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Structural Changes and the Impact of FDI on Singapore's Manufacturing Activities

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Abstract: *This chapter examines the investment and foreign direct investment (FDI) policy of Singapore's economy in terms of the structural transformation of the economy from 1998 to 2018. The study also examines the impact of FDI on the productivity of the Singapore manufacturing industries in a panel framework from 2017 to 2019. The results indicate that FDI activities have a positive impact on labour productivity. The export activities of multinational businesses have a positive impact on labour productivity. We also observe agglomeration effects from FDI activities (average FDI activities over 3 years) in Singapore's manufacturing industries. However, we observe a negative impact of outsourcing labour productivity. The study also derives policy implications for forward-looking policies in terms of the position of Singapore in the global production value chain.*

Keywords: Structural Transformation, FDI Policy

1. Introduction

Since its independence, Singapore has effectively used the drivers of globalisation to develop its economy and integrate itself into global value-added activities. By attracting foreign direct investments (FDI) to drive its industrialisation, attracting immigrants to augment the domestic population, and adopting an export-driven economic strategy, it has achieved robust and sustained economic growth for the past 4 decades. Excellent infrastructure, as well as strong and stable institutions, has enhanced its returns from globalisation. The results of globalisation are evident in Singapore. Empowered by its strategic location in the Asia-Pacific region, Singapore has one of the most competitive global airlines and airports, an excellent maritime hub, a leading financial centre, and globally competitive manufacturing clusters in electronics, biomedical, and chemical production that are part of the global production networks.

Since the Asian financial crisis of 1997, new economic and social challenges have emerged for Singapore and the Southeast Asian region through globalisation and openness. Although global competition improves the efficiency of domestic industries in terms of adopting new technologies and better organisational structures to remain competitive, it also increases the pace of industrial development of the region and the Singapore economy. Increasingly, Singapore is being pushed into higher value-added activities in both the manufacturing and services sectors to remain competitive. The approach of attracting multinational corporations (MNCs) to augment domestic capital and technologies, although still relevant, is also becoming more challenging as MNCs are becoming more receptive to relocating their activities elsewhere due to new innovations and are seeking higher returns from their operations.

The pace of industrialisation is also increasing the need for a globally competitive human capital and workforce. The transition to higher value-added activities has increased the demand for skilled jobs that complement the new technologies. The pace of industrialisation is much faster than the rate of accumulation of human capital through the polytechnics and universities, resulting in a ‘skill gap’. This means that the demand for new skills has outpaced the ability of the labour market to supply workers with the relevant skills. With the need to anchor multinational activities and facing the ‘skill gap’, the economy is relying heavily on skilled foreign workers to meet these demands. Unlike multinational activities and trade, the movement of people creates additional social costs, such as the taking up of economic and social space as the economy matures.

Although small in size, Singapore continues to benefit from the dynamic gains resulting from its openness and globalisation, as world trade and the global production networks create unlimited opportunities for Singaporeans and domestic firms. Singapore's sustained economic growth depends critically on its links to the global economy and on managing the vulnerability of the economy.

The Singapore economy is strategically aligned to benefit fully from the new emerging opportunities from globalisation. Manufacturing exports are well-diversified in the electronics, chemicals, and biomedical clusters to ride out the external shocks. Increasingly, Singapore's products are also reaching a wider spectrum of export destinations, including China and India. However, to benefit fully from the openness of the economy, Singapore needs to develop its own indigenous technology and local MNCs.

With local technology and domestic MNCs, there can be greater value creation and linkages for the domestic economy to the global production networks. Productivity growth and a flexible labour market are the other key ingredients for Singapore to benefit from a globalised economy.

This chapter examines the investment and FDI policy of Singapore's economy in terms of the structural transformation of the economy from 1998 to 2018. The study also examines the impact of FDI on the productivity of Singapore's manufacturing industries in a panel framework from 2017 to 2019. The study derives policy implications for forward-looking policies in terms of Singapore's position in the global production value chain.

The chapter is organised as follows. The next section provides an overview of the Singapore economy and the structural transformation that is currently being undertaken in the economy. Section 3 discusses the trade and investment policy of the economy. In Section 4, we provide the empirical framework and discuss the key results of the study. Section 5 provides the policy discussions.

2. Singapore's Economy: Dynamic Effects from Structural Transformation

2.1. Overview of the Singapore Economy: Increase in Vulnerability

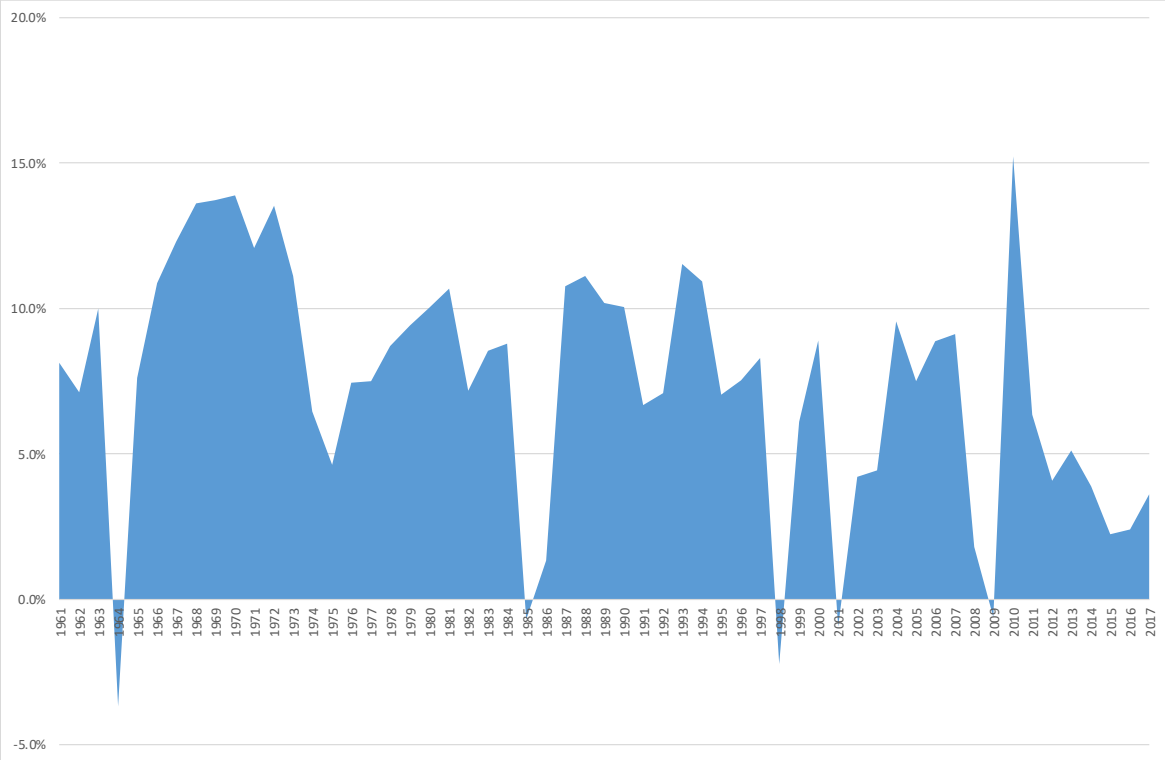
The Singapore economy has experienced one of the highest rates of growth in the world over the past 3 decades, with its gross domestic product (GDP) appreciating at an annual average rate of about 7.6% during the period from 1970 to 2005. Singapore's economic success can be attributed to five factors. First, it has stable and robust institutions that reduce the elements of political and investment risks to the economy, enabling businesses to make future plans with certainty. Second, it has developed its infrastructure extensively, allowing the economy to enjoy stable returns on public and private investments. Third, the government engages in comprehensive long-term planning that looks far beyond the immediate future. Fourth, the country maintains an open economy policy that is focused on maintaining a low tax base and supporting a pro-business environment. Businesses are often involved in policy decisions. Finally, the country places a huge emphasis on human capital development and invests heavily in its population. These fundamentals underpin Singapore's economy and have enabled it to generate stable growth consistently over the decades since independence.

Although the Singapore economy has experienced strong real growth in the long run, the average growth rates reveal that it has been quite fragile in the past decade. The economy has also been experiencing various types of economic shocks, thus rebalancing to a lower level of growth equilibrium. Specifically, following the sharp downturn in the global electronics industry and the sluggish regional and global growth, Singapore has experienced an acute economic contraction in recent years. In 2001, the economy experienced its worst recession in 30 years. The impact on rising rates of redundancies, bankruptcies, financial and asset markets, consumer, and business sentiments has been deep and widespread. The depth of the recession was mainly due to the confluence of negative factors, such as the 2001 September 11 attack in the United States and the global recession that followed, the outbreak of severe acute respiratory syndrome (SARS) in 2003 and avian flu in 2007, the Indian Ocean tsunami of 2004, the Middle East war, oil shocks, and the dot.com bubble crash. These factors emphasise the acute vulnerability of the city-state to external shocks.

Indeed, the Singapore economy has appeared relatively fragile and is at greater risk to boom-bust cycles following the Asian financial crisis. The last few years have revealed

the vulnerability of the economy to business cycles and the degree of fragmentation (industrial process and products broken up into various parts and components due to improvements in technologies) that is occurring in the industries (see Figure 1). In recent years, Singapore has been rebalancing to nearly 4% growth since the global financial crisis from 2008 to 2017. In the period 2014–2019, the economy only registered around a 3% rate of real growth. Since the Asian financial crisis, the city-state has been rebalancing to a lower growth rate due to structural adjustments in the industry. As the economy shifts its activities towards the services sector, the share of the services sector has increased to nearly 65% of GDP and creates nearly over 80% of employment in the domestic economy (Ministry of Trade and Industry, Singapore, 2019).

Figure 1: Singapore's Real GDP Growth Rate, 1961–2017



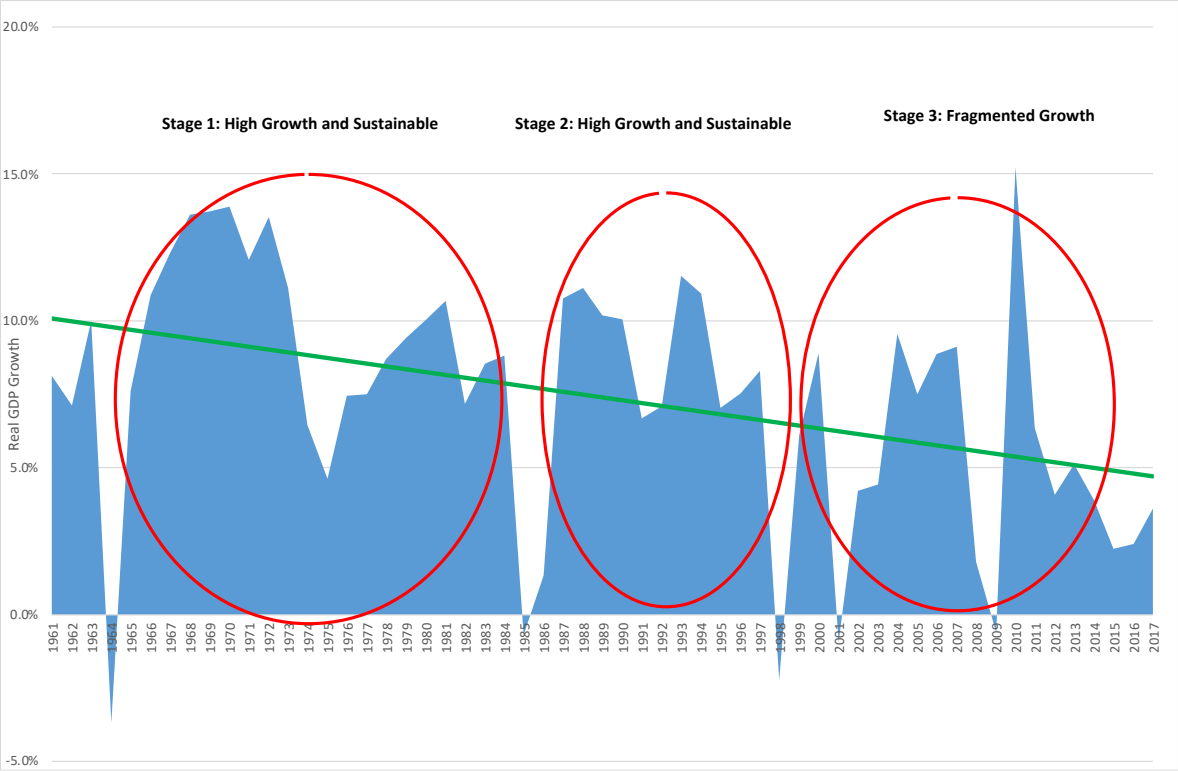
Source: Singapore Department of Statistics.

2.2. Structural Transformation of Singapore's Economy: Three Observed Stages of Development in Singapore

Figure 2 charts Singapore's real GDP growth rate from 1965 to 2017. Singapore's development in this period can be distinguished as three stages of growth, which are visually represented by three distinctive 'chunks' in the figure. In stage one, from 1965 to

the early 1980s, Singapore enjoyed high and sustained economic growth. In stage two, from the mid-1980s to the late 1990s, growth moderated slightly, but it was still fairly high and consistent. The third stage, beginning from 2000, was characterised by volatile and fragmented growth disrupted by episodes of economic contractions and structural changes. In fact, each of these stages is also linked to global production value chain activities and the unbundling of the value chain activities in Asia and the Association of Southeast Asian Nations (ASEAN).

Figure 2: Stages of Growth of Singapore, 1965–2017



Source: Singapore Department of Statistics.

2.2.1. First Stage

In the first stage of growth, a large amount of development came from utilising excess capacity in land and labour. There was strong growth in multinational activities, which spilled over strongly into the domestic economy in the areas of employment, organisational structure, human capital development, trade, and global networks. MNCs helped to make Singapore a manufacturing base, particularly in the electronics industry. Multinational activities were 'lumpy' in terms of creating a large production base in localised activities within the region with linkages across the production base. At this stage, the key linkages

were shipping and logistics. The 'lumpy' and localised activities of MNCs provided a stable framework for industrial policy and human capital development. The 'demand-driven' model of human capital was developed to facilitate and manage the growing demand for occupations and skills in the economy. Singapore's educational institutions and schools had their curricula aligned to meet the growing demand for labour in the economy.

At this stage of growth, FDI activities, especially from Japanese investments, were critical to the building of production bases and networks in Singapore, just as they were in the other newly industrialising countries. This concept is known as the 'flying geese' paradigm, which postulates that less developed countries in a region could be considered as 'aligned successively behind' advanced countries in the order of their different stages of growth, in a wild-geese-flying pattern. The 'lumpy' investments in capital also created strong agglomeration effects and industrial policies, such as clustering, and government-linked companies (GLCs) reinforced the agglomeration effects in the Singapore economy. It was also during this initial period of independence that GLCs such as Singapore Airlines (SIA), Port of Singapore Authority (PSA), and Singtel were created alongside the development of Singapore's infrastructure. Over time, the nature of Singapore's exports evolved from one that was labour intensive to more capital- and semi-skilled intensive. Government policies were also strategically focused on encouraging regional integration and establishing regional production networks, as can be seen in the creation of ASEAN and the ASEAN Free Trade Agreement (AFTA).

Strong institutions and industrial policies to develop land and infrastructure were the key drivers of economic growth in the first stage. Human capital was developed with the implementation of primary and secondary school education, alongside massive investment in educational infrastructure. There was also more creation than destruction in the economy during this phase of growth, and one of the government's development strategies was to create GLCs to leverage economic growth. As GLCs maintained a large amount of domestic content and investment, there was little need to extract a lot of fiscal rent. The advantage of being both a city and a state was apparent in this stage of growth as it enabled Singapore to set up crucial institutions and key infrastructure that permeated the entire economy without much difficulty. The average GDP growth rate was 9.9% from 1965 to 1984, and the economy was driven by a constant stream of capital investments.

2.2.2. Second Stage

During the second stage, hard infrastructure, such as the creation of research universities and science and technology parks, allowed industries to consolidate their strengths and benefit from agglomerative effects. Industrial policies, namely cluster strategies, reinforced the strengths of the economy and targeted quality MNCs to invest in Singapore. In addition, the government had strategically focused on enhancing the soft and hard infrastructure of the chemical and pharmaceutical sectors to deepen their capabilities.

The government also introduced industrial policies, such as the Local Industry Upgrading Programme (LIUP), to strengthen the linkages between small and medium-sized enterprises (SMEs) and MNCs. These programmes provided SMEs with capital subsidies to develop supporting production for MNC supply networks. MNCs were encouraged to groom SMEs that were part of their value chain, with the objective of improving their efficiency and technological capacity. During this time, the economy saw a large increase in electronics contract manufacturing firms, whilst exports diversified into electronics and electrical, chemical, and pharmaceutical products. Policies continued to focus on regional integration and ASEAN but with greater convergence coming from Malaysia, Thailand, Viet Nam, the Philippines, and Indonesia. The convergence in institutions portended less risk in investing in the region and spurred the consolidation of foreign investment activities in Singapore to higher value-added activities that possessed a competitive advantage.

There was a continued push in human capital development, with initiatives and reforms made to secondary schooling, vocational training, polytechnics, and diploma education. Government policies maintained the creation of industries whilst managing the destruction of industries, which resulted in a net creation of enterprises. However, GLCs continued to dominate the domestic economy in terms of production and investments. It was also during this stage in 1987 that Singapore attained developed status. The high savings rate coupled with Central Provident Fund contributions meant that there was less fiscal rent to capture in the economy.

Then, in the early 1990s, there was a shift in government policy towards more market-driven growth. This increased the economy’s shift towards services-oriented activities, and correspondingly the share of the services sector started to increase. The average labour productivity growth rate from 1985 to 1996 was 5.5%. During this period,

real GDP growth was driven mainly by gains in productivity due to the strong investment in domestic content. The average real GDP growth was around 8% during this period.

The end of the Asian financial crisis marked the start of the third stage of Singapore's growth, which was also a fragmented one. The fragmentation of production processes was driven by MNCs due to telecommunication technological developments and the reduction in logistics and transportation costs from economic liberalisation in the region. Production processes were broken down and developed into vertical and horizontal regional and global production value chains based on the factor intensity of production. The lower labour- and capital-intensive production processes were outsourced to the less developed ASEAN countries, with higher value-added activities being retained in the more developed ASEAN countries, such as Singapore. The fragmentation of production reduced the agglomeration effects and agglomeration strategies of the government in terms of clustering and creating the 'twin' engines of growth in manufacturing and services.

An interesting dimension of fragmentation is the development of service linkages and global value chain activities in services (Thangavelu et. al, 2018). Increasingly, stronger growth in services and service sectors is becoming more global in nature. Singapore's service sector share in the contribution to GDP growth has increased with greater value-added activities, as observed in the services trade and exports.

The Singapore economy continued to liberalise towards market-driven growth with a transition to more knowledge-based industrial activities. However, an open and market-based economy such as Singapore is also subjected to greater vulnerability and external shocks. The role of the government in industrial policy was further reduced in favour of encouraging competition in the markets. The average real GDP growth rate was 5.2% from 1997 to 2014, 5.4% from 2007 to 2017, and 3% from 2014 to 2017. The labour productivity growth rate was 0.3% from 2007 to 2013.

Many key electronics manufacturing companies were acquired by foreign companies in the process of market liberalisation. It was, to a certain extent, a missed opportunity to develop Singapore's local MNCs and enable them to become a larger part of the global production value chain with their cores anchored within the country. On the other spectrum, GLCs tended to be in the services sector and had reoriented their growth strategy to investing overseas instead of in the domestic economy. As a result, the traditional linkages between GLCs and investment in the industrial-base in the domestic economy weakened considerably over time.

Government policy during this period also shifted to focusing on building up soft infrastructure due to a workforce that was beginning to age but with an average educational attainment that was only secondary level. Essentially, the labour market faced the looming problem of a vulnerable population that could not participate effectively in the newly emerged market-based economy in Singapore. There were fewer levers of industrial policy to work on; the country had relied mostly on foreign human capital initially to maintain the competitiveness of the domestic economy. This had a positive impact on the exports of the domestic economy. During this period, the government also shifted its fiscal policy from direct regulatory capture (reduction in corporate taxation) to indirect regulatory capture in terms of indirect taxation, such as the goods and sales tax, electronic road pricing, and foreign worker levy.

However, institutions in the region – such as those in Cambodia, Lao PDR, Myanmar, and Viet Nam – were concurrently catching up with Singapore due to greater liberalisation, thereby eroding the competitive advantage of the city-state's institutions. Regional liberalisation unlocked a swathe of labour into the region, which in the process created new opportunities for old methods of labour- and semi-skilled-intensive production to be used again, and opening production opportunities for SMEs. With fewer policy levers to manage the domestic economy, there was a 'hollowing-out' effect in the manufacturing industries, as the level of firm destruction outstripped firm creation. This trend extends to even today.

As the population grew rapidly, the city-state became constrained as the economic capacity was being used up, and the social returns and ratio of space to the population were reduced. After the recovery from the global financial crisis of 2009 and the 2011 general election, there was a sharp shift in foreign manpower policy from high growth to low growth, which dealt a shock to the SME sector. The activities of SMEs had always been focused on cost-based rather than investment-based activities, an outcome driven by the large abundance of relatively cheap labour in the region. The overall development strategy since then was to recalibrate the economy to productivity-led growth, which required deeper adjustments due to the path dependency of the economy attributable to past developments, such as market liberalisation and the structural tilt towards cost-based competitiveness. However, with fewer levers to pull in terms of industrial policy to stimulate the economy, there is less investment in the domestic economy and a weak shift to the next stage of growth.

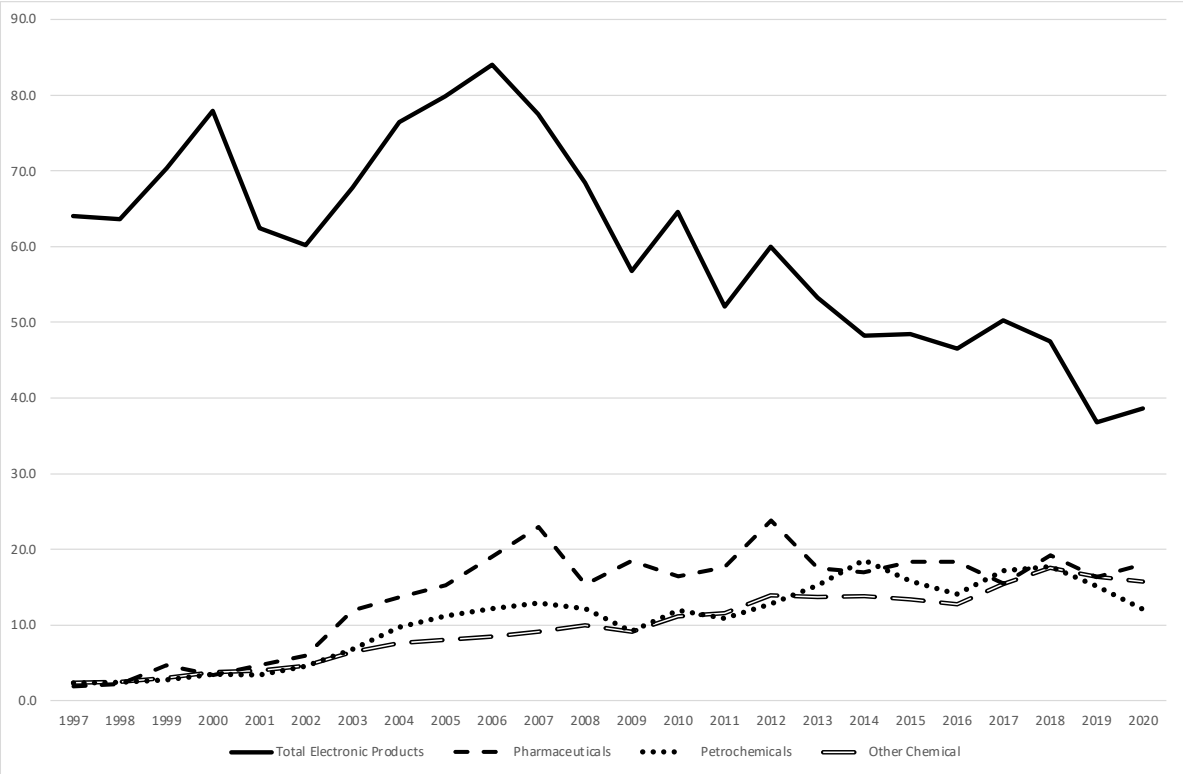
Greater economic shocks were increasing the vulnerability of skilled and older workers, especially professionals, managers, and executives, who have difficulty getting back into the job market and cannot retain previously drawn wages. At this stage of growth, under a market-driven labour market, Singapore is facing the risk of a widening wage gap given that the wages of in-demand skilled workers will increase faster than those of unskilled workers as the country pushes towards a knowledge-based economy.

The SME sector should experience further shrinkage due to the policy of foreign manpower tightening. Labour constraints have led to rising costs of production, reducing export growth in key sectors such as electronics and chemicals as export production relocates to the low-cost economies in the region. The development of crucial infrastructure and institutions adds to the attraction of these regional countries.

The fragmentation of production processes is causing an 'unhooking' effect on Singapore's manufacturing sector from regional and global production value chains, as the export markets for many of the manufacturing industries, such as the electronics industry, are shrinking due to rising labour costs, the lack of indigenous technologies, and catch-up by other regional economies (Figure 3). A weakening growth trend can also be observed in the chemicals industry with export stagnation (flat export growth) since the global financial crisis.

Figure 3: Singapore's Exports of Electronic, Pharmaceuticals, Petrochemicals, and Other Chemicals, 1997–2020

(S$ million)



Source: Singstat.

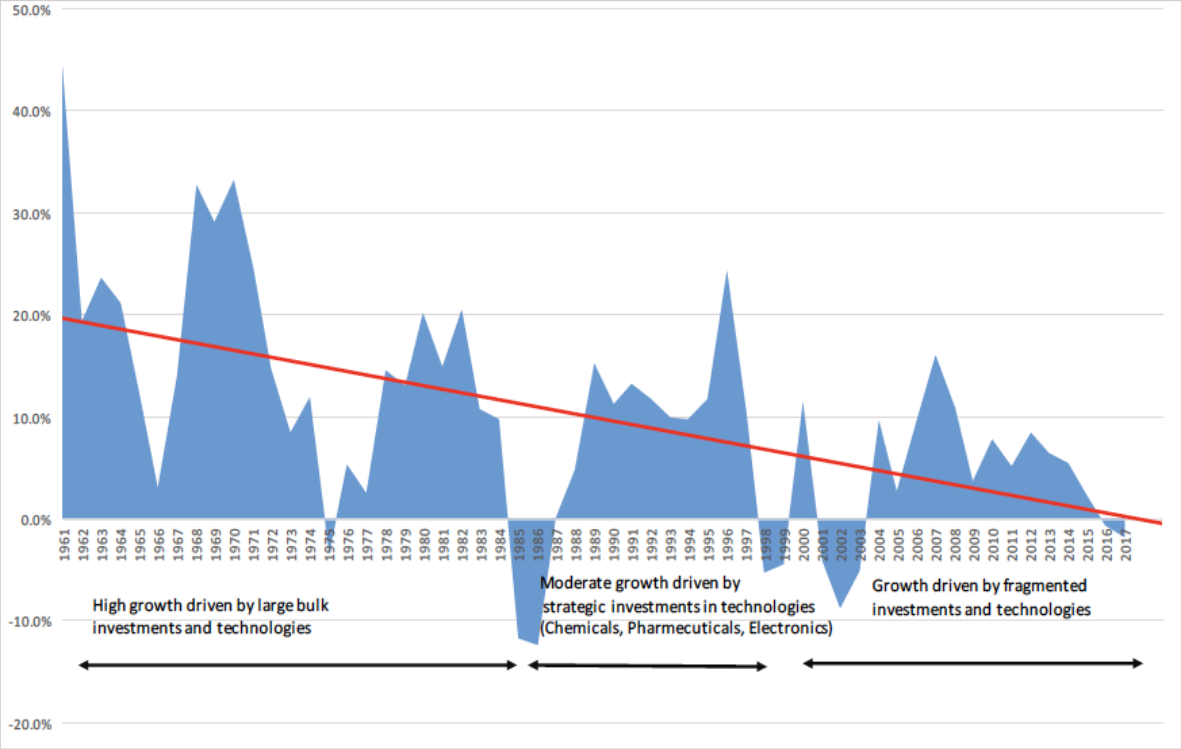
2.2.3. Third Stage

In the current third stage of growth, Singapore is experiencing a strong shift towards the services sector and services exports. However, it is difficult to maintain the same level of technology or advance to higher technology-based activities based purely on services sector development. There is a pressing need for the manufacturing sector to form linkages with and complement the development of the services sector. But with a large part of the economy already shifted heavily to the services sector due to the thinning of Singapore's industrial base that was established in the first and second stages of growth, there are few levers available to pull for the next phase of industrial development.

Investments in the domestic economy in the form of capital formation reflect a long-term downward trend (Figure 4), which, if continued, poses a concern. In the first stage, the bulk of investments was channelled into building a solid foundation of industrial infrastructure and institutions for the country. These came in the form of education, public housing, and industrial estates. The second stage saw the consolidation of the investment

base as the government adopted a cluster strategy approach and developed, amongst others, dedicated science parks, petrochemical islands, and vocational training institutes. At this stage, there was stronger complementarity between human capital development and the technologies adopted in the economy. The third stage marked a distinctive shift in policy as the government ceded large control of the economy to the market, reducing the role of industrial policy. At the same time, private investment into local content, which is important for productivity gains, has been declining.

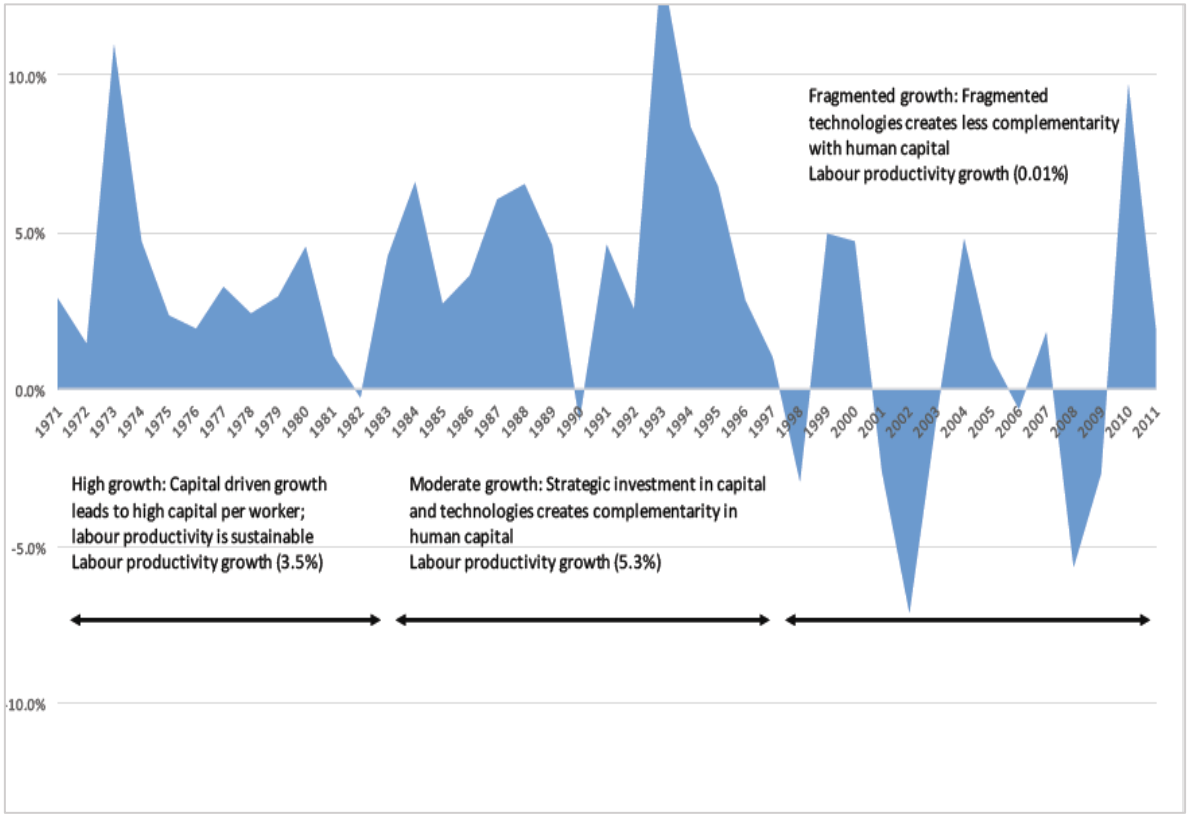
Figure 4: Rate of Growth of Gross Fixed Capital Formation in Singapore, 1965–2014



Source: Singapore Department of Statistics.

In line with the decline in domestic capital formation, we also observe a decline in labour productivity (see Figure 5). The average yearly productivity growth from 1971 to 1984 was 5.3%. In the third stage, there was a policy shift under which the service sector expanded its share of the economy. Less investment was made in the local economy, which reduced the investment base to drive productivity. Productivity growth since then has been subdued, fraught with periods of contraction. Growth averaged 0.3% from 1997 to 2004 and 0.1% from 2005 to 2014.

Figure 5: Labour Productivity of Singapore, 1965–2017



Source: Singapore Department of Statistics.

3. Trade, Foreign Direct Investment, and Investment Policy

The Singapore Government has a policy of actively encouraging FDI inflows. Established in 1961, the Economic Development Board (EDB) is a one-stop agency for leading Singapore's industrialisation drive by encouraging export-oriented FDIs into Singapore. To this end, the EDB has worked very closely with various ministries and other government bodies to facilitate FDI in key strategic industries. Whilst the initial emphasis of the EDB was on labour-intensive manufacturing, over the years, the focus has shifted. It now encourages inflows in higher value-added areas and skill-intensive manufacturing activities, as well as knowledge-based professional sector activities, such as financial services, information and communications technology services, and offshore services.

Table 1: Main Manufacturing Industries in Singapore

Manufacturing	- Electronics clusters (semi-conductors, data storage and imaging products, computers, communications and consumer electronics, key modules, and devices) - Chemical clusters (petroleum, petrochemical, pharmaceutical, and chemicals) - Engineering clusters (precision engineering, process engineering, and transport engineering)

Source: EDB, Singapore.

Table 1 shows the list of the main manufacturing industrial clusters in Singapore. International businesses are encouraged to establish research and development (R&D) facilities in Singapore and to use the country as international or regional headquarters. With the focus of Singapore's FDI promotion being on developing key clusters, the EDB has concentrated on the chemical, electronics, and engineering clusters, all of which have become key economic engines of growth. More recently, emphasis has been on product development, biomedical research, educational, and healthcare services.

Singapore does not impose any restrictions on foreign ownership in manufacturing activities, but it maintains restrictions on key strategic sectors, such as those pertaining to national security (arms and ammunition) and certain services. However, since the late 1990s, the government has been liberalising the services sector by relaxing foreign ownership in key industries. Whilst the 40% limit on the foreign ownership of local banks was lifted in 1999, the 70% limit on foreign ownership was removed in 1999. Foreign ownership restrictions in the telecommunication sector were completely removed in 2002. However, the government still maintains ownership restrictions in specific professional services, such as air transport, law, and media (newspaper publishing and broadcasting). Overall, the government neither screens FDI inflows nor maintains policies on performance requirements, and it has liberal investment regulations.

Singapore has largely complied with World Trade Organization (WTO) Trade-Related Investment Measures (TRIMS) obligations. It has signed investment guarantee agreements with its ASEAN members and other countries. These agreements offer mutual protection of citizens or companies of either country against war and non-commercial risks

of expropriation and nationalisation. Similarly, it has signed a few trade pacts, most of which offer some form of investor protection.

4. Impact of Foreign Direct Investment on the Singapore Economy

Exports are critical to the development of Singapore's economy, with the export-to-GDP ratio standing at 175% in 2019.[1] On the other hand, the large push for foreign investments has resulted in FDI inflows to the country growing at an average annual rate of 17% over the past 2 decades (Department of Statistics). The economic policies to attract FDI are aimed at bringing positive spillovers to the domestic economy. Foreign investments have a direct impact on domestic growth, thus increasing the domestic capital stock, which is subsequently used by firms to boost their production. Additionally, FDI is also associated with technology transfers and knowledge spillovers that will benefit the domestic economy (Gorg and Greenaway, 2004; Greenaway et. al, 2007). The inflow of foreign capital is often accompanied by transfers of advanced technologies or management skills to domestic firms. By learning from their foreign counterparts, local companies will improve their production techniques and managerial abilities, hence leading to an increase in domestic productivity.

The rapid growth of the manufacturing sector in Singapore can be attributed to the large presence of MNCs in the sector (stages 1 and 2). Approximately 36% of all FDI inflows to Singapore are absorbed by the manufacturing sector. Hence, this sector has experienced an average annual growth rate of 14% over the past 2 decades. The continuous stream of investments into this sector from overseas has thus improved its technical knowledge and production abilities. The manufacturing sector is continuously undergoing structural transformations, including its key policy focus on the production of high value-added manufactured goods, such as pharmaceutical and petrochemical products (Anwar, 2008).

FDIs have also boosted employment levels in Singapore, through the establishment of MNCs in the domestic economy. By investing in the training and education of human capital, these MNCs have enhanced the pool of skilled workers, thus enabling Singapore to compete and advance in the global economy (Thangavelu, 2017, 2016). Whilst there has been ongoing discussion in the economic literature regarding the relationship between FDI

[1] See ADB Statistical Database: https://kidb.adb.org/economies/singapore

and economic growth, these studies have failed to conclusively define the connection between these variables. Whilst some studies suggest that FDI has a negative impact on domestic productivity as it decreases the demand for local products (Aitken and Harrison, 1999), others postulate that the positive impact of FDI is conditioned on domestic factors, such as economic policies and human capital development (Balasubramanyam et al., 1996).

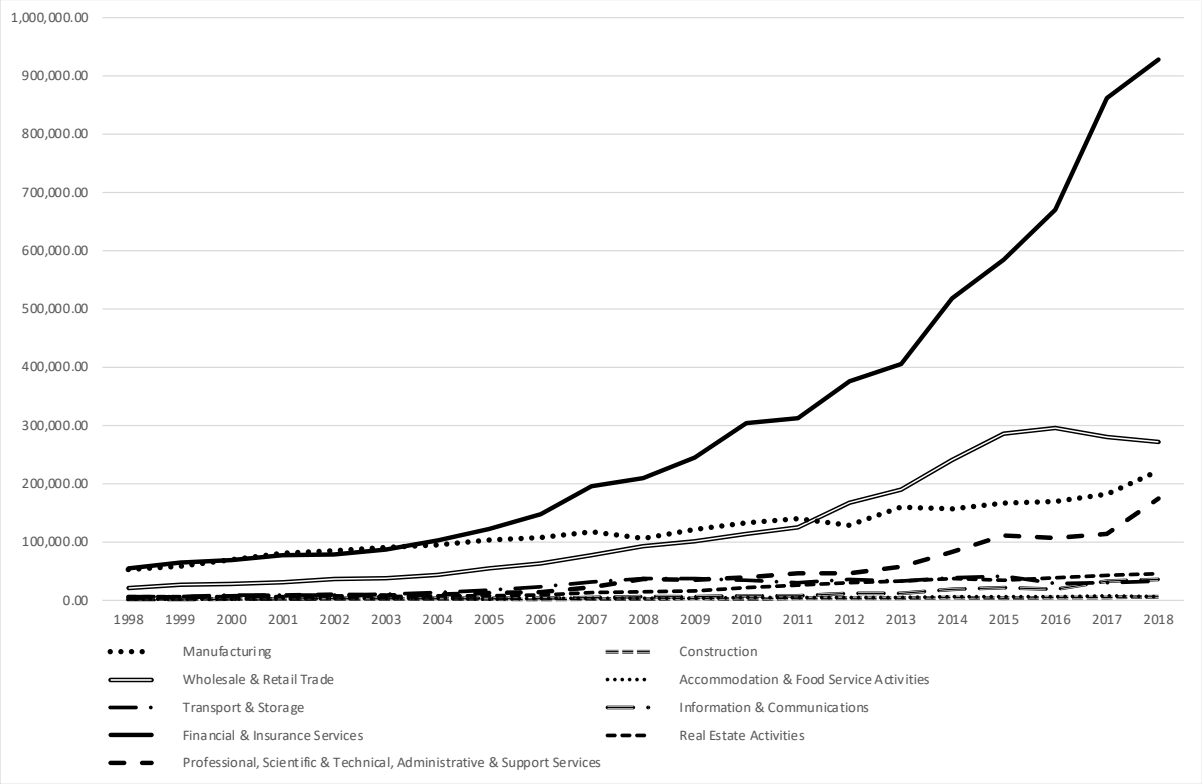
Singapore is also supporting the deeper integration of FDI activities to the region and global value chains through the promotion of bilateral and multilateral free trade agreements (FTAs) especially in the third stage of growth after the Asian financial crisis. Whilst FTAs are not an entirely new component of Singapore's commercial trade strategy, they are the cornerstone of the city-state's larger international economic policy. FTAs provide Singapore with a vital link to new markets and international economies. An ardent supporter of the global trading system, Singapore has actively pursued a second track to liberalisation via the regional route in the 1980s and 1990s. Empirical evidence has also shown the effectiveness of international investment agreements, such as bilateral investment treaties and regional trade agreements (RTA)s, in attracting FDI (Urata, 2015). Urata (2015) found that Japan's RTAs contributed to an expansion of Japan's FDI to its RTA partner countries.

4.1. Key Trends of FDI Activities in Manufacturing Industries in Singapore: 2012–2019

Currently, as Singapore structurally transforms to more service and value-added activities in the GVC, the FDI activities also complement the shift towards more services and value-added activities.[2] The key trends of FDI activities in Singapore in manufacturing activities are discussed in this section. FDI activities by key industries in Singapore are presented in Figure 6. The key sector driving FDI activities in Singapore is the service sector, particularly the financial sector.

[2] The current discussion is on the third stage.

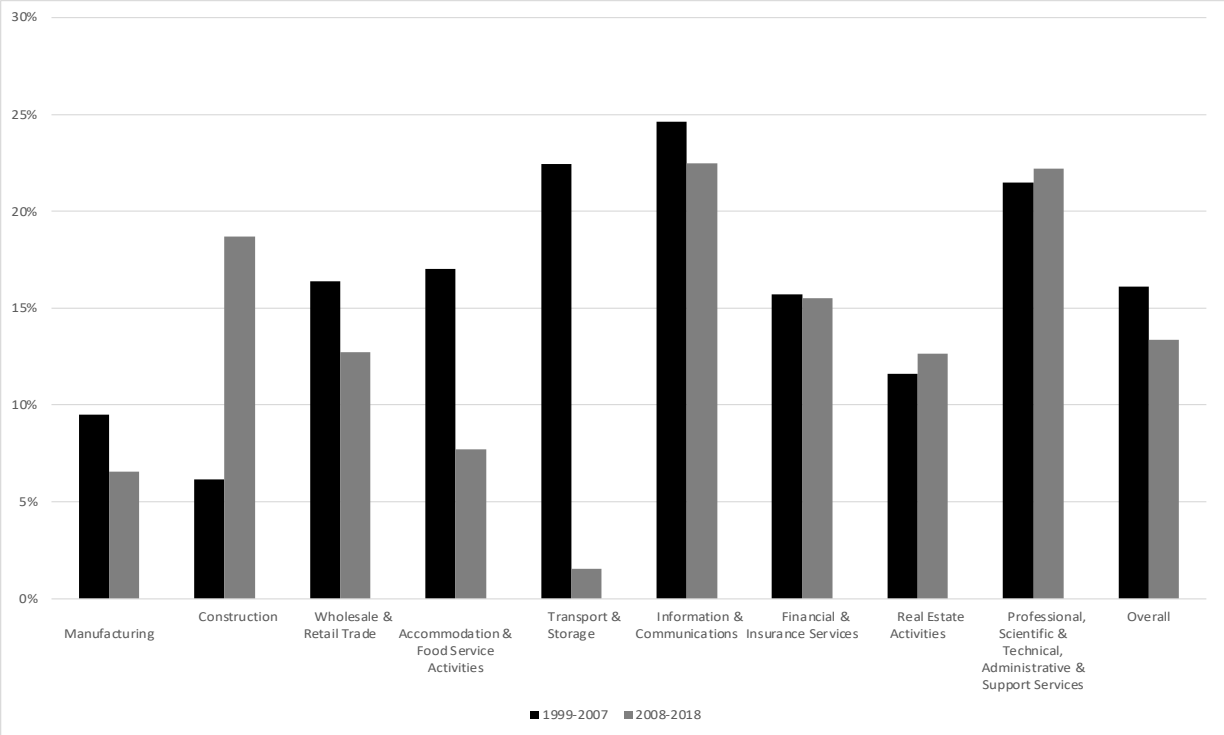
Figure 6: FDI Activities in Key Industries in Singapore, 1998–2018
(S$ million)



Source: Singstat, Department of Statistics, Singapore.

We observe a strong rising trend of FDI activities in the finance and insurance sector in Singapore since the global financial crisis. FDI activities in the finance and insurance sector increased to over S$9 billion in 2018, a 3-fold increase from around S$3 billion in 2008. We observe a slower rate of increase in FDI activities in manufacturing activities in Singapore after the global financial crisis. In 2008, FDI activities in manufacturing were around S$10.5 billion, and this increased to only S$22.1 billion in 2018, a slow pace of growth. The slow FDI activities in manufacturing are again an indication of structural transformation in the Singapore economy (see Figure 7). There is a significant decline in the average growth rate of FDI in manufacturing industries, declining from nearly 10% in the 1999–2007 period to nearly 7% in the 2008–2018 period. We also observe a significant decline in FDI in transport and storage, accommodation and food services, and wholesale and retail trade. There is a large increase in FDI activities in construction activities. We do not observe any large increase in the average growth rate of FDI in financial and insurance services in Singapore between 1999–2008 and 2009–2018, which reflects the volatility in FDI flows to financial and insurance services.

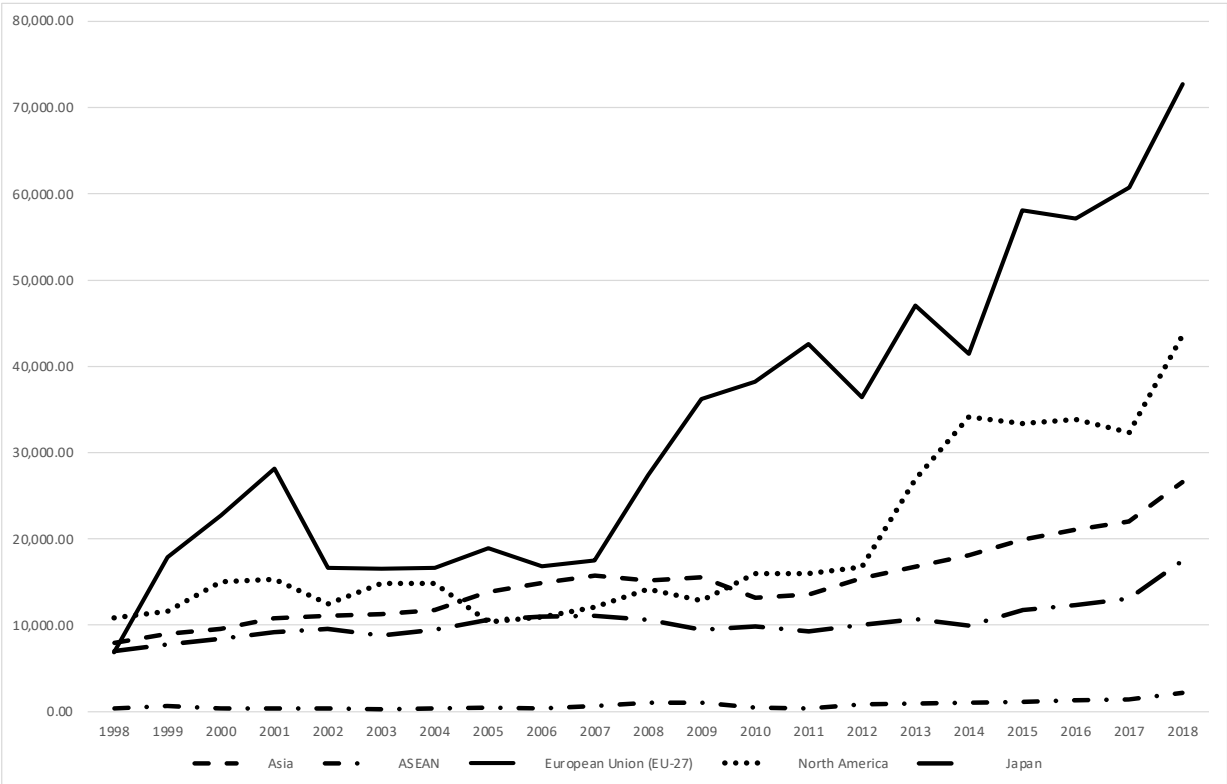
Figure 7: Average Growth Rate of FDI in Key Sectors in Singapore, 1999–2018



Source: Singstat, Department of Statistics, Singapore.

Figure 8: FDI Activities by Source Country/Region in Manufacturing in Singapore, 1998–2018

(S$ million)



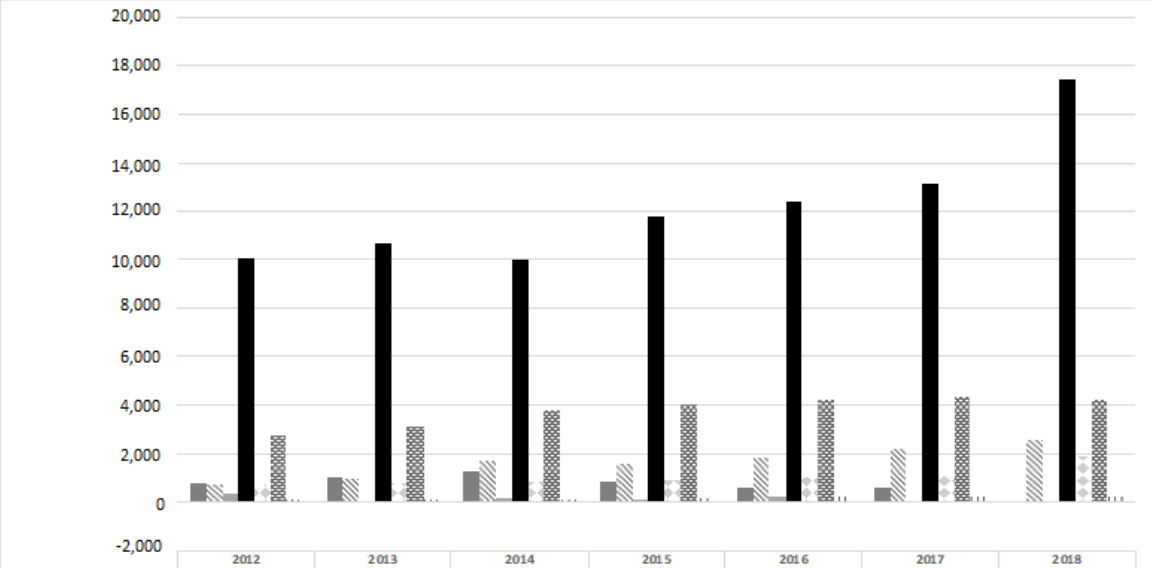
Source: Singstat, Department of Statistics, Singapore.

The FDI activities by source country/region in manufacturing in Singapore from 1998 to 2018 are presented in Figure 8. We observe a rising trend in FDI activities from the European Union (EU-27) after the global financial crisis. In 2006, the EU-27 invested around S$16 billion in manufacturing activities, and this increased to nearly S$72 billion in 2018. We also observe a strong rising trend in FDI activities in manufacturing from North America after the global financial crisis. Investment from Asia also shows a rising trend in the years from 2012 but at a slower pace. We also observe that the intra-ASEAN FDI activities were slow and weak as there was a very low share of FDI activities from ASEAN.

FDI activities by selected Asian countries in manufacturing activities in Singapore from 2012 to 2018 are shown in Figure 9. Japan is the leading country investing in manufacturing activities in Singapore. Japanese investment in manufacturing activities in Singapore increased from S$10 billion in 2012 to nearly S$17 billion in 2018. We also observe a rising trend in FDI activities from Hong Kong, Taiwan, and Malaysia in manufacturing activities in Singapore. The FDI activities by Japan, Hong Kong, Taiwan, and Malaysia in the manufacturing activities clearly reflect the GVC activities in the region.

Figure 9: FDI Activities in Manufacturing by Selected Asian Countries in Singapore, 2012–2018

(S$ million)

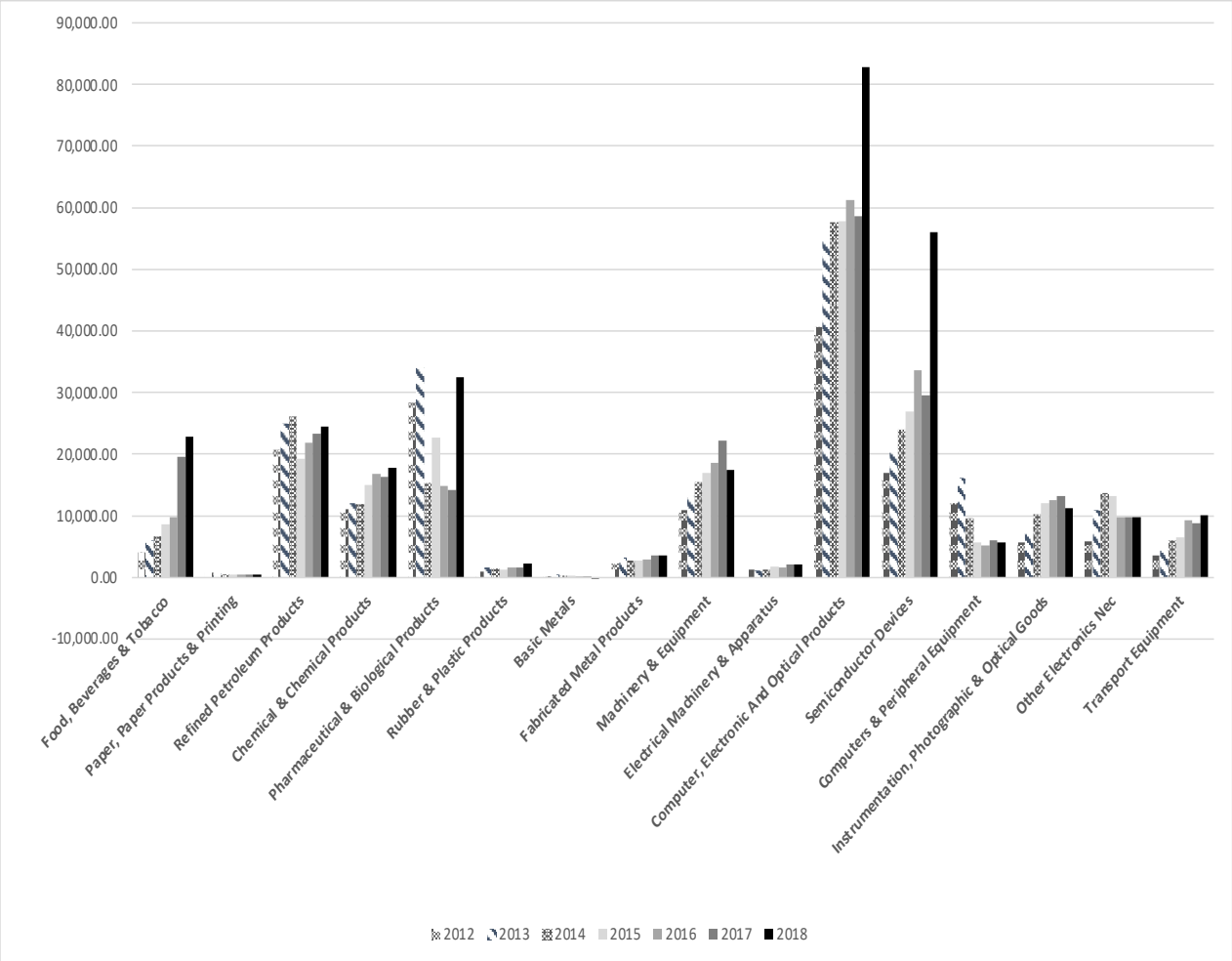


	2012	2013	2014	2015	2016	2017	2018
Mainland China	742.4	1,011.40	1,283.40	847.9	597.5	557.9	28.1
Hong Kong	732.5	949.6	1,699.30	1,585.30	1,791.90	2,165.80	2,512.20
India	328.8	71.7	159.5	82.7	252	37.8	-21.2
Japan	10,027	10,700.30	9,959.30	11,797.70	12,368.70	13,107.30	17,413.50
Malaysia	738.4	744.1	802.8	891.6	1,049.40	1,099	1,870.50
Taiwan	2,739.80	3,135.20	3,774	4,036.70	4,208.90	4,370.30	4,236.50
Thailand	90.9	119.1	119.1	146	227.5	257.3	227.3

Source: Singstat, Department of Statistics, Singapore.

The GVC activities driven by FDI in manufacturing are given in Figure 10, which shows the manufacturing industry-level activities. The key FDI activities are in (a) computer, optical and electronics; (b) semiconductor products; (c) pharmaceutical and biological products; (d) refined petroleum products; (e) chemical and chemical products; (f) food, beverage and tobacco. The key industrial activities that will drive the global value chain activities are the computer-related and semiconductor manufacturing activities in regional and global GVC activities. We hope the GVC activities will also induce pharmaceutical and bio-medical activities and chemical products manufacturing, however the scope for deeper GVC activities is hampered by the lack of indigenous innovation and R&D activities in Singapore's activities. The government is trying to build more R&D linkages and activities through incubators and science parks and also linkages to universities in Singapore. The government also provides key investment incentives and financial support for local companies to develop key research fundamentals to participate in the pharmaceutical and biomedical activities in the region. This industry will be critical for post-pandemic manufacturing activities in Singapore.

Figure 10: FDI Activities in Key Manufacturing Industries in Singapore, 2012–2018
(S$ million)



Source: Singstat, Department of Statistics, Singapore.

5. Impact of FDI on Manufacturing Efficiency in Singapore: An Empirical Analysis

We examine the impact of FDI on manufacturing productivity at the industry level from 2017 to 2019. We obtained the data on industry-wise output, employment, material inputs, direct exports, number of firms in operation, and gross fixed assets from the Annual Census of Manufacturing Activities conducted by the Economic Development Board of Singapore. We aggregate the SITC two-digit level industry data of the census to comply with our industry classification and match this with the FDI inflows from the Foreign Equity Investment survey. Our study includes panel data for 2017–2019. All variables are based to 2018 prices.

We measured the productivity at the industry level by labour productivity given by the output per worker. We also examined the accumulative effects of FDI on the productivity of the manufacturing industries by (a) lagged FDI by industry and (b) 3-year average FDI by industry (accumulation effects). The accumulative effects of FDI represent the agglomerative effects of FDI activities in the key manufacturing activities (Howard et al., 2016). We also included industry agglomeration by the number of establishments at the industry level and also the outsourcing effects represented by the number of activities outsourced by industry. The GVC impact in our model is given by the imports of material inputs. We estimated the model by fixed effects and a generalized method of moments (GMM) estimation framework. All our variables are given in natural logs. The descriptive statistics of the key variables are provided in Annex 1.

The results of the fixed effects are given in Table 2. We observe a positive impact of exports on labour productivity in the manufacturing industries. The result indicates a positive impact of FDI and export activities on the labour productivity of the manufacturing industries in Singapore.

We also observe a positive impact of imports of material inputs and fixed capital stock on manufacturing labour productivity. Lagged FDI has a positive impact, and this is reflected by the persistence of FDI activities. The persistence and agglomerative activities of FDI are also given by the positive coefficient of the 3-year averaged FDI inflows in the manufacturing industries. However, we did not find any industrial agglomeration given by the number of establishments at the industrial level. The result also indicates a negative coefficient for the lagged labour productivity measure, which is statistically significant. The negative impact of the labour productivity result might be due to weak learning effects

from labour, the weak domestic capacity of local companies, and also a lack of skills to match the technologies of FDI activities in the manufacturing industries.[3]

Table 2: Results of Panel Data with Fixed Effects Estimation on the Impact of Exports and FDI on Productivity for Singapore's Manufacturing Industries: 2017–2019

	Fixed Effects	**Fixed Effects**
Ln (Export)$_t$	0.105**	0.097**
	(2.210)	(2.170)
Ln (Material Imports)$_t$	0.590**	0.610**
	(5.970)	(6.530)
Ln (Fixed Assets)t	0.351**	0.346**
	(3.640)	(3.680)
Ln (FDI)$_{t-1}$	0.055*	-
	(1.850)	
Ln (Avg FDI 3 years)$_{t-1}$	-	0.053**
		(2.100)
Ln (Agglomeration)$_t$	-0.511**	-0.524**
	(-8.110)	(-9.190)
Ln (Outsourcing)$_t$	-0.047	-0.035
	(-1.000)	(-0.840)
Ln (Labour Productivity)$_{t-1}$	-0.085*	-0.085*
	(-1.730)	(-1.800)
Constant	-2.139**	-2.200**
	(-5.440)	(-5.760)
R-squared	0.949	0.9419
Observations	75	75
Industry effects	Yes	Yes

*: 10% level of statistical significance; **: 5% level of statistical significance; ***: 1% level of statistical significance.
Source: Author's calculations.

The fixed-effects panel estimation is likely to have endogeneity effects from FDI activities, as more efficient and productive firms will attract more FDI activities. We adopt the GMM estimation framework to manage the endogeneity effects in our estimation. The results of GMM estimation are given in Table 3.

[3] See Blundell and Bond (1998) on production function estimation for the persistence of productivity variables. There could be persistence in the capital and labour inputs that also creates persistence of labour productivity over time. The persistence of productivity reflects the learning and dynamic spillover effects over time from technology.

The results of the GMM estimation are consistent with the panel fixed effect estimation. As with the fixed effects estimation, we observe a statistically significant impact of exports on labour productivity. We also observe a positive impact of imports of material inputs and fixed capital stock on the labour productivity of the manufacturing industries. The FDI variables of the lagged FDI and 3-year averaged FDI show a positive and statistically significant impact on labour productivity. As with the fixed-effects panel estimation, we do observe a negative impact of industrial agglomeration on labour productivity.

Table 3: Results of the GMM Estimation on the Impact of Exports and FDI on Labour Productivity for Singapore's Manufacturing Industries: 2017–2019

	Labour Productivity	**Labour Productivity**
Ln (Export)$_t$	0.107***	0.097***
	(21.230)	(8.710)
Ln (Material Imports)$_t$	0.599***	0.607***
	(6.190)	(6.430)
Ln (Fixed Assets)t	0.333**	0.350**
	(2.190)	(2.920)
Ln (FDI)$_{t-1}$	0.058***	-
	(5.110)	
Ln (Avg FDI 3 years)$_{t-1}$	-	0.053***
		(6.920)
Ln (Agglomeration)$_t$	-0.501***	-0.526**
	(-16.610)	(-46.160)
Ln (Outsourcing)$_t$	-0.047*	-0.035
	(-1.870)	(-1.240)
Ln (Labour Productivity)$_{t-1}$	-0.086**	-0.087**
	(-2.330)	(-2.850)
Constant	-2.170**	-2.200**
	(-16.420)	(-17.840)
Observations	65	65
Industry effects	Yes	Yes
Sargan over-identification test	43.88	46.10
	(p-value =0.681)	(p-value =0.7376)
2nd autocorrelation test	1.726	1.702
	(p-value =0.084)	(p-value =0.088)

*: 10% level of statistical significance; **: 5% level of statistical significance; ***: 1% level of statistical significance.
Source: Author's calculations.

The GMM estimation has to be consistent and stable for the use of lags as instruments. The Sargan over-identifying test indicates that we cannot reject the null of over-identifying restrictions, thereby indicating the instruments are appropriate. The 2nd autocorrelation test is rejected at a p-value of 5% level of statistical significance, indicating there are no autocorrelation effects in our estimation.

6. Policy Conclusions

With Singapore's status as a small open economy, it relies heavily on foreign investments for its sustained growth. The government's dependence on foreigners for capital investments can be attributed to the lack of indigenous technology and natural resources in the country. The general policy of the government is to encourage foreign investors by offering various tax incentives whilst placing limited restrictions on the foreign ownership of local operations.

Recent evidence has indicated that the vulnerability of the Singapore economy has increased due to external shocks and globalisation with greater fragmentation in the industries. The traditional institutional framework of attracting multinational activities and FDI through the EDB is also becoming increasingly challenging due to global production fragmentation and the difficulties in attracting high-technology investments in the economy. The traditional fundamentals, such as infrastructure, efficient and stable political institutions, and human capital development, are creating fewer returns to the Singapore economy. This is due to greater convergence across emerging Asian countries in adopting and imitating the institutional and infrastructure development of Singapore. With the city-state's ageing population, the returns on human capital are also eroding due to greater fragmented technologies and investments that are 'destructive' to human capital development. This is because the rate of developing and accumulating new skills from new technologies is taking longer to acquire compared to the rate of growth of new technologies. As Singapore gets closer to the technology frontier, the rate of technological innovation is rapidly accelerating and human capital developing in the ageing labour force as Singapore is trying to keep pace and catch up with the new technologies. The government's new initiative to develop key future skill-sets and portfolios of skills to

manage the 'creative-destruction' of new technologies is critical to maintaining the competitiveness of workers in regional and global value-chain activities.[4]

In the past, Singapore attempted to attract foreign investors through a series of tax exemptions and concessions. For example, foreign companies were offered concessionary tax rates when they established their international headquarters in Singapore. Similar tax rates were offered to companies embarking on projects that brought significant economic gains to Singapore. Whilst such incentives have proved to be successful in the past, their effectiveness in attracting new FDI inflows has decreased in view of the current economic environment. Further, higher value-added FDI activities are attracted by key fundamentals of the domestic economy, such as indigenous technology, skilled human capital, and hard and soft infrastructure (Brussevich, 2020; Ghazanchyan et al., 2018, Thangavelu and Narjoko, 2014; Thangavelu, Urata, and Ambaw, 2022). Emerging economies like China and India are offering similar tax incentives, and when these are coupled with the lower labour costs, there are strong grounds for MNCs to relocate their operations to these countries.

Hence, the government needs to identify more innovative methods to stimulate FDI inflows to the economy to shift to higher value-added activities in the GVC.

1. More emphasis should be given to developing Singapore's indigenous technology. As it is unable to compete with the low labour costs in developing countries, Singapore should instead focus on moving up the GVC by producing more sophisticated products and services. This has been achieved to some extent as the focus of the manufacturing sector has shifted from the production of low value-added goods (such as basic parts and components) to high value-added goods (sophisticated electronic parts and components, biomedical, chemicals, and petrochemicals) over the years. However, the technology base should be extended to more local companies and local technologies to push for deeper vertical integration into the regional and global supply chains. This integration could be driven by more innovation in both manufacturing and services industries. Also, Singapore should continue to broaden its manufacturing base by increasing its production of technology-intensive goods. Such developments will attract higher quality foreign investments that are accompanied by more advanced technological expertise.

[4] See Singapore Future Skills framework: https://www.skillsfuture.gov.sg/skills-framework

2. There is an urgent need to emphasise the development of human capital to undertake different tasks, as the country will face greater third-stage GVC unbundling in the skills of workers. For the past decade, the shift to high technology-intensive activities in the manufacturing sector has been accompanied by an increase in R&D activities in the local economy. The government has offered various incentives to attract MNCs to relocate their R&D activities to Singapore. For example, R&D facilities, such as the Singapore Science Park, have been set up as technological hubs for innovation and invention. Other facilities include Fusionopolis and Biopolis, which were designed to boost scientific research. However, the provision of physical infrastructure alone is insufficient to foster foreign investments. Human capital is also an important factor as MNCs need highly educated or skilled workers to conduct research and for technology transfers from MNCs. Hence, government spending on education should be increased.
3. There is a need to develop critical domestic absorptive capacity in innovation in terms of SMEs and local talent. To maximise the effect of FDI on the domestic economy, emphasis should also be placed on the development of local innovations. Studies have indicated that Europe and the United States experienced high FDI inflows due to their strong fundamentals in technology and human capital (Balasubramanyam, et al., 1996). The fostering of local technological advancements will attract foreign investors who are keen to learn from the expertise of domestic firms. The development of a strong local knowledge base will also allow for easier absorption of the technologies brought by MNCs. The development of local SMEs and local talent will generate a strong impact in terms of services sector development that creates service linkages in the globalised environment.
4. Increase market access through regional and multilateral FTAs. The recent development of the Regional Comprehensive Economic Partnership in East Asia is a good direction for Singapore to develop strong market access to higher value-added activities in both manufacturing and services. Such multilateral trading platforms allow the structural transformation of the Singapore economy to higher value-added activities in the GVC. As Singapore develops stronger innovative capabilities in service sectors, such as financial, professional, logistics, and telecommunication services, the impact of digitalisation in the post-pandemic recovery will provide greater opportunities for Singapore to attract and retain higher-quality FDI activities in the region.

5. Singapore should emphasise greater liberalisation in the service sectors in ASEAN and the East Asian region. The level of services liberalisation is not as progressive as with manufacturing sector liberalisation. The impact of the COVID-19 pandemic will hamper the liberalisation of the services sector due to issues related to the limited movement of people. Thus, there is a stronger need to push for greater services liberalisation and investment in service industries in the ASEAN region.

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Annex 1

Descriptive Statistics

Table A1: Descriptive Statistics (Ln)

	Mean	Standard Deviation	Min	Max
Labour Productivity	6.125	1.264	4.219	9.188
FDI	7.605	2.129	3.058	11.323
Exports	13.966	2.581	8.935	18.635
Materials	14.222	2.067	10.022	17.875
Fixed Assets	13.422	2.125	9.068	16.883
Average FDI	7.330	2.191	1.860	11.120
Agglomeration	11.092	2.601	5.558	15.586
Outsourcing	11.252	2.588	4.060	16.344

Source: Author's calculation.

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