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## Utilizing FDI to Stay Ahead: The Case of Singapore

Penelope B. Prime, Ph.D.<sup>1</sup>

### *Abstract:*

A country of five million people in 710 square kilometers, Singapore has built itself into an integral part of global markets with living standards that are among the highest in the world. The purpose of this article is to apply a capabilities-based approach to understand how a small, resource-scarce country dependent on global markets has done so well. The core of Singapore's success has been the continuous updating and expanding of domestic social capabilities to meet the needs of foreign companies. Government policies were hyper-sensitive to providing conditions for foreign firms to be successful. Foreign firms investing in Singapore by now have helped close the income gap with advanced economies and are on the way to closing the innovation gap. Singapore demonstrates that with deliberate attention to building skills, institutions and infrastructure, it is possible for a small country to upgrade skills and to move up the production-value chain with primary reliance on FDI. Cultivation of private Singaporean firms has been secondary but may be the next step needed to sustain progress, both to respond to increased competition from China and others, and to build a knowledge-based economy.

Key words: capabilities-based approach, Singapore, small country development, upgrading, structural change

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## **Introduction**

In the midst of uncertain global economic conditions with many countries struggling to avoid a middle-income trap, Singapore stands out. A very poor country in the 1960s with little in its favor except location, this land of five million people in 710 square kilometers has built itself into an integral part of global markets, resulting in living standards that are among the highest in the world.

The purpose of this article is to explore the Singapore experience in the context of a capabilities-based approach (see Paus, Introduction, this volume) to understand why Singapore has done so well, especially as a small, resource-scarce country dependent on volatile global markets. Singapore has benefited from its location in Asia and its timing in terms of promoting manufacturing exports just as the electronics industry began to build global production networks, but it also had to overcome inherited characteristics such as land and labor shortages resulting in comparatively high costs of these resources. I argue that at the core of Singapore's success has been government attention to building domestic social capabilities that were continuously updated and expanded to meet the needs of foreign companies. Government policies were hyper-sensitive to providing the conditions for foreign firms to be successful. In particular, the government provided incentives to foreign labor to immigrate to Singapore to fill skill shortages, invested in general education and specific skills training, and built world-class infrastructure. While the government selectively intervened in domestic markets, such as for labor and land, it maintained an open business environment for foreign investment and trade. Hence, the Singapore case demonstrates that it is possible for a small country to upgrade skills and to move up the production-value chain in an open market context with primary reliance on foreign direct investment (FDI).

The People's Action Party (PAP) has dominated political power since 1959, providing stability and leadership. This leadership developed cohesive policies across institutions of government and sectors of the economy that did not leave the development process to market forces alone. This helped create a policy environment that blended the needs of transnational corporations (TNCs) with benefits for Singaporeans. Singapore's success has been a function of a proactive government that utilized both horizontal and vertical industrial policies. The horizontal policies focused on supplying and upgrading infrastructure and appropriate labor skills; generating resources to pay for the incentives needed to encourage TNCs to come to the

country; enabling public-private communication and cooperation; and building and maintaining a competitive, business-friendly environment for both foreign and domestic firms. Companies in targeted sectors that received incentives were expected, in turn, to deliver on performance measured by exports, training, technological upgrading or research and development. Hence the vertical policies also encouraged spillover benefits. Government companies have been an important piece of this process, especially in providing logistics and other business services, while cultivation of home-grown, private Singaporean firms has been secondary. This is the weakest link in Singapore's capabilities-based approach. Looking to the future, focusing incentives and resources toward the development of local capabilities for small and medium-sized private firms may be needed to sustain progress.

### **Economic Outcomes**

Singapore's economic development has been successful by many measures. Overall GDP, GDP per capita, quality of life, exports and export capabilities, and wages have all grown substantially. Growth rates have been healthy, and the manufacturing's share of GDP has remained above 20% (Table 1). Population growth has been sensitive to immigration policy, as is evident in the substantial variations in the population growth rates over time. GDP per capita has climbed steadily and now is one of the highest in the world. Quality of life, as represented by life expectancy, has climbed steadily to over 80 years. Wage growth has generally followed the upward trend in GDP per capita. Real wages increased only slightly until the late 1970s because of a deliberate policy to provide low-cost labor to export industries, but have increased steadily since (Akkemik 2005). Access to low-cost housing, education and training, and jobs has given Singaporeans opportunities to advance in an environmentally clean and safe setting (Ghesquiere 2007).

[Table 1 about here]

Changes in export composition reflect an impressive growth in Singapore-based firm capabilities (Table 2). Manufacturing exports as a share of merchandise exports increased from just under 30% in 1970 to a high of 85% by 2000. Since then the share has fallen off to about 70% by 2010. Of manufactured exports, more than half were classified as high-tech by the

1990s. Exports of information and communications technology (ICT) were also more than half of total exports by the 1990s, although this category fell to 35% by 2009. Exports of ICT services were also present by the 2000s, representing 2.8% of service exports by 2010.

[Table 2 about here]

U.N. data also show the changing composition of Singapore's trade over time (Table 3). In 1989-90, 36% of total exports and 27% of total imports were high-tech products. The 1999-2000 figures show an increase to 60% for exports and 48% for imports, although both fell by 2007-08 to 48% and 38% respectively. Whereas Singapore started out emphasizing low-tech, labor-intensive exports, by the 1990s high-tech trade was dominant. This is one indicator of successful upgrading in Singapore.

[Table 3 about here]

One performance indicator that has been questionable for Singapore over the decades is factor productivity. While labor productivity generally has increased until most recently, Akkemik (2005) estimates that labor shifts across sectors since the mid-1980s have had a negative impact. Attention to questionable progress in factor productivity in Singapore and other Asian economies was stimulated by Young's (1992) well-known study showing Singapore experienced low productivity growth in the first couple of decades because of very high input use. Other studies followed to re-test this result. Many found somewhat higher estimates but few show stellar performance, although productivity—especially capital productivity—seems to have improved in the 1990s (Wong 2003: 231-232; Chia 2005: 4-5; Ghesquiere 2007). In general, it is not surprising to have higher input use in earlier stages of development with higher productivity later (Chang 2005: 113-114), and the ability to mobilize resources for growth is commendable in itself. However, multifactor productivity in Singapore has fallen based on productivity estimates by the Singaporean government over the last part of the 2000s (Figure 1). Declines in labor productivity appear to be especially serious, falling from 7% growth in 2004 to 0.9% decline in 2007 (WTO 2008: Table AI.1). A key question is whether this trend is a short-term dip influenced by global financial problems or a reflection of deeper issues possibly related

to the fall in manufacturing's share of GDP and the fall in high-tech exports, as shown in Tables 1-3.

[Figure 1 about here]

To summarize, Singapore's economy has done very well since its start in the 1960s. Firms within the country have shown an ability to increase value added in production, as well as to improve the technology base of products. These companies have moved up the value chain, and the people of Singapore have achieved developed-economy-level living standards. Other economies in the region, such as Malaysia and Thailand, have struggled much more (Yusuf and Nabeshima 2009; Doner 2009). How was Singapore able to accomplish this, and is the current development path sustainable given declines in productivity, manufacturing as a percentage of GDP and high-tech exports observed in recent years?

### **Using Institutions and Policy to Build Social Capabilities**

Singapore's economy has been open to trade and investment since a brief period of import substitution between 1963 and 1965 (Blomqvist 2000: 9). Singapore has become known as a place where government is efficient and uncorrupted, and competition is welcomed (Brown and Tucker 2010). This global reputation is reflected in high scores that Singapore earns on many of the World Bank's Ease of Doing Business Rankings. Singapore earned the highest overall ranking globally in 2011 and 2012 out of 183 countries (World Bank Group 2012). Singapore was also number 1 in the "trading across borders" category (ease in hiring, setting work hours and redundancy costs), and number 2 in the "protecting investors" and "resolving insolvency" categories. Singapore does not restrict profit or capital flows and does not impose trade tariffs except for a few products such as alcohol, tobacco, petroleum and motor vehicles (WTO 2009: 60). The Monetary Authority of Singapore (MAS), the country's central bank, sets the exchange rate within an undisclosed band with the ultimate goal of domestic price stability. Inflation averaged only 3% between 1964 and 2004, and the MAS intervened to prevent the currency from becoming overvalued (Ghesquiere 2007: Chapter 3). Consequently, approximately 7,000 foreign firms have Singapore-based operations (Lim and Wei 2010: 3).

Within the context of internationally open markets and an excellent business environment, domestic policy has targeted incentives to encourage foreign companies to invest in Singapore. The main government body setting economic policy has been the Economic Development Board (EDB), which was established by statute in 1961. The EDB's first task was to attract foreign investment (EDB website). It opened its first overseas offices in New York and Hong Kong. Its mission, as articulated on its website, continues to encourage FDI in Singapore using tax and non-tax incentives while planning for the country's future.

In addition to the EDB, the government has utilized land ownership, other statutory boards and government linked companies (GLCs) as the core instruments of industrial policy (WTO 2008: 53-60). More than 80% of the land in Singapore is owned by the government. Land is leased at fair-market rates for 99 years for residences and commercial property, 30 or 60 years for industrial development and 20 years for agriculture. These lease sales generate revenues as well as allow influence over the pricing and allocation of land.

The statutory boards, of which the EDB is the most visible, were created to help implement industrial policies and have focused on providing infrastructure and public utility services. Recently, however, their focus has shifted to development of knowledge and value-added activities. These boards are set up by parliament and fall under the jurisdiction of relevant ministries.

Unique to Singapore, GLCs are a type of state-owned enterprise that has played a major role in domestic development, especially in the early years. GLCs are generally defined by shares held by Temasek Holdings, the government's investment institution, or directly by statutory boards (Ramirez and Tan 2003). In many cases, former statutory boards or other public agencies evolved into GLCs. Examples are Singapore Airlines and Singapore Telecommunications. Some of the first GLCs were involved in shipbuilding, oil rig construction and defense-related manufacturing and services for the military (Low 2001: 115). Smaller GLCs include public hospitals and educational institutions such as the National University of Singapore and Nanyang Technical University (WTO 2008: 56).

Initially set up to compensate for a lack of private funding and expertise, GLCs now number in the hundreds and represent 20% of Singapore exchange marketization (Ramirez and Tan 2003). GLCs are run competitively and have been partially privatized over time through share issuance on the Singapore Stock Exchange (Geok 2004). They represent the majority of

Singapore's own TNCs and have substantial overseas investment. At this stage, GLCs do not receive special funding, tax benefits or other preferences, and one empirical study found no evidence of easier access to credit (Ramirez and Tan 2003). Information is scarce, however, because the state considers GLC activities confidential (Ramirez and Tan 2003: 6; Low 2001: 120).

Singapore also has private national firms, some of them large but most small or medium-sized (SMEs). Foreign firms have been its most important corporate sector by far. Since the 1970s, foreign firms have produced 70% to 75% of Singapore's manufacturing output (Blomqvist 2000: 11). At the end of the 1980s, locally owned firms contributed only 15% of the value added in manufacturing, 15% of gross output, 28% of employment and 6.5% of exports (van Elkan 1995: 6, table 3-1). The rest was generated by wholly- or majority-owned foreign firms. Even a decade and a half later, 90% of the business establishments in Singapore were local SMEs, but they employed only half of the labor force and produced only one-third of the output measured as value added. Most of these firms were not entrepreneurial and mostly engaged in activities in the domestic market such as construction and personal and social services (Chia 2005: 11). As one indication of how Singapore views this mix of firms, national statistics rarely separate economic activity by national and foreign ownership, or by state and private.<sup>2</sup>

#### Policy Space: Sources of Development Funding

Singapore has relied on foreign direct investment more than most countries. Net inflows of FDI averaged 6% of gross domestic product (GDP) in the 1970s, 10% in the 1980s, and 12% and 15% in the 1990s and 2000s (World Bank, World Development Indicators). Between 1980 and 1985, FDI was almost 19% of domestic investment and almost 28% between 1994 and 1997 (Lall 2003: 43, Table 2.9). This compares with 7% and 10% in Hong Kong and 0.4% and 1.1% in South Korea, in the same two time periods. Singapore's success in attracting FDI can be attributed in part to affordable housing, recreation, clean environment, low crime, efficient services, quality infrastructure, sufficient power and clean water, and attentive, non-corrupt government. In these aspects, Singapore was competitive with Hong Kong (Yusuf et al. 2008: 12-13).

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<sup>2</sup> When data is published on "local" firms the definition is establishments with at least 50% local equity.



Foreign investors also have enjoyed numerous incentives, including tax breaks, few restrictions and pre- and post-investment services from government agencies. In 1959, the Pioneer Industries Ordinance and the Industrial Expansion Ordinance were passed, both of which offered tax breaks to encourage the establishment and development of manufacturing. Tax breaks for exports were added as part of the Economic Expansion Act of 1967. Incentives beyond tax reductions included, for example, local enterprise finance, local enterprise technical assistance, start-up enterprise development, technopreneur programs, the skills development fund and initiatives in new technology (WTO 2008: Box III.1 and table AIII.8). A unique characteristic of these incentives is that all are directed at rewarding expansion, upgrading, establishing regional or global headquarters, earning royalties, encouraging innovation or introducing high-tech skills as opposed to encouraging any specific industry (Chia 2005: 19-21; Respondek 2008 as referenced in Lim and Wei 2010: 5-6).

These incentives were available to both foreign and local firms, but data indicate foreign firms took advantage of them much more than local firms did (Blomqvist 2000: 11). One study reported that the post-tax return of foreign firms was on average twice that of local firms, and three times as high in manufacturing. The difference between firms' returns in pioneering industries as compared with others was also high. These data imply that tax incentives made a difference, and foreign firms benefited substantially from them (van Elkan 1995: 15 and table 3.2).

In addition to the foreign capital that flowed into Singapore, domestic funding also was plentiful. Savings rates have been very high, reaching or exceeding 40% for the past 30 years. Consistent with rising savings, household consumption as a share of GDP fell over the decades. By 2010, household consumption was low at 37% of GDP (World Bank, World Development Indicators). Central to creating the high saving rates was the Central Provident Fund (CPF). This was set up as a compulsory private savings mechanism for retirement, originally established by the British in 1955. Households also saved more than the CPF regime required. Some studies have suggested that demographics, the lack of government-provided welfare and steadily rising incomes explain many of Singapore's saving trends (Ghesquiere 2007). In addition, budget surpluses and profits of GLCs pushed government revenue to an average of about 27% of GDP, compared with 22% in the 1970s (World Bank, World Development Indicators). The Singapore government has not borrowed to finance deficits in many years (CIA Factbook).

## Social Capabilities to Attract and Keep FDI

To attract FDI, Singapore focused on creating an environment supportive of foreign companies and their employees. Three cornerstones of this environment were infrastructure, education and pro-development institutions.

### *Infrastructure*

From the beginning of Singapore's development, the importance of infrastructure to capturing the country's location advantage was recognized and acted upon (Table 4). The port, of course, was central to the country's role in regional trade. The government also purposefully planned modern living environments with good housing and transport to help attract foreign companies and employees. As technology changed, new infrastructure investment was initiated to connect Singapore to global information systems. Further, the Singaporean government has viewed infrastructure in broad terms. Aside from providing excellent basic infrastructure such as airports, roads and public utilities, the city included affordable housing and facilities to assist industrial sectors' research and manufacturing development (Vietor and Thompson 2006: 3).

### *Education*

At the time of independence, only 50% of Singapore's population was literate in any language (Blomqvist 2000: 5). By 1980, literacy had risen to 80% and by 2008 it was 95% (World Bank, World Development Indicators). By the late 1990s, Singapore ranked second in the educational performance index (Oxfam International 1999 as referenced in OECD 2000: 54), and in the 2009 PISA educational comparison, Singapore ranked fifth in reading, and fourth in math and science (OECD 2010). According to the 2000 Census, 35% of the population speaks Mandarin as their primary language and 23% speak English (CIA Factbook). Twenty-three percent of the labor force had a tertiary education in 2007 (World Bank, World Development Indicators).

Government expenditures on education have not been particularly high, however: just 3% of GDP in 2001, which was lower than 122 other countries (CIA Factbook). Even by 2010, education spending remained low at 3.3% of GDP. As a share of government revenue, education spending was about 10% in 2010, the same as in 1983 and below that of the OECD countries

(about 13%) and far below developing countries in Latin America and the Caribbean (15%) (World Bank, World Development Indicators).

Singapore's educational system has developed an effective industrial and vocational training system that has been able to continuously upgrade its curriculum (Wong 2003: 222). It was designed in cooperation with EDB and foreign entities such as the French Electrical/Electronic Industry Federation and the German Agency for Technical Cooperation.

A second distinctive feature of the Singaporean approach to supplying skilled labor has been to encourage immigration of foreign workers when shortages of particular skills existed. By 1999, for example, more than 17% of the R&D-focused scientists and engineers were foreign, many from India and China (Wong 2003: 223). This number did not include the many who had already received permanent residency. According to the 2010 census, Singapore's total population was 5.1 million, of which 3.8 million were citizens or permanent residents (Singapore Department of Statistics). This flexible immigration policy has allowed for rising capabilities before the education system could adequately deliver the quantity and quality of talent needed.

Both of these features underscore the linking of education policy to industrial policy. Despite obvious successes, policy makers worry that teaching methods are too passive to stimulate critical thinking and creativity that will be required for the next stage of upgrading. Reforms initiated in the late 1990s were directed at these concerns (OECD 2000: 55). In addition to curriculum changes and adding a variety of activities to the school day, Singapore also began initiatives with universities abroad, such as MIT, to access lectures electronically and to encourage the establishment of campuses in Singapore.

[Table 4 about here]

### *Pro-development Institutions*

Organizations that are capable of coordinating and implementing policy, as well as enabling communication between business and government, are themselves part of a society's capabilities (Abramovitz 1986). The Singaporean government over the years has focused on economic strategy in the context of how to position the country within the global context (Sheth 2009). The government has been proactive, as well as responsive to problems when needed, but with clear strategic targets—similar to a business, as one author suggested (Blomqvist 2000: 4). Single-party continuity has been helpful with the PAP being in power since 1959. Two people in

particular played major roles in placing and keeping Singapore on the development track: Lee Kuan Yew and Goh Keng Swee (Goh Chok Tong), who were Prime Ministers between 1965 and 1990 and 1990 and 2004, respectively. The executive leadership maintained tight control over economic policy-making and sought technical advice upon which decisions were based. The elections of 2011, when PAP won a slim majority, were the first time the electorate signaled that traditional power arrangements might not be inevitable forever.

Fundamental to the pro-FDI approach, Singapore needed to understand which services and infrastructure would attract and assist foreign firms, and then to communicate the incentives and environment they were offering. Singaporean institutions also needed to communicate and coordinate among themselves. As there were many of these organizations, this was no small feat. Descriptions of the Singapore developmental state are clear that coordination and communication was done very successfully (e.g., Blomqvist 2000, Chia 2005, Ho 2003). Doner (2009) argues that this type of institutional capacity is fundamentally political, and that Singapore is one example of successful public-private consultation. The EDB itself plays a central role by promoting Singapore to foreign firms and ascertaining what foreign firms need in order to move to, and to stay in, Singapore. The ability to be flexible with policy and change as needed is also critical, and evidence shows that Singapore has been fairly good at this (Ho 2003).

Within Singapore competing interests also needed to be recognized and accommodated. For example, one possible unmeasured benefit of continuing to have GLCs could be that the government connections make policy formation and implementation easier than if the EDB and other government institutions had to deal only with private firms. As long as GLCs are as efficient and innovative as they would be if they were private, then this benefit would matter greatly over time. This connection is implied by Ho's (2003) discussion of "embeddedness," which points to a lack of interest group pressure combined with enough connection to industry to convey and receive good information about what is happening and what should be improved for future development. Blomqvist's (2000) discussion of the "endogenous" role of the state in the Singapore case is similar. Ghesquiere (2007) emphasizes the merit-based nature of elites in Singapore and the sharing of benefits via opportunities to be upwardly mobile.

## **Development Phases Shaped by Internal-External Dynamics**

The adaptation of government policy and institution-building to changing conditions can be seen throughout the country's development phases. Names of policies and initiatives used by officials and analysts over time reflect a focus on capabilities and upgrading, with a core focus on attracting and keeping foreign firms.

### **Creating Jobs: 1965-1978**

The first main phase of development focused on building infrastructure and a manufacturing base to create jobs for Singaporeans. Unemployment was about 9% and the exit of the British military was expected to cause even more job loss (Blomqvist 2000: 20). Relations with neighbors, Malaysia in particular, were tense, so policies were created that looked beyond the region (Ho 2003: 431). A Dutch economist and long-time advisor to Singapore, Albert Winsemius, is credited with suggesting that Singapore build good relations with the West to encourage foreign investment and access to those markets, and to emphasize high-tech in the country's industrial development (Ong 2009).

Singapore was successful in attracting multinational companies early on, and especially benefited from the investment of two U.S. firms: National Semiconductor and Texas Instruments (Athukorala 2008). By the 1980s, almost every electronics producer had some presence in Singapore, making the country the major exporter of disk drives by the end of that decade. Foreign companies were attracted by low wages, which were mandated by policy at the time, but apparently they also especially liked Singapore's location and friendly business environment, including tax incentives. Public goods provision such as physical and institutional infrastructure and support to R&D were also attractive, along with subsidized financing for exports (Blomqvist 2000: 13).

The FDI that came to Singapore during these years was part of emerging global networks, or production fragmentation, at the time. Increasingly intermediate products, such as disk drives, were being outsourced to countries with matching comparative advantage based on factor endowments (Hoon and Ho 2001). Singapore was not a large enough market to be the main end-user of computers, so being part of the global supply chain was a good way to leverage what turned out to be a substantial growth segment in global trade over the past 50 years.

Because of early success of attracting industry, the end of this period was characterized by labor shortages (Beng 1997: 97; Akkemik 2005). Since wages were barely allowed to increase to encourage export-oriented, labor-intensive industries, the result was prolonged disequilibrium in the labor market.

#### Upgrading Local Skills: 1979-1990

The next phase began with sharply rising wages spearheaded by the National Wage Council. The Council, established in 1972, recommended annual wage increases (Akkemik 2005). There was a push to increase labor productivity by moving into capital intensive production and acquiring skills needed to support a changing industrial structure. Wages rose substantially. In response to recession in 1985, however, the Council adopted a flexible wage system that allowed for both bonuses and downward adjustment in bad economic times.

Policy initiatives continued to try to attract industrial TNCs to Singapore. Wages, in fact, turned out not to be a major obstacle, probably because skills were rising in tandem. The Skills Development Fund (SDF) was established in 1979 to finance retraining of workers and to promote labor-saving investments. Throughout the 1980s, a series of programs was initiated to supplement these efforts, including the Basic Education for Skills Training program, a Modular Skills Training program, a Secondary Education program and the Core Skills for Effectiveness and Change program (Beng 1997: 96-100). Rising skills were needed to meet the needs of targeted industries including computers, computer peripherals, electronic medical instruments, automotive components, specialty chemicals and pharmaceuticals, and optical and photocopying equipment (Encyclopedia of the Nations).

The effort to move beyond labor-intensive industry included incentives for Singapore companies to move unsophisticated production off-shore. Initially targeted at local firms, it was mostly GLCs and foreign firms that set up production in nearby countries but also in India and China as well. Coined the “second wing” or “external wing” policy, this strategy was designed to overcome resource and market constraints at home by building links in the region (Blomqvist 2000: 25-26). Part of the process was for GLCs to set up industrial parks in China, India, Vietnam, Malaysia and Indonesia that provided infrastructure, including schools for employees’ children, and other incentives for Singapore-based firms to locate production there while upgrading their own activities in Singapore (Pereira 2005). Outward foreign investment from

Singapore increased from S\$2.2 billion in 1976 to S\$14.2 billion in 1989 (van Elkan 1995: 14). The establishment of the Johor-Batam-Singapore triangle with Malaysia and Indonesia in 1989 was a complementary move. Singapore supplied capital to the factories in industrial parks in Johor and Batam, while these areas supplied food, water and raw materials back to Singapore, and utilized Singapore's trading services (Lim 2001: 198-199). Tourism was also important, especially Singaporeans and others visiting the islands around Batam. Outward investment reached S\$37 billion (US\$ 52 billion) by 1995, of which more than 30% was to Indonesia, Malaysia and Thailand (Ho 2003: 432).

#### Exploiting Production Networks using Local Capabilities: 1991-1998

Singapore's early entry into regional networks helped place the country in a strong position to take advantage of changing production patterns once China entered the global market. After an initial decade of reforms and opening, China became a center of manufacturing assembly. Singapore's exports to developed markets such as the U.S. began to slow, with some evidence that rising competition from China was a factor (Liu 2007). In response, Singapore, and ASEAN more generally, increasingly took advantage of a growing Chinese demand, exporting components and parts to China. Between 1992 and 2005, ASEAN's share of parts and components exports to China increased from 0.5% to 36% (Athukorala 2008: 505). In 2004 alone, Singapore's exports to China increased more than 50%, much of which comprised electronic components, and likewise China became an increasingly important supplier of inputs and goods to Singapore (Liu 2007: 511-512).

China's entry into global manufacturing also meant that Singapore needed to continue to upgrade its skills and increase the sophistication of its industrial base to keep ahead of China's capabilities. By the late 1980s, Singapore had substantial strength in chemicals, electronics and precision engineering, logistics and transport services, information and communication, and media. However, strategic planners had a vision of a knowledge-based economy and set out to develop innovative capabilities as a way to stay ahead of competition (Vietor and Thompson 2006: 12). Singapore was weak compared to some of its Asian competitors in high-tech sectors, and Singaporean local firms were moving in the opposite direction -- into basic services such as tourism -- as labor-intensive manufacturing was being moved to other countries with lower costs.

These trends caused policy makers to emphasize manufacturing and services as twin engines of growth (Blomqvist 2000: 14-17).

A study called “The Next Lap” issued in 1991 called for technological upgrading (Blomqvist 2000: 15). The National Science and Technology Board was established, and national science and technology plans were instituted. Singapore’s national innovation system had relied on the presence of TNCs up to this point (Wong 2003). Fortunately for Singapore, the TNCs engaged in increasingly sophisticated innovation over time, which to some extent spilled over to the local economy. In this phase, however, the Technology Investment Fund was created specifically to help local Singapore entrepreneurs and companies innovate throughout the economy. This approach was designed not simply to supplement the activities of the TNCs, as had been the case of new initiatives in the past, but rather to strengthen Singapore as a “...vibrant enterprise system—a total environment bringing together companies big and small, foreign and local, thriving in synergy and symbiosis” (Teo Ming Kian, Chairman, EDB, quoted in Vietor and Thompson 2006: 12). A series of national science and technological plans (NSTP) followed, along with increasing investments in R&D and technological infrastructure. The NSTPs targeted 13 clusters and 6 “thrusters.” A number of institutions were established to help link local SMEs to evolving technology, including the Technology Development Centre, the National Productivity Board and the Singapore Institute of Standards and Industrial Research (Wong 2003, Farhoomand 2005 7-8).

The success of these policy initiatives has varied. Wong (2003: 224) shows that technology spillover has been quite strong between local and international entities, but linkages between universities and other public R&D centers and local firms, and among local firms themselves, have been much weaker. He argues it is these links that Singapore needs in order to build its own domestic innovative capability.

#### Increasing Global Competitiveness: 1999-2011

The Asia Crisis in 1997, followed by the bursting of the dot-com bubble, led to a serious economic downturn in Singapore, but perhaps more importantly, it spurred renewed thinking about how to lessen the economy’s dependence on manufactured exports and growth in Southeast Asian economies. At that time, almost half of Singapore’s trade was with six countries: Malaysia, Indonesia, Thailand, Hong Kong, South Korea and Japan (Ho 2003: 425).



In terms of short-term strategies, the Singapore government responded to the Asia crisis with cost-cutting measures that represented 7% of GDP to try to stay competitive as an international business location. The government also largely resisted pressure from developers to halt the fall in property values (Ho 2003: 427-429; OECD 2000: 15). The corporate tax rate was also cut a number of times, from 40% in 1986 to 26% in 1997, and then to a low of 18% as of 2008 (Liu 2007: table 13, p.519; WTO 2008).

Goals developed in “The Next Lap” were refined with the EDB’s “Industry 21” campaign launched in 1999 to create a “learning nation” across the board (OECD 2000, pp,15-16; Parayil 2005: 54-55). An Economic Review Committee was established in 2001 to advise the government on ways to “remake Singapore.” In 2003 it offered recommendations to make Singapore a creative and entrepreneurial nation with a globalized and diversified economy (Singapore, Ministry of Trade and Industry).

A key aspect of implementing the first recommendation has been to negotiate a series of trade agreements. The only major trade agreement that Singapore had before 2000 was its membership in ASEAN. Since then, agreements have been signed with dozens of countries, many of which are beyond Southeast Asia, including the U.S., Japan, India, China, Australia, New Zealand, Jordan, Korea, Chile, Panama, Peru, Switzerland, Norway, Iceland and Liechtenstein. These agreements are consistent with attempts to lower Singapore’s dependence on Southeast Asia and to re-build itself into a global rather than a regional trade hub. Fouquin (2008: 291-292) notes that other Asian countries began to negotiate trade agreements at about the same time. In addition to the Asia crisis, he argues that this was also in response to the U.S decision to set up NAFTA. Until NAFTA, Asia countries had not seen a strong reason to pursue agreements beyond the multilateral ones they already had, but NAFTA was seen as a possible new “American fortress.” Spurred in part by these new global agreements, Singapore’s exports rose from 192% to 243% of GDP between 2001 and 2008 (World Bank Database).

The second two parts of “Industry 21” re-emphasized innovation and creating new local companies as part of a knowledge-based economy. A specific goal has been to build a biomedical cluster based on local start-ups and existing local SMEs rather than GLCs that previously supported development of the electronics industry (Parayil 2005: 62). A

complementary “SME 21 Report” focused on ways to strengthen local firm capabilities.<sup>3</sup> Not willing to rely entirely on local capabilities, however, attracting biotech TNCs to the cluster continued to be part of the program. In addition, a special visa program for foreign entrepreneurs was begun in 2004 (guidemesingapore.com). Many foreign biomedical firms have a presence in Singapore, and individual scientists also have been enticed to move from their home countries to set up laboratories. A biomedical industrial park, called Biopolis, which includes residential and recreational spaces was built near the National University of Singapore.

Another piece of the strategy was laid out in “IT2000: A Vision of an Intelligent Island,” which focuses on how to better use IT to enhance the quality of life and business environment of Singapore. Its recommendations focus on improving connectivity, using IT to create new learning opportunities and adding electronic applications across the economy (OECD 2000: 16).

Parayil (2005) argues that Singapore shows signs of success in creating a new type of business environment with more flexible structures between business and government, meaningful interaction with universities to support innovation and start-ups, and the beginnings of viable industrial clusters. He sees these new arrangements as qualitatively better at creating an innovative economic environment than approaches of decades past, which, while successful at producing goods, did not lend themselves to developing dynamic Singaporean companies or to supporting new ideas and innovations. Value added in the biotech industrial cluster has increased, and start-ups have been launched.

### **Evidence of Firm Capabilities**

Singapore has relied on the presence of TNCs to establish and upgrade industries over the decades. Even with the new thrust toward building a knowledge economy and encouraging local firm development, this strategy has not changed. Some countries have trouble gaining benefits from the presence of FDI. This does not seem to be the case with Singapore. The linkages and spillovers have been substantial, and far from “footloose,” many foreign firms end up staying and upgrading in Singapore.

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<sup>3</sup> According to Chia (2005: 11 and note 10), an earlier report was issued in 1988, the SME Master Plan, which represented the first attempt to focus development policies on local firm capabilities beyond support to TNCs. She suggests, however, that not much progress was made as a result of that plan.

While incentives for firms were not initially aimed at foreign firms specifically, for various reasons they were the ones who benefited (Blomqvist 2000: 11). In any case, local entrepreneurs and local manufacturing were nurtured by the state much later. In the meantime, by supporting TNCs, local industries and the capabilities of the local labor force advanced. One measure of the advancement of firms in a country is the type of businesses that exist and how these have changed over time. In Singapore's case, a move from labor-intensive manufacturing and basic transport logistics in the 1960s to increasingly sophisticated industrial production and service provision is evident from Tables 1-3. Additional data presented by Athukorala (2008: 485-86, Table 1) show that Singapore's export of primary products fell from 26.7 % of non-oil exports in the mid-1970s to 6.1% by 2003/04, while manufactured exports rose from 73.3% to 93.9%. Within manufactures, machinery and transport rose to 66.5% and electric machinery to 27.5%. All of these measures indicate Singapore's success at competing globally and at upgrading production and exports across and within sectors.

Measuring the capabilities of firms that support increasing-value-added and the sophistication of industries, however, is more difficult and often indirect. Even more difficult is measuring the relative contributions of different types of firms. In Singapore's case in the context of this study, it would be helpful to know what local firms have contributed to the upgrading process as compared with TNCs, and then within local firms, the relative contribution of GLCs as compared with private local firms. There are scattered examples, such as the development of indigenous precision engineering that supplied foreign electronics firms (Doner 2009: 53, 57). Data by firm ownership are scarce, and even data separated by foreign and local firms are difficult to find. With this caveat, the following may give clues to the Singaporean economy's changing firm capabilities that have propelled the country's impressive growth in GDP per capita and upgrading of export composition.

### Entry and Exit

One might expect that an economy that encourages the creation of companies would experience much turnover, in terms of entry but failure as well. Part of the Industry 21 strategy was to encourage start-ups and fresh businesses. Figure 2 provides data on new and closing firms. In 2000, just over 11,500 companies opened with about 4,700 closing. By 2010, almost 30,000 firms opened with just over 15,000 closing. Not surprisingly, with the global economic turmoil

in 2009, bankruptcies rose. Figure 2, however, suggests that Singapore has become a more dynamic business environment that may in fact reflect the goals of creating an innovative society. Or, at least, it suggests that incentives to start new companies may have been effective.

[Figure 2 about here]

### Research and Development

A major piece of the “Industry 21” campaign was to increase R&D across the economy. In 1996, R&D was 1.4% of GDP, but this increased to 2.6% by 2007 (Table 5). According to the 2010 National R&D Survey, R&D spending as a percentage of GDP was 2.3% in 2009 and 2.1% in 2010 (Singapore Agency for Science, Technology & Research 2011). Growth was seen in R&D spending by the government sector, but private sector increases were substantial, from \$1.6 billion in 1999 to more than \$5 billion in 2008, although private sector R&D spending fell in 2009 due to the financial crisis (Figure 3). More of this investment—both government and private--was directed at manufacturing than at services. The number of researchers and the number of published scientific and technical journal articles both increased substantially as well (Singapore Department of Statistics).

[Figure 3 about here]

Patent applications—one measure of the outcome of R&D—have risen over time. Singapore firms applied for 750 patents in 2009, compared with only 145 in 1995. Still, foreign firms account for many more. A similar situation existed with trademark applications, but both began to grow substantially for residents and non-residents alike in the mid-1980s, suggesting a growing dynamism in the economy.

This dual dynamism is also suggested by Wong (2003). While he cites an estimate that 56% of Singapore’s R&D comes from TNCs, he identifies three sets of local firms that engage in R&D. The first is SMEs that support the TNCs; second, state-controlled GLCs; and third, private high-tech startups. Wong sees evidence that the third group is a recent phenomenon but a growing part of Singapore’s landscape. According to data put together by Farhoomand

(2005:11, table 3), in the 1990s, 46% of innovators in Singapore were TNCs, while 45% were local firms and organizations and the rest were individuals. This shows some indigenous capability and motivation to innovate. In stark contrast, however, less than one percent of the innovators in South Korea were TNCs. This is reflected in South Korea's receiving more than 11,000 U.S. patents between 1995 and 1999 as compared with 499 for Singapore (Farhoomand 2005: 2, table 1).

## **Conclusion**

Singapore's success can be summarized as the ability to establish and continually advance social capabilities while utilizing FDI to lead the economy's technological and production upgrading. Tapping the benefits of FDI is a challenge for many countries, but since so much of Singapore's economy is driven by FDI, this aspect has been critical to Singapore's success to date.

### Reasons for Success

So how has Singapore been able to benefit so handsomely from the presence of foreign companies? Three factors stand out as explanations for the success: regional context and timing, plentiful funding and conservative financing, and a developmentalist state whose policies focused on advancing social and firm-level capabilities. These factors are consistent with the propositions of the capabilities-based approach as laid out in the Introduction to this volume by Paus. The case of Singapore demonstrates that income convergence is sustainable if it is based on capability convergence.

### *Regional context and timing*

Singapore has benefitted from its location in Asia and its timing in terms of promoting manufacturing exports just as the electronics industry began to build global production networks. Historical events may have also favored the city-state for foreign investment. In the mid-1960s, just as Singapore was opening for business, East Asia was affected by the turmoil of the Cultural Revolution in China. This negatively affected Hong Kong and Taiwan, and perhaps also made South Korea less attractive, especially in the aftermath of the Korean War (Athukorala 2008, Stubbs 2005). U.S. and Japanese companies found Singapore to be a good location for investment in Asia. Later, in the mid-1980s, Great Britain's agreement to negotiate the return of

Hong Kong to China created much uncertainty over the colony's status and how this would affect business as well as private households. While Hong Kong was comparable to Singapore in terms of infrastructure and other aspects of doing business, this may have made a difference to location decisions for some firms.

Singapore's location continues to provide a benefit. One reason TNCs have opted to stay and upgrade their activities in Singapore even as they move their lower value-added activities is that their new production locations are nearby, making them convenient to manage. For example, Malaysia and Indonesia were major recipients of manufacturing as foreign firms moved their operations from Singapore to lower-cost locations. By the 2000s Singapore began to market itself as the center of business with both China and India, as these economies were growing quickly and Singapore is fairly convenient to both. The proximity of firms' activity outside Singapore makes it easier for Singapore to focus on the service links that help coordinate companies' cross-border operations (Hoon and Ho 2001: chapter 20). This proximity dovetails nicely with the country's comparative strength in logistics.

#### *Plentiful funding and conservative financing*

Building an environment to attract and keep firms is an expensive and long-term investment. Government finance in Singapore has been prudent and plentiful. The mandatory retirement system, high household savings, selected land sales and tax revenue have all contributed to the resources available for development. Having the resources to fund the government's strategy has helped immensely to fulfill it. Foreign funding helped as well, of course, especially for the firm-specific aspects of development. Singapore's financial solvency has been a big plus in an uncertain global financial environment, lowering the country's risk factors substantially.

#### *Developmental state policies focusing on capabilities*

Developmental state policies in Singapore have been consistent with several key aspects of the capabilities-based approach. First, Singapore's success has been driven by attracting, keeping and encouraging the upgrading of foreign investment. Government linked companies were key in providing logistical and business services, while foreign companies played the major role in establishing manufacturing for export and over time, upgrading their activities to higher value-added using increasingly sophisticated technologies. This was accomplished by deliberate

policies aimed at building local labor skills and social capabilities that supported FDI. Horizontal policies focused on building infrastructure, including affordable housing, education and training, and institutions that were credible and worked toward long-term goals with a focus on facilitating business. Macroeconomic policies, such as low inflation, an exchange rate managed to prevent overvaluation and fiscal conservatism, also contributed greatly to create an excellent environment for business. Industrial policies that targeted specific sectors were primarily focused on improving technology. A key aspect of the development process beginning in the 1960s was to create competitiveness through skill development in tandem with plans to eventually move away from labor-intensive manufacturing (Beng 1997: 96). These vertical policies granted tax and other incentives in exchange for upgrading, training and job creation for both foreign and Singaporean national firms.

Underlying Singapore's development strategy has been a unique political-economic environment. On the one hand, a single party political continuity helped focus the development goals and coordinate the public-private sectors, as well as the interests within the public sector. On the other hand, there also existed an open, competitive business environment in which local, private firms were not protected and hence have not developed as much as they would in other contexts. However, TNCs that were attracted to Singapore were not exploiting resources or competing directly with local firms, which made the acceptance of TNCs easier, both politically and economically (Chia 2005). Based on measured outcomes, Singapore has flourished as a result. Hence it is difficult to argue that Singapore has been over-reliant on FDI.

### The Next Stage?

Whether Singapore can continue to rely on FDI as it moves to the next stage of a knowledge economy is a fair question. Recent studies have found positive effects of FDI on innovation. For example, Kemeny (2010) shows with a cross-country analysis that FDI's effect on technological upgrading is evident in poor countries, but stronger if they have some minimum level of social capability. Kemeny's results further show that richer countries also benefit from FDI, just not as much. Lin and Lin (2010) show that outward flows of FDI have a larger positive effect on product innovation than inward flows, imports or exports, but they all have some positive effect. Hence there is evidence that utilizing FDI to upgrade technology and spur innovation can work.

While FDI can facilitate the move to a knowledge-based economy, some analysts argue that sustained development into the next stage is unlikely to occur without innovative local firms (Schrank 2008). Lall (2005), for example, argues that while access to technology is in principle the same across countries, where it goes and succeeds depends on the learning capability of a place, and this is influenced greatly by the abilities of local firms. Another concern is that higher profits resulting from higher value-added activities will be earned by foreign firms and repatriated, rather than earned by local firms unless the local firms are engaged in these activities. Policy makers in Singapore seem well aware of these issues. There are numerous signs that Singapore has gone beyond simply establishing supply links between local firms and TNCs, and in recent years policy has increasingly emphasized developing local firm capabilities. Also, the cluster approach in Singapore incorporates many stages within a sector so that innovations can occur anywhere along the chain. In the biomedical area, for example, many innovation possibilities exist beyond just drug discoveries. This may help lessen the difficulties of head-to-head competition with foreign firms and increase the opportunities of local firms to innovate to complement the strengths of foreign firms.

Perhaps the success of the next stage of development in knowledge-based innovation will rest less on the nature of FDI's role and more on the right type of social interaction to allow the creativity and networking necessary for success (Parayil 2005: 68; OECD 2000: 59). This may require yet another iteration of upgrading institutions to create conditions for a new stage of development. Birkinshaw and Hood (1998) identify four country host factors that influence the decisions of foreign subsidiaries to locate there: support provided by the host government, the strategic importance of the host country, the relative cost of factor inputs and the dynamism of the local economy. The first two factors are well established for Singapore. The third, relative costs, has been more challenging because of shortages of labor and land in particular, but other costs of doing business are likely to be low in Singapore as suggested by its high rank in the Ease of Doing Business Surveys. The fourth factor—dynamism of the local economy—exists but is driven largely by foreign firms. The costs of this characteristic of Singapore's economy may increasingly be showing up in declines in productivity and the importance of manufacturing and high-tech exports. A direct link between these phenomena has yet to be established, but policy makers in Singapore seem to be worrying about just such a possibility as global competition heats up for export markets around the world.





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Table 1 Summary of Selected Growth Performance Indicators, Singapore, 1965-2010

| Year | GDP per capita (2000 constant \$) | GDP growth (five year averages) | Life expectancy (years at birth) | Population growth rate | Manufacturing (share of GDP) | Services (share of GDP) | Agriculture (share of GDP) |
|------|-----------------------------------|---------------------------------|----------------------------------|------------------------|------------------------------|-------------------------|----------------------------|
| 1965 | 2,733                             | --                              | 66                               | 2.4                    | --                           | --                      | --                         |
| 1970 | 4,531                             | 12.6                            | 68                               | 1.6                    | --                           | --                      | --                         |
| 1975 | 6,417                             | 9.9                             | 70                               | 1.5                    | 23.2                         | 64.0                    | 2.3                        |
| 1980 | 9,043                             | 7.6                             | 71                               | 1.3                    | 30.0                         | 60.3                    | 1.6                        |
| 1985 | 10,866                            | 7.0                             | 73                               | 0.1                    | 22.6                         | 62.9                    | 1.0                        |
| 1990 | 14,658                            | 6.7                             | 74                               | 3.9                    | 27.3                         | 64.9                    | 0.4                        |
| 1995 | 19,359                            | 8.9                             | 76                               | 3.0                    | 26.5                         | 64.7                    | 0.2                        |
| 2000 | 23,019                            | 6.7                             | 78                               | 1.7                    | 27.7                         | 64.3                    | 0.1                        |
| 2005 | 26,886                            | 5.4                             | 80                               | 2.4                    | 26.9                         | 68.9                    | 0.1                        |
| 2010 | 32,538                            | 2.9                             | 81                               | 1.8                    | 22.2                         | 71.7                    | 0.04                       |

Source: World Bank Database, <http://databank.worldbank.org>

Table 2 Singapore's Changing Export Composition, 1970-2010

| Year | Manufacturing Exports (% of merchandise exports) | High-Tech Exports (% of manufactured exports) | ICT Goods Exports (% of total exports) | ICT Services Exports (% of services exports) |
|------|--|---|--|--|
| 1970 | 27.7   | --  | --                                     | --   |
| 1975 | 41.5   | --  | --                                     | --   |
| 1980 | 46.7   | --  | --                                     | --   |
| 1985 | 51.2   | --  | --                                     | --   |
| 1990 | 71.6   | --  | --                                     | --   |
| 1995 | 83.9   | 53.9  | --                                     | --   |
| 1997 | --   | --  | 54.1                                   | --   |
| 2000 | 85.6   | 62.6  | 56.1                                   | 2.4  |
| 2005 | 81.1   | 56.6  | 46.4                                   | 2.0  |
| 2010 | 73.1   | 49.9  | 35.4*                                  | 2.8  |

Note: \* ICT Goods exports are for 2009. Source: World Bank Database, <http://databank.worldbank.org>.

Table 3 Singapore's Technology-Intensive Trade, Selected Years 1989-2008

| Percentage of Exports by Level of Technology | 1989-1990 | 1999-2000 | 2007-2008 |
|--|-----------|-----------|-----------|
| Primary                                      | 7%        | 2%        | 2%        |
| Resource-Based                               | 25%       | 13%       | 24%       |
| Low-Tech                                     | 9%        | 7%        | 6%        |
| Medium-Tech                                  | 23%       | 18%       | 20%       |
| High-Tech                                    | 36%       | 60%       | 48%       |
| Percentage of Imports by Level of Technology | 1989-1990 | 1999-2000 | 2007-2008 |
| Primary                                      | 17%       | 9%        | 14%       |
| Resource-Based                               | 13%       | 11%       | 19%       |
| Low-Tech                                     | 12%       | 9%        | 7%        |
| Medium-Tech                                  | 30%       | 23%       | 21%       |
| High-Tech                                    | 27%       | 49%       | 38%       |

Source: Calculated with data from UN-COMTRADE.

Table 4 Summary of Selected Infrastructure Indicators: Singapore, Selected Years

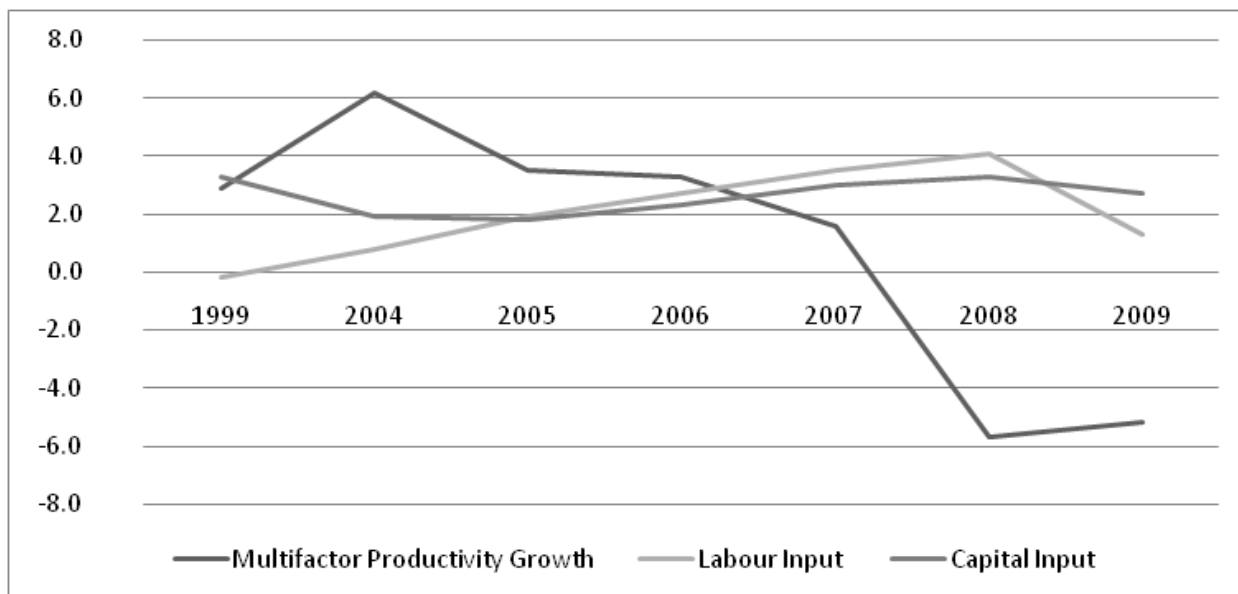
| Year | Container Port Traffic (TEU: 20 foot equivalent units, 1000s) | Air Transport, passengers carried, (1000s) | Air Transport, Freight (million ton-km) | Telephone Lines (per 100 people) | Mobile Cellular Subscriptions (per 100 people) | Internet Users (per 100 people) |
|------|---|--|---|----------------------------------|--|---------------------------------|
| 1970 | --  | 749  | 9                                       | 5                                | --   | --                              |
| 1975 | --  | 1815                                       | 147                                     | 9                                | --   | --                              |
| 1980 | --  | 3827                                       | 544                                     | 22                               | --   | --                              |
| 1985 | --  | 4912                                       | 981                                     | 29                               | --   | --                              |
| 1990 | --  | 7046                                       | 1653                                    | 35                               | 2  | --                              |
| 1995 | --  | 10779                                      | 3687                                    | 41                               | 9  | 3                               |
| 2000 | 17100   | 16704                                      | 6005                                    | 48                               | 68   | 32                              |
| 2005 | 23192   | 17744                                      | 7571                                    | 43                               | 103  | 62                              |
| 2009 | 25866   | 18427                                      | 7391                                    | --                               | --   | --                              |
| 2010 | --  | --   | --                                      | 39                               | 144  | 70                              |

Source: World Bank Database.

Table 5 Firm Capabilities in Singapore: Various Indicators, 1970-2009

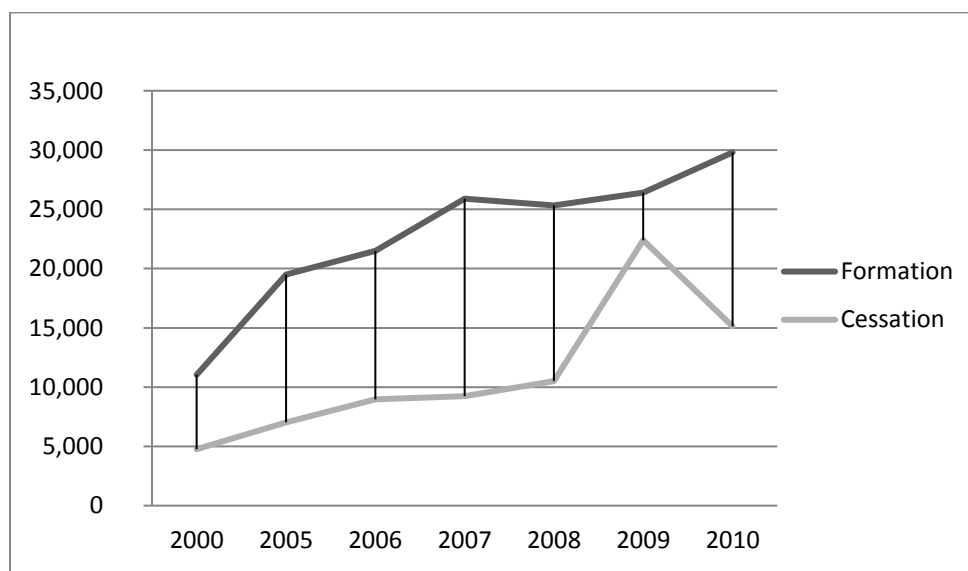
| Year | R&D<br>(% of<br>GDP) | Researchers<br>in R&D per<br>1 million<br>people | Scientific<br>and<br>Technical<br>Journal<br>Articles | Trademark<br>Applications<br>(Direct Non-<br>resident) | Trademark<br>Applications<br>(Direct<br>Resident) | Patent<br>Applications<br>(Non-<br>Resident) | Patent<br>Applications<br>(Resident) |
|------|----------------------|--|---|--|---|--|--------------------------------------|
| 1970 | --                   | --   | --  | 1750   | 1014  | 289  | 1                                    |
| 1975 | --                   | --   | --  | --   | --  | --   | --                                   |
| 1980 | --                   | --   | --  | 3501   | 2072  | 631  | 2                                    |
| 1981 | --                   | --   | 124   | --   | --  | --   | --                                   |
| 1985 | --                   | --   | 289   | --   | --  | 1003   | 4                                    |
| 1990 | --                   | --   | 572   | --   | --  | --   | --                                   |
| 1995 | --                   | --   | 1141  | --   | --  | 2412   | 145                                  |
| 1996 | 1.4                  | 2535   | 1141  | --   | --  | --   | 224                                  |
| 2000 | 1.9                  | 4139   | 2361  | 17062  | 5187  | 7720   | 516                                  |
| 2005 | 2.3                  | 5575   | 3611  | 9885   | 5067  | 8170   | 569                                  |
| 2007 | 2.6                  | 6088   | 3792  | 11170  | 5383  | 9255   | 696                                  |
| 2009 | --                   | --   | --  | 5234   | 4104  | 7986   | 750                                  |

Source: World Bank Databank



**Figure 1** Multifactor Productivity: Contributions to Growth in Real GDP, 1999-2009

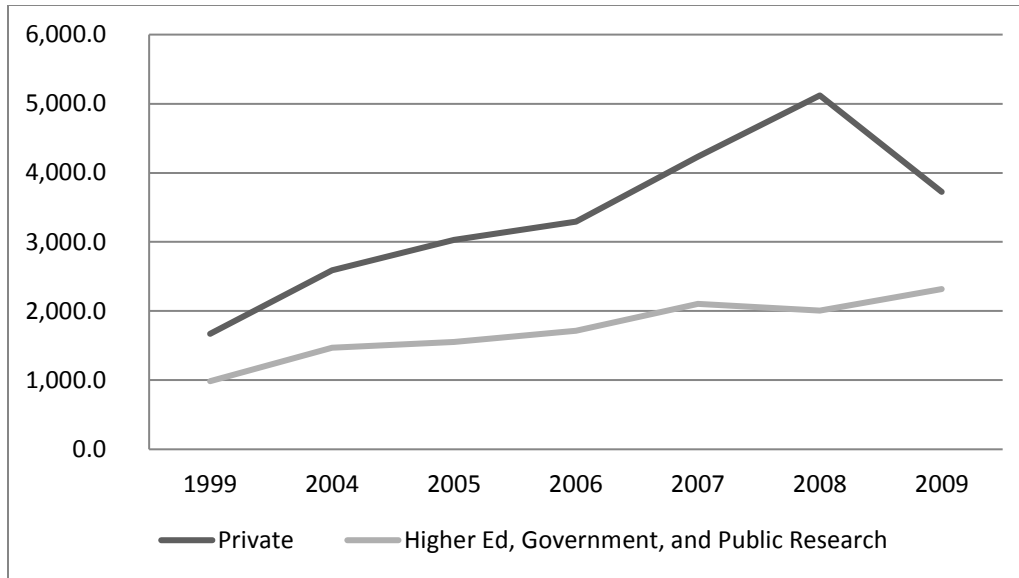
Source: Singapore Department of Statistics.



**Figure 2** Entry and Exit of Firms in Singapore, 2000, 2005-2010

Note: Data on companies and businesses are primarily sourced from the registration records of the Accounting and Corporate Regulatory Authority; Source: Singapore Department of Statistics; <http://www.singstat.gov.sg/stats/themes/economy/com>





**Figure 3** R&D Expenditure by Public & Private Sectors, 1999, 2004-2009

Note: Data on Research & Development (R&D) in Singapore are collected through the National Survey of R&D, conducted annually by the Agency for Science, Technology and Research; Source: Singapore Department of Statistics; <http://www.singstat.gov.sg/stats/themes/economy/rnd.html>