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Singapore's five decades of development: lessons and future directions

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This paper looks at Singapore's transition from a Third World economy at the time of political independence in August 1965 to a First World economy five decades later. It is a unique city-state with a dearth of land and natural resources and pursuing a government-led, MNC (multinational corporation)-led, and export-led development strategy. Government and governance have been outstanding, and the city-state overcame its constraints by adopting open trade and investment policies, making the region and the world its economic hinterland. Five decades later, while facing the same demographic and land constraints, it has to overcome the challenges of transitioning into a private-enterprise-driven and innovation-driven economy.

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1. Introduction

Singapore gained its political independence on August 9, 1965 and celebrates its 50 years of nationhood in 2015 with much introspection as well as aspirations in going forward. Notwithstanding its small nation status, its rapid transition from a Third World to a First World economy has attracted worldwide attention from the scholarly, policymaking, and business communities.

In 1965, the economic and political challenges facing Singapore were more challenging than those faced by many newly independent developing economies. Its city-state economy was small, with land area of only 580 square kilometers and a population of less than 2 million; there was a dearth of natural resources, including crucial water and energy. Political independence had cut off its Malay Peninsula hinterland and its two economic pillars—entrepôt trade and British military base—faced dismal prospects. There was high unemployment

and budget deficits, militant trade unions, and ethnic unrests. Many thought Singapore was a "basket case".

However, there were also some positive initial conditions. Singapore inherited the British legal system and use of the English language in government and business and has a wel1-developed seaport, commercial and financial expertise, a highly monetized economy, and no backward agricultural sector. Its per capita income was only second only to Japan in Asia. Furthermore, as with other Asian newly industrializing economies at the time, Singapore also benefited from the growth of global production networks and supply chains that spearheaded its industrialization. Above all, Singapore was lucky to have a visionary and non-corrupt political leadership and a pragmatic and effective economic management team.

Going forward, the overall economic challenge for Singapore is how to successfully transition to an innovation-driven economy and meet the rising aspirations for better quality of life and social inclusiveness. While there are many constraints and challenges, Singapore also has a foundation of high-quality institutions and is educationally and financially in much better shape than five decades ago. Following the September 2015 General Elections, the government is establishing a Futures Committee to explore the pathways for the next phase of Singapore's economic development.

Section 2 of this paper analyzes the policy and performance record of the past five decades. Section 3 examines the domestic and external constraints, challenges, and opportunities in going forward. Section 4 concludes.

2. Performance record and policies pursued

2.1. Transition from Third World to First World economy

This transition from 1965 took five decades. In the first two decades, the political leadership undertook the daunting task of nation building, economic restructuring, and forging social cohesion. It adopted a development model characterized by being government-led, foreign MNC-led and export-led.

The government built a world-class, non-corrupt public service with recruitment and promotion based on meritocracy; reformed the labor movement resulting in industrial peace and a flexible labor market; and built low-cost public housing to remove urban slums and provided home ownership for the masses. Singapore faced threats to its traditional economic pillars of entrepôt trade and servicing the British military base, and the government played a proactive role in jump-starting the economy through industrialization. The very small domestic market and policy lessons from failed import substitution experiments elsewhere led to the choice of an export-led industrial strategy. The lack of manufacturing expertise and the daunting task of transforming trading entrepreneurs into industrial entrepreneurs capable of international marketing led to reliance on foreign MNCs. This would enable Singapore to access foreign investment capital, technology and managerial expertise, and integrate into global production networks and supply

chains. Where MNCs seemed hesitant to enter, government-linked-corporations were formed to fill the void.

As a labor shortage emerged by the late 1970s, Singapore's industrial strategy evolved towards higher-skill and higher-value added manufacturing and services. In more recent decades, the government has steered the economy through the 1991 Strategic Economic Plan, the 2003 Economic Review Committee Report, and the 2010 Economic Strategies Committee Report. In particular, the 2010 report developed strategies for Singapore to achieve sustained and inclusive growth to 2020.

- Economic growth targets: Annual GDP growth of 3-5 percent and annual productivity growth of 2-3 percent. Economic growth to be driven by productivity in the face of growing labor shortage and rising real wages.
- Human skills: Singaporeans with the skills, expertise, and flair to take on higher quality and higher- level jobs across the whole range of occupations.
- Singapore companies: Deeper base of globally competitive Singapore companies with leadership in market niches across Asia; a key base for global companies to grow and manage their pan-Asian operations and for Asian enterprises that are expanding internationally.
- Innovation: Vibrant climate of innovation, seeking commercial success through design, new products, and services, and tapping knowledge from a broader base of public and private sector R&D.
- Leading global city with its unique characteristics.

In the May 2011 General Elections, the ruling People's Action Party lost a significant percentage of the popular vote, due to public dissatisfaction over the rising cost of living and housing prices; stagnating wages for the low-income workers and widening income gap; and crowding out by foreign labor of public housing, public transportation, and public healthcare facilities. In the interim years to the August 2015 General Elections, the government attempted to address many of these grievances through pumping up public housing, public transportation, and public healthcare facilities, increasing subsidies and transfers to the low income and the elderly, improving the wages of low-income workers, and slowing down the inflow of foreign workers. In the recent August 2015 General Elections, the People's Action Party government was returned to office with a much higher percentage of the popular vote, reflecting satisfaction with the ability of the government to deliver on its promises.

2.1.1 Growth and global competitiveness

High GDP growth was achieved for a sustained period, with full employment and low inflation delivering rising incomes and living standards. Economic growth averaged 7.5 percent annually in the period 1965-2014, to reach a per capita GDP of S$71,318 (US$56,284) by 2014. Annual GDP growth moderated from 7.6

percent in the decade 1990-1999 to 4.9 percent in the decade 2000-2009 as the Singapore economy matured and moved towards its technological frontier and as the economy was buffeted by many cyclical shocks. For 2011-2014, annual economic growth further slowed to 3.6 percent. Average labor productivity growth slowed from 3.4 percent in the 1990s to less than 1 percent in recent years.

The 2015 Global Competitiveness Report ranked Singapore second behind Switzerland in overall competitiveness among 144 countries. Singapore ranks high on basic requirements, institutions, infrastructure, macroeconomic environment, health and primary education, efficiency enhancers, higher education and training, goods market efficiency, labor market efficiency, and financial market development. Singapore scored less well on the technological front in terms of technological readiness and innovation and sophistication.

2.1.2. Structural change

Singapore's current economic structure is shown in Table 1.

TABLE 1. Singapore's changing economic structure

	2000	2014	2000	2014
	S$ million		Percentage distribution	
Total GDP, current market prices	162,584	390,089	100.0	100.0
Goods producing sectors	52,434	92,055	32.3	23.6
Manufacturing	40,699	67,817	25.0	17.4
Construction	8,863	18,961	5.5	4.9
Utilities	2,719	5,148	1.7	1.3
Services producing sectors	93,154	259,448	57.3	66.5
Wholesale and retail trade	20,405	64,440	12.6	16.5
Transport and storage	15,464	25,359	9.5	6.5
Accommodation and food services	3,521	8,161	2.2	2.1
Information and communications	5,697	14,915	3.5	3.8
Financial services	15,748	46,026	9.7	11.8
Business services	16,725	58,168	10.3	14.9
Ownership of dwellings	5,759	17,018	3.5	4.4
Taxes on products	11,238	21,568	6.9	5.5

Source: Yearbook of Statistics Singapore, 2011 and 2015

In 1965, the leading industries were domestic market oriented (printing and publishing, and food and beverage manufacturing). Industrial development was export-led and foreign MNC-led. By the 1980s, the leading industries comprised petroleum refining, marine transport equipment, and electronic products and components; Singapore was well integrated into regional production networks and global supply chains. By the 2000s, the leading industries were electronic and optical products, pharmaceutical and biological products, marine transport equipment, and machinery and equipment.

Singapore also grew as a regional services hub in finance and sea and air transport, linking Southeast Asia to the rest of the world. Its competitive advantages are a strategic geographical location; well-developed physical and telecommunications infrastructure; expertise in commerce, finance and infrastructure management; well-educated and English-speaking workforce; conducive legal environment; minimal restrictions on right of establishment; favorable tax regime; absence of controls on capital flows and foreign exchange transactions; and political, social and economic stability. It serves as the regional headquarters of many American, European, and Japanese MNCs. Emerging service activities include healthcare, education, and creative industries.

2.1.3. Social well-being

Singapore ranked 9th in the UNDP's 2014 Human Development Index with improvements in recent decades in life expectancy at birth, expected years of schooling, mean years of schooling, and Gross National Income per capita. The Boston Consulting Group's 2015 study ranks Singapore 10th in overall well-being, the only non-European nation to make the top 10. Singapore was found to have made particularly strong progress in education and governance, but it lagged in economic stability and income equality.

Singapore's Gini coefficient rose to 0.478 by 2012, before it fell to 0.464 in 2014. After adjusting for government transfers and taxes, it moderated from 0.432 in 2012 to 0.412 in 2014, still high by Organisation for Economic Co-operation and Development standards. The ratio of household income from work per household member at the top and bottom percentiles rose to 9.64 in 2008 before declining to 8.92 in 2014 before government transfers and taxes and to 6.02 after. Also in 2014, the median monthly resident household income from work per household member was S$2,380, with 8.2 percent of resident households earning under S$2,000. Various government measures introduced in recent budgets include increasing social transfers, especially to the working poor through the Workfare Income Supplement scheme and the Workfare Training Support scheme. The Workfare Income Supplement scheme provides support for low-wage workers and encourages them to work by supplementing their work income and Central Provident Fund (CPF) savings and encourages them to enhance their skills and employability. The Workfare Training Support scheme encourages employers to send their older low-wage workers for training.

However, with rising costs of living, low-income households are pressured to make ends meet. And with expectations of continuing volatile growth and retrenchments in times of economic recession and corporate restructuring, the absence of unemployment assistance means unmitigated hardships for the unemployed. Measures to help the elderly, especially those without adequate social safety nets, include the Pioneer General healthcare subsidies and the Silver

Support scheme. Measures have also been introduced to equalize education and training opportunities to increase inter-generational social mobility.

2.2. Effective role of the state in development

Government intervention following political independence in 1965 was extensive and went beyond the provision of public and merit goods as the public sector also played a leading role as investor and catalyst for Singapore's development.

International reports such as the World Economic Forum's Global Competitiveness Report, Transparency International's Corruption Perceptions Index, and the World Bank's Ease of Doing Business Index have ranked Singapore highly in quality of economic management and lack of government corruption.

The single-tier city-state government, a dominant-party legislature, and close integration of government ministries and agencies make for cohesive top-down decision-making and swift implementation of policies and measures. Public sector manpower recruitment is based on meritocracy, and public sector corruption is well controlled. Statutory boards were created to provide added administrative and financial flexibility, and many were given significant autonomy to carry out their tasks. Government-linked-corporations were established to lead the development of strategic sectors such as banking, telecoms, air and maritime transport development, industrial estates, and industry clusters. Pragmatism is manifested in government willingness to continually calibrate the balance between state intervention and market discipline. The leadership and policymakers continuously interact with international organizations, foreign governments and leading business leaders and thinkers around the world to establish friendly ties and identify emerging technological, economic and business trends globally and regionally so as to plan appropriate and timely policy responses.

Prudent fiscal and monetary policies were pursued. A low tax regime encouraged investments, savings, and the work ethics, while tax evasion is severely punished and budgetary expenditures were kept in check by eschewing the welfare state. There is zero external public debt and a large accumulation of forex reserves.

Innovative institutions were encouraged to tackle unique problems that Singapore faced early on. For example, the institutions to promote industry, investment, and export include the following:

- The Economic Development Board was established in 1961 to spearhead Singapore's industrialization and foreign direct investment drive. Its International Advisory Council includes global heads of MNCs to advise on international and regional strategies. Its network of overseas offices in North America, Western Europe and Asia target sectors, activities and firms for investment promotion. It functions as a one-stop investment center, assisting

investors to reach commercial production in Singapore in a matter of weeks. It focuses not only on pre-investment promotion but also on post-investment services, keeping existing investors satisfied so that they are encouraged to stay, reinvest and expand. Since 1993 the Economic Development Board also led in promoting outward investment drive by Singaporean firms.

- SPRING Singapore promotes Singaporean enterprises through assistance in financing, capability and management development, technology and innovation, and accessing new markets. As the national standards and accreditation body, it develops and promotes internationally recognized standards and quality assurance infrastructure that build trust in Singapore enterprises, products, and services.
- International Enterprise Singapore promotes the overseas growth of Singapore-based enterprises and international trade. With a global network, it offers services to help enterprises export, develop business capabilities, find overseas partners, and enter new markets. At the same time, it works to position Singapore as a base for foreign businesses to expand into the region in partnership with Singapore-based companies.

The National Wages Council fosters tripartism, industrial peace, and wage flexibility. It was formed in 1972 as a tripartite body (representing employers, trade unions and government) when a tight labor market led to concerns over possible rise in industrial disputes and excessive wage demands. It forges national consensus on wages and wage-related matters and its annual recommendations served as guidelines for negotiation between employers and unions. Following the 1985-1986 recession, the National Wages Council shifted from issuing quantitative to qualitative guidelines to enable more flexibility in wage negotiations and introduced a flexible wage system with variable components linked to company performance. Following on the Asian financial crisis of 1997-1998, further wage flexibility was introduced in the form of a monthly variable component to enable companies to respond more readily to a volatile business environment.

CPF provides home ownership and a social safety net. It is a compulsory self-funded scheme inherited from Singapore's colonial past, initially intended to meet Singaporeans' retirement needs but subsequently expanded to include housing and healthcare needs. The employer and employee contributions to the CPF have been tinkered with from time to time to reflect cyclical upturns and downturns in business costs and profitability. With expanded use of CPF funds, the amount left for old age retirement has been seriously eroded, raising concerns over its adequacy to meet the retirement needs of a rapidly ageing population.

The Housing and Development Board provides public housing for the masses. It was established in 1960. By 2014, 82 percent of Singapore's population was

living in Housing and Development Board-built flats, with 80 percent home ownership. Public housing has transformed the physical and social landscape of Singapore. It has enabled slum removal and efficient town planning in land-scarce Singapore as well as social and ethnic integration. From time to time, the affordability of public housing became a hot political issue. While rising property values benefit the existing homeowners, there was growing concern among young couples whose home ownership aspirations were checked by rising prices and a long waiting period. In recent years, a slate of new policies has been introduced to improve affordability and availability, particularly for young couples and low-income families.

2.3. Outward- and forward-looking sectoral policies

2.3.1. Industrial development

The industrialization strategy is export-led and FDI-led. Export orientation was necessitated by Singapore's small domestic market. A strategy of trade openness enables export production according to comparative advantage with exploitation of economies of scale and agglomeration, while zero import tariffs on capital and intermediate goods help keep production costs competitive and those on consumer goods benefit consumers through lower retail prices. Singapore is a key node in the region's production and distribution networks. High trade-dependence, however, also makes Singapore vulnerable to changes in the external environment and necessitates nimble economic management to moderate the effects of transmitted business cycles.

Singapore's export manufacturing necessitated dependence on FDI. The city-state lacked industrial or crafts traditions, and transforming trading entrepreneurs into industrial entrepreneurs with technological and international marketing capabilities was time consuming**.** FDI enabled Singapore to have access to foreign technology as well as industrial capital, management, marketing and integration into global production networks and supply chains. Attracting FDI became a policy priority. As most developing countries were then strongly influenced by the dependency school and eschewed the role of MNC, the first-mover advantage enabled Singapore to successfully leapfrog into export manufacturing in the late 1960s.

With the emergence of labor shortages by the late 1970s, Singapore's industrial strategy shifted towards higher skill and value added manufacturing. The Manufacturing 2000 program targeted manufacturing at not less than 25 percent of GDP and called for the development of industry clusters, aimed at upgrading capabilities across the entire value chain. The Industry 21 initiative identified electronics, chemicals, engineering, life sciences, education and healthcare, headquarters, communications and media, and logistics as industry clusters to be nurtured. This transformation of industry-mix by 2010 is seen in Table 2.

TABLE 2. Singapore's industry clusters, 2010

					Percentage distribution		
	Output, S$ million	Value added, S$ million	Employment number	Value added per worker, S$000	Output	Value added	Employment
Total manufacturing	270,494.7	56,863.8	419,963	135	100.0	100.0	100.0
Electronics	94,193.6	17,865.0	80,466	222	34.8	31.4	19.2
Semiconductors	57,029.4	11,904.3	40,662	293	21.1	20.9	9.7
Computer peripherals	8,966.9	2,235.6	10,659	210	3.3	3.9	2.5
Data storage	14,487.2	1,977.5	13,360	148	5.4	3.5	3.2
Information communications and consumer electronics	11,375.6	1,111.7	8,149	136	4.2	2.0	1.9
Other electronic modules and components	2,334.6	635.9	7,636	83	0.9	1.1	1.8
Chemicals	80,506.5	6,081.4	23,826	255	29.8	10.7	5.7
Petroleum	41,627.9	1,234.1	3,535	349	15.4	2.2	0.8
Petrochemicals	29,991.0	1,972.0	4,735	416	11.1	3.5	1.1
Specialty chemicals	6,794.5	2,248.4	9,846	228	2.5	4.0	2.3
Others	2,093.0	627.0	5,710	110	0.8	1.1	1.4
Biomedical manufacturing	23,253.5	11,126.7	13,738	810	8.6	19.6	3.3
Pharmaceuticals	19,668.0	9,700.4	5,369	1807	7.3	17.1	1.3
Medical technology	3,585.5	1,426.3	8,369	170	1.3	2.5	2.0
Precision engineering	26,546.2	7,620.3	92,323	83	9.8	13.4	22.0
Machinery and systems	14,073.9	4,186.1	38,814	108	5.2	7.4	9.2
Precision modules and components	12,472.3	3,434.1	53,509	64	4.6	6.0	12.7
Transport engineering	25,058.7	8,339.4	115,478	72	9.3	14.7	27.5
Marine and offshore engineering	16,030.6	4,875.7	91,140	54	5.9	8.6	21.7
Aerospace	7,207.7	2,826.5	18,213	155	2.7	5.0	4.3
Land	1,820.4	637.3	6,125	104.1	0.7	1.1	1.5
General manufacturing industries	20,936.2	5,831.0	94,132	62	7.7	10.3	22.4
Printing	2,656.7	1,340.3	17,406	77	1.0	2.4	4.1
Food, beverages, tobacco	7,283.3	1,868.1	26,500	71	2.7	3.3	6.3
Miscellaneous industries	10,996.2	2,622.7	50,226	52	4.1	4.6	12.0

Source: Yearbook of Statistics Singapore, 2011

Industrial estates and business parks ensure the efficient use of scarce land resources, enable businesses to enjoy the economies of scale and agglomeration from locational clustering, and allow speedy start-up of commercial operations with the ready availability of land and industrial amenities. The Jurong Industrial Estate was established in the late 1960s and is the forerunner of many smaller and specialized industrial estates, business parks, and science parks. The latest developments are the Jurong Island petrochemical cluster and the Biopolis biotech cluster.

2.3.2. Services hub development

The role of services in the Singapore economy rose to reach 66.5 percent of GDP by 2014, with leading services in trade, business services and financial services.

Blueprints to develop the Singapore services sector were first outlined in the 1991 Strategic Economic Plan, which emphasized trade, transport, logistics, telecoms, and financial services. This was followed by the 2003 Economic Review Committee Report, which has the following recommendations:

- Position Singapore as world-class education and healthcare hub, with emphasis on attracting a strong cluster of education centers with world-class universities, executive learning centers, corporate training centers, and distance learning providers.
- Build the information communications and media cluster into a global hub in Asia for the digital economy offering a wide range of initiatives and developments in ICT, media, e-commerce, and the Internet. Parallel with efforts to strengthen the telecommunications infrastructure is the active promotion of software development, Internet builders, application service providers, portals, and intermediaries.
- Build on Singapore's reputation as the premier location for MNCs to attract them to base regional and business headquarters.
- Nurture a logistics and supply-chain management cluster to develop Singapore into a leading Asia- Pacific integrated logistics hub and to build up supply chain capabilities by getting logistics players, cargo airlines, value-added distributors, and manufacturers to locate their supply chain centers for Asia in Singapore. These world-class logistics services enhance manufacturers' global supply chains. A free trade zone logistics park has been established at Singapore Changi Airport, and a chemical logistics hub set up on Jurong Island.

The 2010 Economic Strategies Committee Report further recommended that Singapore carry out the following:

- Grow manufacturing-related services such as headquarter-related activities, R&D, Intellectual Property (IP) management, and product lifecycle management by capitalizing on the convergence of manufacturing with services.
- Strengthen Singapore's position as a leading global-Asia financial and business hub that connects the global and Asian business community.
- Establish Singapore as the leading business hub in Asia with strengths in risk management and trading, asset management and private banking, loan syndication, project and infrastructural financing, and capital raising as well as information communications technology, accounting, legal, and consulting services.

- Seek to seamlessly integrate physical trade with related services such as trade finance, risk management, supply chain management, certification, and distribution.
- In maritime and aviation areas, enhance activities in insurance, financing, legal, and arbitration services.
- Develop Singapore as a leading consumer business center with clustered companies in marketing, branding, consumer research, and market intelligence, capitalizing on Singapore's Asian cultural affinity, and develop Singapore into the pan-Asian location of choice.
- Establish Singapore as the location for future-ready urban solutions, by leveraging on Singapore's own future urban needs and track record in urban planning, focusing on areas such as urban mobility/smart transportation, energy efficiency and management, renewable energy, and water and waste management. Such initiatives can also foster collaboration among Singapore-based companies to provide solutions that could be scaled up and exported.

2.4. Global and regional trade and investment integration

Singapore has been able to leverage on its strategic geographic location with infrastructure development, financial, and commercial expertise, and a free trade policy to become trading, transportation, and financial hubs. Its growth performance to date is due in no small part to the pursuit of economic openness. Table 3 shows Singapore's economic openness through trade in goods and services and inward and outward direct investment.

TABLE 3. Singapore's economic openness

	2000	2010	2014
Total merchandise trade (S$ million)	470,001	902,063	982,701.9
Total merchandise exports (S$ million)	237,826	478,841	518,922.7
Domestic exports (S$ million)	135,938	248,610	273,492.1
Re-exports (S$ million)	101,888	230,231	245,430.6
Domestic/total exports (percentage share)	57	52	53
Total merchandise imports (S$ million)	188,142	423,222	463,779.1
Merchandise trade/GDP ratio (%)	292	297	252
World Trade Organization Most Favored Nation average tariff (%)		0	0
Total services trade (S$ million)	101,125	284,252	357,298.1
Exports of services (S$ million)	49,213	152,929	177,935
Imports of services (S$ million)	51,912	131,323	179,362.5
Services trade/GDP ratio (%)\	63	97	92
	1999	**2010**	**2014**
Inward FDI stock (S$ million)	276,819	625,780.4	853,339.5
Inward FDI/GDP ratio (%)		194	219
Outward FDI stock (S$ million)	92,720	425,207.7	531,691.1
Outward FDI/GDP ratio (%)		132	136
Outward/Inward FDI ratio (%)	33	68	62

Source: Yearbook of Statistics Singapore, 2011 and 2015

2.4.1. The pursuit of free trade agreements (FTAs)

Singapore's trade in goods and services amounted to over 300 percent of GDP, and the import contents of consumption, production, and exports are extremely high. It is a key node in the global and regional production networks in the electronics and machinery industries. Top export destinations are ASEAN (particularly Malaysia and Indonesia), EU, US, as well as Northeast Asia (China, Japan, Hong Kong, Taiwan, South Korea). The major import sources are ASEAN, EU, US, China, and Japan.

Table 4 shows that domestically produced exports comprise largely of refined petroleum and petroleum products and technology-intensive products, such as chemical and biotech products and high-end electronics. Exports of services include financial, maritime, aviation, logistics, and tourism services, while education and health services are also emerging exports. Singapore also serves as an entrepôt of Southeast Asia, providing efficient and timely shipment services for a sizeable portion of the region's trade in commodities and manufactures. Its advantages are its container port (second in Asia after Shanghai), frequency of shipping and airline routes, logistics, financial services, and other distribution services. As a result, shipment costs to destinations in the Americas and Europe are often cheaper via Singapore than via national ports in the region.

TABLE 4. Singapore's domestic exports, 2014

	Value (S$ million)	Percentage share
Food, beverages, and tobacco	6,522	2.38
Crude materials	2,074	0.76
Petroleum and products	106,986	39.12
Animal and vegetable oils	217	0.08
Chemicals and chemical products	49,383	18.06
Machinery and equipment	73,567	26.90
Electronics	44,059	16.11
Integrated circuits and parts	24,784	9.06
Personal computers and parts	9,313	3.41
Diodes and transistors	3,412	1.25
Disk drives	1,910	0.70
Telecoms equipment	1,454	0.53
Non-electronic machinery, equipment	29,508	10.79
Professional, scientific, optical equipment	9,689	3.54
Others	25,054	9.16
Total domestic exports	273,492	100.00

Source: Yearbook of Statistics Singapore, 2014

Singapore has been prolific in signing and implementing FTAs with countries and regions across the world. These FTAs benefit both FTAs and foreign companies in Singapore who are goods exporters, service providers, and investors, providing them with improved market access and investment protection.

There is little domestic resistance to FTAs, as businesses are accustomed to import competition. Services liberalization leads to inflow of foreign service providers, which improves the efficiency, range, and quality of services available to Singapore's goods producers and consumers. There are also indirect benefits as trade and investment expansion leads to higher economic growth, job creation, and spin-offs for domestic enterprises. National and preferential treatment and investment protection measures in FTAs also facilitate more Singapore-based companies, especially small and medium-sized enterprises (SMEs), to venture abroad, particularly to ASEAN countries.

2.4.2. Inward and outward direct investment integration

From the 1960s to the 1970s, inward FDI helped to close the domestic saving-investment gap and finance net imports of goods and services. By the mid-1980s, Singapore had become a net capital exporter, and inward FDI contributed to technological and managerial know-how and integration into regional production networks and global supply chains. Inward FDI contributed importantly to Singapore's increasing export sophistication, particularly in electronics, petrochemical, chemical, and pharmaceutical and financial sectors. Wholly foreign and joint venture firms are much more export-oriented than domestic firms.[1]

Singapore's technological development can be divided into four phases.[2] First, from the early 1960s to mid-1970s, there were few innovation links between foreign MNCs and the rest of the Singapore economy. Second, from the mid-1970s to late-1980s, there was rapid growth of local technological development within MNCs and development of local supporting industries. Third, from the late-1980s to late-1990s, there was rapid expansion of applied R&D by foreign MNCs, local firms, and public R&D institutes. Lastly, since the late-1990s, there has been emerging emphasis on high-tech startups and basic R&D development. However, Singapore's ability to innovate and pioneer new technologies still lags behind the world frontier.

Singapore began the outward investment drive in 1993. On the push side, a maturing Singapore economy facing severe land and labor constraints and rising costs needed to develop "an external wing" to sustain its growth performance. On the pull side, East Asia has become the world's most dynamic economic region and

[1] This is in part due to the fact that domestic firms acted as local suppliers to Singapore-based MNCs rather than exporting directly.

[2] See Wong [2003].

offers Singapore investors abundant natural resources, low-cost labor, and rapidly expanding markets. Additionally, Singaporean domestic enterprises with limited outward investment experience and managerial resources would find it easier to regionalize due to geographic proximity and cultural and linguistic familiarity, which help reduce information and transaction costs and need for management oversight. Furthermore, Singapore government agencies have developed close relations and extensive networks in the region, and its regional projects, information networks, and contacts could facilitate investments by the Singapore private sector. Singapore's FTAs also help facilitate overseas investments.

Table 5 shows inward and outward FDI stock. Inward FDI stock rose rapidly to reach S$853.3 billion by 2013 or 226 percent of GDP. Singapore played host to thousands of foreign MNCs. Reinvested earnings and expansion investments accounted for a growing share of FDI inflows. Manufacturing's sectoral share has been falling, and FDI is much larger in services. Major sources of FDI are the advanced industrial economies, with EU, Japan, and the US accounting for a major share. Over the past decade, the EU's share has risen rapidly, particularly from the Netherlands and the UK, while the Japan and US shares have shrunk. Outward FDI stock grew to S$531.7 billion by 2013, or 141 percent of GDP, and investments were mostly in services, particularly financial and insurance services. The outward investment in manufacturing reflects the deindustrialization in Singapore due to land and labor constraints. The outward push has also responded to the strengthening Singapore dollar and improved investment climate in the ASEAN region, China, and India. Investments in overseas financial activities reflect Singapore's growing role as an international and regional financial center. In the post-1997 Asian financial crisis, cash-rich Singapore firms were busy acquiring regional business assets as the crisis countries relaxed their mergers and acquisitions restrictions. Singapore's outward direct investment (ODI) traditionally has a strong Asian bias, but the emphasis has declined from a 75.9 percent share in 1981 to 54.4 percent in 2013. China's share grew rapidly from less than 3 percent in 1985 to 19.4 percent in 2013, mostly taking place after 1992, almost equal to ASEAN's share of 19.8 percent.

2.4.3. Spatial connectivity

To serve Singapore's highly trade-dependent manufacturing and services activities, the city-state invested heavily in a wide range of infrastructure including transportation, logistics, and telecoms systems. To maintain its competitive edge, there is constant upgrading and expansion of infrastructure. Singapore's world-class seaports and airports provide crucial links with the region and the world. Singapore also has a well-developed information and communications technology infrastructure that contributes to its international competitiveness as a knowledge-based economy.

TABLE 5. Singapore's stock of inward and outward foreign direct investment, by industry

	1999	2010	2013	1999	2010	2013
Inward FDI		S$ million		Percentage distribution		
Total	170,820.8	625,780.4	853,339.5	100.00	100.00	100.00
Manufacturing	58,139.6	133,590.7	150,791.1	34.04	21.35	17.67
Construction	1,505.1	1,468.3	3,227.6	0.88	0.23	0.38
Wholesale and retail trade	26,008.7	108,721.5	146,273.6	15.23	17.37	17.14
Accommodation and food services	1,993.7	3,811.8	3,976.5	1.17	0.61	0.47
Transport and storage	5,958.6	36,793.8	36,858.2	3.49	5.88	4.32
Information and communications	873.7	6,418.4	8,595.1	0.51	1.03	1.01
Financial and insurance services	64,647.4	270,176.8	293,621.8	37.85	43.17	34.41
Real estate activities	5,620.7	20,083.1	29,560.5	3.29	3.21	3.46
Professional, technical, and administrative services	5,674.9	35,173.7	40,578.7	3.32	5.62	4.76
Others	398.4	9,542.4	14,166.5	0.23	1.52	1.66
Outward FDI						
Total	92,719.9	425,207.7	531,691.1	100.00	100.00	100.00
Manufacturing	22,869.5	88,635.7	109,943.8	24.67	20.85	20.68
Construction	797.4	1,342.3	2,238.9	0.86	0.32	0.42
Wholesale and retail trade	5,921.3	26,571.0	45,725.0	6.39	6.25	8.60
Accommodation and food services	1,692.4	3,798.6	4,442.2	1.83	0.89	0.84
Transport and storage	3,408.7	10,363.6	13,730.8	3.68	2.44	2.58
Information and communications	2,257.8	17,958.4	21,935.5	2.44	4.22	4.13
Financial and insurance services	44,717.5	206,204.1	210,207.9	48.23	48.49	39.54
Real estate activities	6,869.4	35,390.9	44,215.7	7.41	8.32	8.32
Professional, technical, and administrative services	2,737.0	7,617.2	10,205.3	2.95	1.79	1.92
Others	1,448.8	27,326.0	34,480.4	1.56	6.43	6.49

Source: Yearbook of Statistics Singapore, 2011 and 2015

2.5. Education and skills levels of the workforce

Although Singapore has four official languages (English, Mandarin, Malay, and Tamil), English is the language of administration and business and the medium of instruction in tertiary institutions.

In the early decades of industrialization, vocational and skills training in vocational institutes and polytechnics equipped the workforce with industrial skills. The government also leveraged on the training capabilities of MNCs

and their home governments by setting up joint training institutes to provide industrial skills in demand. Singapore was able to minimize the mismatch between skills supplied and skills needed. As the economy advanced towards a knowledge-based-economy, the educational level and skills-set required changed correspondingly.

The educational attainment of the resident labor force has improved rapidly in the past decade, as the less educated retired and the new labor force entrants are much better educated. High-skilled professionals, managers, executives, and technicians have grown more rapidly (with 53.1 percent share in 2014). The proportion of university degree holders in the workforce correspondingly increased from less than 2.4 percent of the labor force in the 1970s to 31 percent by 2013.

Tertiary education has expanded rapidly since the mid-1980s. By 2015, of the age cohort that started formal education, 45 percent gets into polytechnics and 30 percent into universities, making a total of 75 percent with tertiary education. Table 6 shows percentage distribution of polytechnic and university enrolment by course. The lion's share found in engineering sciences and business administration. In more recent decades, the government realigned its focus and revised the school curriculum to concentrate on developing students' creativity and critical thinking.

Singapore has also been improving on its educational quality. The World Economic Forum competitiveness rankings for Singapore shows that its educational institutions are among the best in the world. The Organisation for Economic Co-operation and Development Program on International Student Assessment shows Singapore students in top rankings in mathematics, science, and reading. Quacquarelli Symonds ranks Singapore's public universities among the top in East Asia.

2.6. Prudent policies and macro-economic stability

Table 7 shows Singapore's strong financial resources as evidenced from the government's strong budgetary position (reflecting prudent monetary and fiscal policies over the years), the household sector's assets including the CPF savings of individuals, and the strong net international position with no government external debt and high official foreign reserves. In addition, Singapore is one of the few countries with an AAA sovereign credit rating by Standard and Poor.

TABLE 6. Enrolment in polytechnic and university courses

	1998	2010	2013	1998	2010	2013
University first degree courses		**Number**		**Percentage distribution**		
Education	630	1,841	1,296	1.90	3.22	2.15
Applied arts		1,076	1,262	-	1.88	2.09
Humanities and social sciences	5,354	9,694	10,642	16.18	16.97	17.66
Mass communications	474	675	702	1.43	1.18	1.16
Accountancy	2,351	3,203	4,042	7.10	5.61	6.71
Business and administration	3,834	6,426	6,476	11.59	11.25	10.75
Law	629	1,423	1,491	1.90	2.49	2.47
Natural, physical, and mathematical sciences	2,952	7,640	7,761	8.92	13.38	12.88
Medicine, dentistry, health sciences	1,203	2,553	3,081	3.64	4.47	5.11
Information technology	1,515	3,207	3,888	4.58	5.61	6.45
Architecture and building	1,177	1,786	1,884	3.56	3.13	3.13
Engineering sciences	12,975	17,294	17,426	39.21	30.28	28.92
Services		299	312	-	0.52	0.52
Total	33,092	57,117	60,263	100.00	100.00	100.00
Polytechnic diploma courses						
Education		174	274	-	0.78	1.09
Applied arts	1,378	1,192	1,805	2.59	5.37	7.19
Humanities and social sciences		275	538	-	1.24	2.14
Mass communications	595	481	606	1.12	2.17	2.41
Business and administration	10,731	4,696	5,695	20.18	21.14	22.69
Legal studies	306	125	159	0.58	0.56	0.63
Science and related technologies	1,324	1,070	1,408	2.49	4.82	5.61
Health sciences	2,093	1,999	2,504	3.94	9.00	9.98
Information technology	5,263	3,568	3,420	9.90	16.06	13.63
Architecture and building	1,859	539	752	3.50	2.43	3.00
Engineering sciences	29,139	7,743	7,453	54.79	34.86	29.70
Services	489	352	483	0.92	1.58	1.92
Total	53,180	22,214	25,097	100.00	100.00	100.00

Source: Yearbook of Statistics Singapore, 2009 and 2015

TABLE 7. Singapore's financial indicators

	2010	2014
Government sector		
Government operating revenue, S$ million	46,060	57,020
Government total expenditure, S$ million	45,338	51,728
Government overall budget surplus, S$ million	980	4,998
Government domestic public debt, S$ million	321,182	387,251
Household sector		
Household net worth	1,191,581	1,467,398
Central Provident Fund due to members	185,888	275,364
International position		
Net international investment position, S$ million	651,406	710,039
Government external public debt, S$ million	-	-
Official foreign reserves, S$ million	288,954	340,438
Official foreign reserves, US$ million	225,754	256,860

Source: Yearbook of Statistics Singapore, 2015

3. Going forward: challenges and opportunities

While Singapore has generally been a successful economic development story over the past five decades, it also inherits a legacy of constraints and challenges going forward. There are two more immediate economic challenges: first, the economy is on a declining path of sustainable growth, and this is in the face of aspirations for higher living standards and social security and an uncertain and sluggish global and regional economic environment; and second, there is a need to push for growth driven by innovation and local enterprise. In the more distant future, Singapore has to worry about the impact of climate change with an accompanying rising sea level and how this will impact on a small island nation.

3.1. Slower growth rate and productivity growth

In January 2015, the Singapore prime minister announced that the targeted growth rate going forward over the next several years has to be reduced to 2-3 percent instead of the 3-5 percent target set by the 2010 Economic Strategies Committee.

The Singapore economy has matured and its growth trajectory will mirror that of other small advanced economies. Domestic constraints of land and labor and a rapidly ageing population have resulted in high costs and deteriorating competitiveness in the absence of rapid improvements in productivity and a vibrant private entrepreneurial sector. Furthermore, the external environment has become less benign and accommodating: regional economies are becoming more competitive and challenging Singapore's hub status, and there is slowing demand for Singapore's goods and services by the advanced economies and by China as they go through periods of slower growth themselves. However, Singapore has the advantage of a solid foundation of high-quality institutions, well-educated workforce, and ample financial resources to pull through.

Productivity growth performance has not met expectations and requires a reinforced push to transform business operations and to intensify skills training. Labor productivity growth fell from an annual 3.4 percent in the 1990s to 1.1 percent in 2000-2009 and 0.3 percent in 2009-2014. One culprit for the poor productivity performance was the large influx of low-skilled labor in the past decade, which disincentivize business upgrading, particularly in the construction and retail services sectors. In addition to putting a cap on foreign labor inflows in order to force businesses to upgrade, the government has also several initiatives including tax benefits, grants, and training subsidies to help companies and workers invest in productivity, innovate, and deepen skills and expertise. In particular, SkillsFuture is launched as a national movement to enable Singaporeans to learn new skills for new jobs as the economy continues to restructure and meet the challenges of globalization and disruptive technological change.

3.2. Widening income gap and inadequate social safety net

The Singapore government has long eschewed Western style social welfare and preferred to focus on providing education, housing, and healthcare, to equalize opportunities. But the income gap has widened in the past decade, necessitating remedial measures in recent years as it could undermine social cohesion.

While obviously more needs to be done to raise the living standards and well-being of low-income groups and the elderly poor, the government also needs to ensure that its rising social expenditures remain fiscally sustainable. It has traditionally exercised fiscal prudence so that there is overall no net public debt or external debt.

Some years ago, the goods and services tax was introduced to ensure adequate tax revenues without raising personal and corporate income taxes, which could disincentivize work and investment. However, the 2015 budget increased the top marginal income tax rate from 20 percent to 22 percent explicitly to provide funds for increased government social expenditures. More taxes on the rich and user-charge fees, as well as further measures to equalize opportunities to education, training, and remunerative employment, can be expected.

3.3. Demographic and labor constraints

Singapore's natural population growth has slowed dramatically with the total fertility rate (TFR) declining below replacement rate for decades, which together with rising life expectancy, has resulted in a rapidly ageing population and elderly healthcare costs. Population of working age citizens (20-64 years) peaked in 2005, but the elderly aged 65 and above is growing rapidly. The ratio of working age to elderly has declined from 13.5 in 1970 to 4.8 currently and will plummet to 2.1 by 2030. Government policy efforts to reverse TFR had produced no sustained result and stood at 1.3 percent in 2014. The ageing and shrinking population means a shrinking labor force and a less vibrant and innovative society.

Population and labor force growths have been heavily dependent on immigration, with foreigners accounting for one-third of the labor force in recent years. Going forward, labor force growth can come from increasing the female and the elderly labor force participation rates and hiring foreign workers.

Female labor force participation has been rising (58.4 percent in 2014) and could be raised further, as it has not reached the levels of many western societies. However, higher female labor force participation could impact negatively on the TFR. It could also be argued that better working conditions for working mothers—such as flexible hours of employment, more family-friendly policies by employers, more reliable and affordable childcare facilities, ease of re-entry married women into the workforce—could increase both female labor force participation and TFR.

With rising life expectancy (82.8 years in 2014), Singaporeans are being encouraged to postpone retirement. In any event, with CPF balances inadequate to fund most retirement needs, working longer is a necessity for many. The government has gradually lifted the official retirement age from age 55 to 60; it is currently age 65. To incentivize the private sector to employ older workers, the employer's CPF contribution rates for older workers have been reduced. The government is also encouraging movement away from a seniority-based wage system to a productivity-based wage system to encourage the employment and re-employment of older workers.

To meet the growing shortage of skills, particularly in the transition to an innovation-based economy, tertiary education and skills training have been ramped up with expansion of universities, polytechnics, and various skills training institutes and continuing changes in educational curriculum and pedagogy. To reduce the demand for labor, there should be faster and wider adoption of labor saving production technologies and practices.

An open policy towards foreign labor has enabled Singapore to overcome the labor constraint since the late 1970s. The large influx in recent years is unsustainable because of physical and social limits, with vocal concerns on foreigners crowding out locals for jobs, housing, education, health and transportation services, and recreational space. Too heavy a dependence on foreign workers has also contributed to the poor productivity performance of the Singapore economy in the past decade, particularly in the construction and some service sectors.

For an innovation-driven economy, Singapore needs a large and expanding pool of foreign human talent, even though local talent is growing with the rapid expansion and revamp of tertiary education and training institutes. Foreign talent is being recruited through liberalized immigration policies, easing requirements for permanent residence and citizenship, offer of scholarships and research fellowships at Singapore tertiary and research institutions, recruitment missions by universities and government agencies to the main centers of learning abroad, and improving the living and cultural attractions and tax regime of Singapore for foreign expatriates.

While the inflow of foreign talent surged, there were even bigger inflows of low-skilled workers into labor-intensive manufacturing, services, and construction sectors. Additionally, the Singaporean workforce is becoming increasingly better educated and eschewing unattractive and low-paying jobs. Government policy aims at moderating employer demand for foreign workers through the use of work permits, foreign worker levies, and dependency ceilings, and there have been increases in these levies from 2010 to make foreign workers more expensive for employers. The government also announced that foreigners will continue to make up the current one-third of Singapore's workforce in the next 10 years, with some flexibility to take account of booms and recessions. The large presence of foreign labor, both professionals and low-skilled employees, was a hot political issue in the May 2011 General Elections. Since then, the government has been further

challenged to fine-tune the balance between the needs of businesses for foreign professionals and workers, particularly in an economic upturn, and the spatial and social limits of allowing a continuing influx. Cutting off ready access to foreign workers will exert pressure on businesses to adopt labor-saving technologies, operations, and practices and will speed up economic restructuring.

3.4. Land and natural resource constraints

Land reclamation is costly and reaching a limit so Singapore would need to make more efficient and innovative use of its land and space. Additionally, there is the longer-term threat of climate change and rising sea level, impacting on Singapore's coastlands and resulting in alternative sea routes bypassing the Straits of Malacca.

Going forward, Singapore needs to do the following:

- Enhance land and space productivity. To gain the greatest benefits from its limited land, Singapore has to create more space upwards and underground and be more creative in urban planning and design to ensure that Singapore remains a livable and business-friendly city. Sectoral policy towards production of goods and services will have to increasingly focus on value added to economize on land and space demands, such as high-value added and clean manufacturing and high-end tourism, healthcare, and education markets. This will also ensure Singapore's continuing competitiveness vis-à-vis other less advanced and lower-cost ASEAN countries.
- Enhance water planning and development. Many parts of Asia will face shortage of water as populations, cities, and agricultural and industrial needs grow. Singapore has historically imported most of its water supplies from neighboring Malaysia. However, over the years, Singapore has developed alternative water resources, including collection of rain water, recycling of waste water, and desalination of sea water. The city-state will become self-sufficient in water by the time the second water agreement with Malaysia expires in 2061. In fact, water technology and management has become a new Singapore growth industry and export of services.
- Enhance the region and the world as Singapore's hinterland: Fortunately, Singapore is neither "landlocked" nor "sea-locked". Instead, it is favorably located in the dynamic Asian region. Continuing improvement of physical (land, sea, and air) and information technology connectivity will minimize the cost for cross-border movement of goods and people and facilitate access to ideas and technologies. Support for global and regional free trade will help overcome the dearth of land and natural resources and achieve economies of scale and scope to overcome its small market size. Singapore must continue to support trade liberalization in the World Trade Organization and regional and bilateral FTAs.

- Meet the rising costs of energy as well as reduce its carbon emissions. As an energy-deficient economy, Singapore has resorted to using the price signal in energy pricing, adopting clean technologies and energy-efficient usages in factories, offices, and homes, and designing of energy-efficient buildings. At the business level, Singapore should promote industries and services and processes that are less energy-intensive and/or use less of fossil energy. At the household level, consumers should be incentivized to save on energy use, such as installing energy-efficient household equipment. At the transportation level, Singapore pioneered efforts to restrict private car ownership and use and heavily taxed fossil-fuel consumption. Exploring energy alternatives include the nuclear option, which will be especially challenging for a densely populated city-state.

3.5. Weak local enterprises

High-income Singapore faces the challenge of weak local enterprises and entrepreneurship. Unlike South Korea and Taiwan, Singapore in the earlier phases of development and industrialization failed to nurture local private enterprise and chose to depend on foreign MNCs and government-linked-corporations. By the mid-1980s, local enterprises were confronted with higher cost structures exemplified by rising land and space costs, labor shortages, and rising wage costs. Also, major public sector infrastructure projects were tendered out to large European, Japanese, Korean, and PRC firms, creating a vicious cycle of local firms lacking the experience and track record to bid for them domestically or regionally.

The 1988 SME Master Plan marked the first coordinated national effort to upgrade local SMEs and to promote domestic entrepreneurship. Since then, a plethora of SME assistance schemes have been hatched and implemented.[3] Furthermore, the SME 21 Report outlined the need to nurture innovative high growth world-class SMEs able to compete in the global marketplace; enhance SME productivity; and create a knowledge-based pro-enterprise environment. A multi-agency SME 21 Implementation Committee was formed. The Technopreneurship 21 initiative was announced in April 1999 specifically to boost development of technopreneurs. Another Master Plan, named SME21, was created to take Singapore SMEs into the 21st century. As a result of the two SME

[3] These include the following: the Local Industry Upgrading Programme which helps local enterprises achieve greater efficiency through the transfer of management skills and technological know-how from MNCs and large local companies; the Economic Development Board-Joint Venture Matching Service to help SMEs seek strategic alliance with foreign organizations for growth; the Business Development Scheme to encourage SMEs to seek business opportunities overseas for marketing arrangements, technological tie-ups, and other business partnerships; the Small Industry Technical Assistance Scheme to help SMEs improve their productivity and technological standards through grants to defray part of the costs of approved upgrading projects; and the Promising Local Enterprise Programme that aims to build 100 local companies with at least S$100 million sales turnover in ten years.

Master Plans, Singapore has a spectrum of some 63 assistance schemes to assist local enterprises.

Government agencies involved in SMEs include the following: International Enterprise Singapore, a statutory board responsible for taking SMEs overseas; SPRING Singapore, a first stop for all SMEs, which are then directed to the relevant agencies; A*Star that fosters scientific research and the exploitation of technology through incubator units; Jurong Town Corporation that provides industrial space and has incubator space as well; Information Development Authority which develops, promotes, and regulates the information technology and telecoms market as well as assists the adoption of online and e-commerce technology by SMEs. In addition to these government agencies, there are private sector institutions, tertiary institutions, and non-government organizations, which SMEs can access.

Notwithstanding these multi-pronged efforts, the World Economic Forum 2011-2012 Competitiveness Report continues to show poor rankings for Singapore in the following: local supplier quantity; local supplier quality; and control of international distribution. Due to the dominance of foreign MNCs and dominance of the services sector in the economy, there are few internationally well-known Singaporean manufacturing brand names. UNCTAD's list of top firms from developing countries has few Singaporean names and they are mainly services firms or government-linked-corporations such as Singapore Airlines, Singapore Telecommunications, Keppel Corporation, Sembawang Corporation, Singapore Changi Airport, and the Maritime and Port Authority of Singapore.

The actual and effective assistance provided to SMEs paled in comparison to that offered to MNCs and government-linked-corporations. Furthermore, local SMEs lack a sizeable domestic market to test their ideas, processes, and products and to grow before expanding abroad.

Many schemes to promote and facilitate local entrepreneurship and SME development and availability of venture capital have been introduced in recent years. There is also a noticeable trend of young university and polytechnic graduates entering directly into business ventures instead of taking up jobs with the public sector and foreign MNCs. So there is hope for Singapore with more homegrown entrepreneurs.

3.6. Shifting to an innovation-driven economy

According to the World Economic Forum, Switzerland, Singapore, and Sweden are the top three in the Global Competitiveness Index rankings in 2011-2012.

- Switzerland tops the Global Competitiveness Index rankings; its most notable strengths are in innovation, technological readiness, and labor market efficiency. Switzerland's scientific research institutions are among the world's best, and the strong academia-business collaboration together with high corporate R&D expenditures and strong IP protection ensure the

commercialization of research into marketable products and processes. Its rate of patenting ranks 7th worldwide. Productivity is enhanced by a business sector and a population that are proactive in adapting the latest technologies. Competitiveness is also buttressed by excellent infrastructure, well-functioning goods markets, and highly developed financial markets.

- Sweden, like Switzerland, has been placing significant emphasis on innovation-led growth. The quality of its public and private institutions are tops in efficiency, transparency, and ethics. Goods and financial markets are very efficient. Combined with a strong focus on education and training and high level of technological absorption, Sweden has developed a sophisticated business culture and is a global leading innovator.
- Singapore is 2nd in Global Competitiveness Index rankings (after Switzerland) and top among Asian economies. While Singapore is tops in rankings on institutions, efficiency of its goods and labor markets, financial market development, world-class infrastructure, and education, it lags in innovation and business sophistication and have considerable catching up to do. Singapore needs to encourage stronger adoption of the latest technologies and measures that support the sophistication of its companies.

Singapore has to transition rapidly from being an investment-driven to an innovation-driven economy. At the investment-driven stage, the key drivers are a strong business environment, openness to trade and investment, well-developed physical infrastructure, legal and regulatory framework, and a solid skill base. But at the innovation-driven stage, the key drivers are a strong innovation system, IP protection, innovative and techno-savvy entrepreneurs, and sophisticated domestic producers and consumers.

Before the 1990s, R&D activities in Singapore remained low for a number of reasons: industrial growth in the 1960s and 1970s depended more on cost efficiency than on innovative capability; the MNC subsidiaries in Singapore had ready access to the processes and technologies from their overseas parents, and they generally preferred to conduct R&D in their home base; and there were no performance requirements to conduct local R&D or partner with local institutions in R&D. Singapore also lacked a critical mass of scientists and researchers to provide a stimulating research environment for both MNC and local enterprise R&D activities.

Recognizing the uphill task, the Ministerial Committee on Research and Development in 2005 reviewed the R&D strategies and directions for Singapore. The committee recommended that national R&D efforts should be driven by 5 key strategic thrusts.[4]

[4] This is excerpted from a speech by Dr. Tony Tan, outgoing Singapore deputy prime minister and incoming chairman of the National Research Foundation, on August 11, 2005.

- Provide more resources for R&D. Singapore's gross expenditure on research and development was 2.15 percent in 2003, which lags significantly behind other leading innovation countries. Singapore must intensify R&D efforts and achieve a gross expenditure on research and development of at least 3 percent of GDP within the next 5 years.
- Need to focus on a small number of strategic areas to develop a critical mass of research capabilities in industries where it can be economically competitive. Existing key clusters are electronics, chemicals, marine engineering, and biomedical sciences. A vibrant research environment will help identify emerging growth areas, such as in environment and water technologies and interactive and digital media.
- Need for balance between investigator-led and mission-oriented research in selected strategic areas. Basic investigator-led research is broadly aligned with the long-term strategic interests of Singapore, and the Ministry of Education's Academic Research Fund was raised from S$550 million for FY2001-2005 to S$1.05 billion for FY2006-2010. Mission-oriented research would be closely integrated with industry development and investment promotion strategies, and the budget for A*Star was raised from S$4 billion for FY2001-2005 to S$5.4 billion for FY2006-2010.
- Encourage more private sector R&D. Incentive packages would be reviewed to better attract more global R&D centers and activities to Singapore, supported by a high quality support framework, including a strong base of scientific and research manpower and sophisticated IP protection regulations. The aim is to have two-thirds of R&D, mainly development, performed by the private sector, and one-third of R&D, mainly research, performed by the public sector agencies.
- Strengthen the nexus between R&D and business. Universities and research institutes must improve on their ability to commercialize their research results and have closer collaboration with industry. There is also a need to promote technology innovation in local enterprises through stronger co-funding frameworks between public and private sectors. In particular, polytechnics with strong applied research and downstream capabilities and industry networks could be encouraged to link with industry associations to collaborate on R&D initiatives.

The government elevated R&D into a national priority by setting up the Research, Innovation, and Enterprise Council and the National Research Foundation. The council announced that it plans to spend S$16.1 billion over 2011-2015 on research, innovation, and enterprise, as compared to an allocation of S$13.55 billion in 2006-2010. Research and innovation will have to underpin the competitiveness of Singapore's industries, catalyze new growth areas, and transform the economy. Increasingly, intellectual capital will be critical to

Singapore's next phase of economic development. More will be done to facilitate collaboration between industry and public research institutions to foster greater commercialization of R&D. A larger portion of R&D funding will be awarded on a competitive basis to projects that will strengthen capability and contribute to economic and social outcomes. The National Research Foundation has been established with key responsibilities to implement the strategic thrusts and to fund longer-term research in strategic areas. The foundation is provided with funding of S$5 billion for FY2006-2010. This, together with the increased budget for A*Star and the Academic Research Fund, will more than double the total public sector R&D budget from just under S$5 billion for FY2001-2005 to almost S$12 billion for FY2006-2010. Singapore aims to increase gross expenditure on research and development to 3.5 percent of GDP by 2015 through greater private sector R&D activity. The foundation's research priorities are in environmental and water technologies; biomedical sciences; and interactive and digital media.

Despite the quantum leap, Singapore's R&D efforts remain modest in absolute terms, reflecting the small size of the economy, its strong services orientation, and weak core of large manufacturing corporations. A challenge for Singapore's R&D ambitions is that it lacks the breadth and depth of talent to compete against the bigger and more advanced economies of the US, EU, Japan, and Russia as well as the emerging economic powers of China, India, and South Korea.

4. Conclusion

In the past five decades, Singapore's non-corrupt and visionary political leadership has brought about political stability and social cohesion, and, together with pragmatic and efficient economic management, has enabled Singapore to achieve well beyond the economic potential of a small city-state that lacks natural resources. However, in the process, Singapore's development depended heavily on foreign MNCs and neglected the nurturing of domestic enterprises. Its heavy dependence on foreign labor delayed the expansion of tertiary education and disincentivized industrial upgrading as businesses had ready access to a large pool of low-wage labor from neighboring countries. Critics have also criticized Singapore as being a "nanny state" with its extensive and intrusive role in the economy and society.

Singapore is a now a high-income country and is on the innovation-driven stage of economic development. Going forward, Singapore has to overcome domestic constraints and challenges as well as operate in a more challenging regional and global environment. The government will have to hold back on its dominant role and let the private sector and civil society grow and become more creative and risk taking. Given the best educational opportunities in the world, and a liberalizing trade and investment environment, and with government playing a less intrusive but more supportive role, the next phase of Singapore's

economic development should be more private-led and local-enterprise led. Whether the Singapore city-state will continue to excel over the next few decades remains to be seen.

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