.9	51.0
Hong Kong, China	25.6	36.0
Republic of Korea	35.0	29.3
Finland	34.8	43.8
OECD Average	27.4	37.6

Source: World Economic Outlook.

55. Despite the large push in access and participation in school, especially in primary education, the quality of education remains below other comparable economies. The tertiary education system is disadvantaged by a secondary school system that does not prepare its students for university education. Only 20% of tertiary entrants go on to graduate which raises serious problems for the government's target of creating 100,000 PhD holders by 2020 under the "MyBrain 15" initiative. In 2008, Malaysia had under 4 000 PhD students over half of whom were educated in part outside the country. In general, there is concern about the quality of tertiary education and serious mismatches between the products of the higher education system and industrial skill needs.

56. Malaysia's higher education system has undergone a rapid transformation (Table 5.2). In the 8th Malaysia Plan (2000–2005), nearly 47% of the allocation for education was designated for tertiary schools. Another area of expansion was in privately provided education as the government opened the gates to private and foreign universities to assist public institutions in catering for increasing demand for skilled labour. Higher education enrolment increased to 30% of the 18-24 year old population. The international student population grew and by 2008, 70,000 international students were enrolled in Malaysian universities. The number of students enrolled in science and technical subjects at both undergraduate and graduate level more than doubled.

Table 5.2. Enrolment and Graduation of Students in higher education institutions, Malaysia (2002-2008)

	Number of Enrolments/Graduates						
	2002	2003	2004	2005	2006	2007	2008*
Public Higher Education Institutions	281,839	294,359	293,978	307,121	331,025	382,997	403,009
	57,435	75,842	71,924	79,934	81,095	85,448	56317
Private Higher Education Institutions	294,600	314,344	322,891	258,825	323,787	365,800	419,778
	139,150	137,018	134,987	57,953	83,186	83,431	51,571
Colleges/Polytechnics/ Community Colleges	56,105	59,916	73,327	83,707	93,318	98,688	102,429
	18,774	20,714	21,441	28,555	31,870	34,451	35,873
TOTAL	632,544	668,619	690,196	649,653	748,130	847,485	925,216
	215,359	233,574	228,352	166,442	196,151	203,330	143,761

Note: * 2008 Data on enrolment and gradation is up to July 2008 only, taken from Quick Facts Malaysia Higher Education Statistics 2008, Ministry of Higher Education, December 2008.

Source: Ministry of Higher Education Malaysia (2008).

57. The 10th Malaysia Plan (2011-2015) specifically addresses the human capital deficiency and the need to train qualified students and develop a skilled workforce. The Higher Education Strategic Plan under the Ministry of Higher Education was put in place to revamp education to meet labour market needs. Emphasis is placed on enhancing the quality of students, teachers and delivery systems. At lower school levels, efforts are concentrated in improving quality, ensuring literacy and numeracy, and raising the standards of secondary schools. Government policy is also focused on shifting the balance of student enrolment to a 60:40 ratio in favour of science-based studies at tertiary level. This will largely depend on an increased focus within secondary education upon these fields, as well as ensuring sufficient career opportunities in the broader economy.

58. Malaysia's ambition to move from a focus on fabrication in the manufacturing sector towards higher-value, front-end aspects such as design is also dependent on increasing the pool of engineers and technical personnel. Over 18% of students in tertiary education are now enrolled in engineering, but there are few students trained in the maintenance of highly complex scientific instruments and machinery.

Would-be technicians have been deterred from vocational training seen as inferior to university qualifications. Statistics show that only about 10% of students are enrolling in technical and vocational education. Improving the availability, access and quality of the technical pathway is equally as important as upgrading the academic pathway of education.

59. The Government set up several new university colleges with the ultimate aim to revamp the science, technology, and engineering education system by incorporating some extent of vocational training in both secondary and tertiary education. A national dual training system has been incorporated into existing vocational education to address technical labour shortages. This apprenticeship program involves a two-year training program carried out 70-80% in workplaces and the remaining 20-30% in selected training institutions. Graduates are expected to acquire the necessary hands-on experience which is immediately applicable in the labour market in order to play a role in modernising production and in innovation.

60. In spite of substantial education expenditures, the supply of skilled labour in Malaysia is still in shortage. Labour force participation rates by education level show that the majority of workers have only a secondary education or below. In 2010, unskilled workers represented more than 75% of total workers employed while those with college level education and applicable skills made up only a quarter of the workforce. Only 28% of Malaysian jobs are in the higher skilled bracket. There are also shortages in critical professions such as qualified engineers, scientists and R&D personnel which is limiting the evolution of current industries and firms into higher value added activities.

61. Enrolment in higher education in Malaysia is still biased towards academic disciplines which follow a rote-learning model. In order to ensure the curriculum and courses offered by Malaysia's 50 universities are of high quality and relevant to the needs of industry, existing programmes are being reviewed for compliance with the Malaysian Qualification Framework (MQF) to determine whether standards are in line with international best practices. Firms are demanding that universities build better curriculum and impart not only technical skills but also intangible skills such as creativity, communication and problem-solving as well as language skills especially English.

62. To its credit, Malaysia has put in place many programs to promote gender equality. The illiteracy rate for women decreased from 35% in 1980 to about 12% at present compared to 5% for males. At the secondary school level, female students achieve significantly higher scores than their male counterparts and a large share of university enrolees are women. These educational gains for women are not reflected in the labour market, as women constitute only about 30% of the labour force mostly in household service sectors. The female share of higher skill jobs, including professionals and technicians, is low at under 25%.

63. Due to Malaysia's foreign labour policy, firms are able to employ cheap unskilled foreign workers, while the current wage structure does not encourage employees to upgrade their skills. A lack of spending on training by firms, especially SMEs, limits knowledge upgrading and undermines progression to higher value added and productivity driven activities. Due to limited financial resources and human resource personnel, firms have difficulties in sourcing and planning training programs for their employees. At the same time, the number of skilled expatriates working in Malaysia has declined in recent years, limiting opportunities for leveraging their knowledge and technological capabilities. The result is a very tight market for skilled labour.

64. The outflow of Malaysian talent is also increasing. It is estimated that about 4% of the country's population resides overseas, approximately 40% in Singapore. More than 300,000 Malaysians – many of whom possess tertiary qualifications – have migrated annually in recent years. The government now views this substantial "brain drain" as a potential asset and is increasing linkages with talented overseas Malaysians. In 2011, it established the Talent Corporation Malaysia aimed at retaining talent and attracting

skilled Malaysians residing abroad to fill the growing deficits in skilled manpower in the country. The Skills Development Fund is dedicated to financing more PhD students and extending educational loans. Top students currently overseas will have their final year of study paid for by the government on the condition that they return. Greater visa flexibility for foreign researchers and technicians has also been instituted to fill private sector skills gaps.

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