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RISING COSTS IN SINGAPORE

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Chapter 5: Market Structure and Rising Costs

Chapter 6: Building Towards a Cost Function Analysis

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PREFACE

One of the key challenges identified by the business sector in Singapore has been that of rising costs. The Economics and Business Research Cluster in the Institute of Policy Studies believes that it is timely to take a step back to understand the issue fully, by defining the problem carefully and exploring some unconventional ideas as to the genesis of the cost problem.

Rising costs per se may not be a problem. It becomes a challenge when Singapore's costs rise faster than those of its trading competitors and when these costs hurt the profitability of locally based enterprises to such an extent that a painful economic adjustment is warranted.

The aim of this volume is not to provide the final answer on the challenge of rising costs. Rather it is meant to provoke thought and lay the grounds for further research in the future. Only through these means can Singapore come to grips with what the cluster believes is a serious economic challenge.

EXECUTIVE SUMMARY

In this report, it is seen that a confluence of demand-side and supply-side factors arose to generate inflation in Singapore. High rates of population growth were a primary driver that led to shortfalls in housing supply. The supply-demand imbalance accelerated home prices and construction activity. This led to overheating in the construction sector, which spilled over to the real economy given the strong output multipliers and backward linkages in the sector.

In addition, global liquidity inflows as well as the liberalisation or privatisation of HDB resale, retail and industrial markets contributed to the acceleration of asset prices and rents. This in turn led to high growth in private household credit and property prices, and a feedback loop of rising credit and prices was averted through successive macroprudential policies and cooling measures.

The high-cost economy marks a shift towards a higher value-added economy; but this has created a distribution of wealth towards the asset-rich. High inflation in the context of stagnating productivity and wages — driven in part by high rates of immigration of low-skilled workers from 2006–2012 — has led to major distributional impacts on the poorest in society, which have not yet been fully explored in a detailed study.

In sum, inflation over the period was driven mainly by accelerating population growth — which overburdened existing infrastructure — and rising land-use costs caused by global liquidity, supply-demand imbalances and institutional shifts in ownership and management of key resources. Other contributory factors included rising commodity prices, and in particular energy prices, which increased the costs of doing businesses.

Based on our studies, several areas of concern for further discussion and research have been raised. These include the optimal level of public ownership of commercial spaces; the role of economies of scale and market structure in firm mark-ups, particularly in the case of dominant firms in a localised market; and the use of cost-function analysis to assess the dynamics of input substitution in relation to changing business cost structures.

Chapter 1

Introduction

CHAPTER 1: INTRODUCTION

DEFINING THE PROBLEM

This paper sets out a number of hypotheses to explain why Singapore's living and business costs escalated so rapidly in the past decade.

Singapore's inflation rate over a long period had been typically lower than the average inflation rate of our trading partners. But in the period 2007–2014, this pattern reversed, displaying above average CPI inflation and volatility.

While the rise in prices signals the success of the economy as a result of its fundamental strengths, sustained inflation has considerable impacts on long-run potential growth due to its negative impact on the country's ability to attract and retain investments and human capital. Inflation reduces the real return on investments, compromising private investments in capital, infrastructure, research capability, skills and ideas that sustains the long term growth potential of the economy. Furthermore, it reduces the attractiveness of Singapore as a tourist and living destination. In addition, high property, consumer and end-user prices may be sticky downwards, which may result in prolonged lags in market clearing despite the presence of deflationary conditions.

Singapore-based businesses have also been severely affected by the escalation in business costs in the past decade. Based on data from the EDB Annual Census of Manufacturing Activities (CMA) 2013, growth in total business costs in manufacturing from 2003–2012 have averaged 7.56% year-on-year, while growth in materials costs have averaged 7.77%, and growth in remuneration costs have averaged 4.76%. Rental costs for commercial retail have increased by 20.7% and 12.6% in Central Area and Fringe Area, respectively, since December 1998. Over the period 1998–2014, suburban and prime office rents have grown 2.68% and 4.17% (CAGR), and 52.8% and 92.3% in total growth, with much of the increases occurring during 2005–2014. In the industrial space, from 2005–2013, the median monthly rental rate for multiple-user factory and warehouse space rose by 92.9% and 64.8%, respectively. This has resulted in a period of restructuring: the production share of manufacturing in the economy has fallen from 27.15% in 2006 to 18.76% in 2013, while that of services has increased from 68.24% to 74.86%.

High inflation may be symptomatic of policy missteps over the preceding decade that emphasised growth numbers over the quality and sustainability of growth. These concerns have underlaid the more recent policy direction changes and emphasis on high value-added growth

through subsidising and co-investments in capital investment, development of skills, and investments in new economy infrastructure.

The government has fundamentally shifted away from a low cost, state-subsidised model and has adopted the use of the price mechanism in shifting Singapore towards a high value-added economy. However, the tendency of markets to volatility and overshooting given the role of expectations and adjustment lags in determining prices, necessitates a continuous review of the role of the state in relation to market conditions and underlying constraints. Our recommendations section highlights some of the issues that have emerged in this ongoing process, and possible approaches at a solution.

HYPOTHESES TO BE EXPLORED

This paper proposes a number of hypotheses that might explain rising costs:

Hypothesis 1 — The economy was operating at a high rate of capacity utilisation, which led to sustained inflation. This was facilitated through several factors:

- **Growth of GDP components, including consumption, capital investments and exports:** The overall economy saw increased growth over the period from 2006–2014. Consumption, gross fixed capital expenditure and exports growth show moderate to strong correlations with inflation growth.

- **Increased global liquidity:** Loose global credit conditions before 2008 and the flow of credit to emerging markets post-2009 contributed to reductions in risk and liquidity spreads and increased credit lending, spurring asset inflation and business cost pass-through as well as increased business activity that contributed to the output gap.

- **Reduced effectiveness of exchange rate policy in controlling inflation:** Population growth and lags in infrastructure development resulted in a lower slack in the domestic economy, which increased the severity of the trade-offs inherent in an exchange rate-based monetary policy. The policy of gradual appreciation of the MAS to reduce imported inflation led to domestically-sourced inflation, which were exacerbated by conditions of land scarcity that increased transport and accommodation rents.

- **Low productivity growth and high employment rates**: The easing of labour supply from 2006–2008 led to a decline in productivity growth and a rising ratio of nominal wage growth over labour productivity growth, which led to an increase in the non-accelerating inflation rate of unemployment (NAIRU) in the period 2007–2013. This resulted in a below-NAIRU rate of unemployment and increased pressures on wage-push inflation.

Hypothesis 2 — Rising property prices and rentals in the residential, commercial and office sectors contributed directly and indirectly to the cost escalation in several ways:

- Residential property price escalation arose from a confluence of low interest rate and risk premiums; infrastructural bottlenecks that created supply-demand imbalances; a tight rental market; and the promotion of public housing as an investment good.

- As home prices rose sharply, employees' desired salary levels rose, causing wages to rise.

- Rising home prices led to increased housing and construction loan growth, which contributed to inflation.

Hypothesis 3 — Product markets in Singapore are not sufficiently competitive; oligopolistic pricing and other distortions cause prices to be higher in Singapore than in neighbouring countries for identical goods.

OVERVIEW OF CHAPTERS

Chapter 2 provides a broad overview of rising consumer and business costs in Singapore, and shows how it has impacted Singapore's labour cost competitiveness and the competitiveness of various industries in terms of trade shares. Chapter 3 provides a breakdown of the growth of various cost components for businesses in Singapore. Chapter 4 examines various aspects of the hypothesis that overheating of the economy contributed to inflation in Singapore. In particular, the private residential property markets are examined as a potential source of cost pass-through. Chapter 5 examines the role of market structures in rising costs in the economy in three sub-markets, including the retail property sector, the furniture industry, and the fast food industry. Chapter 6 includes a methodological section on cost function analysis as a tool for deeper insights into business costs. Chapter 7 concludes by highlighting key areas of concern for public policy and for further research.

Chapter 2

Overview of Rising Costs

CHAPTER 2: OVERVIEW OF RISING COSTS

This chapter defines the problem of costs in Singapore by studying the changes in inflation, which have affected the cost of living as well as business costs.

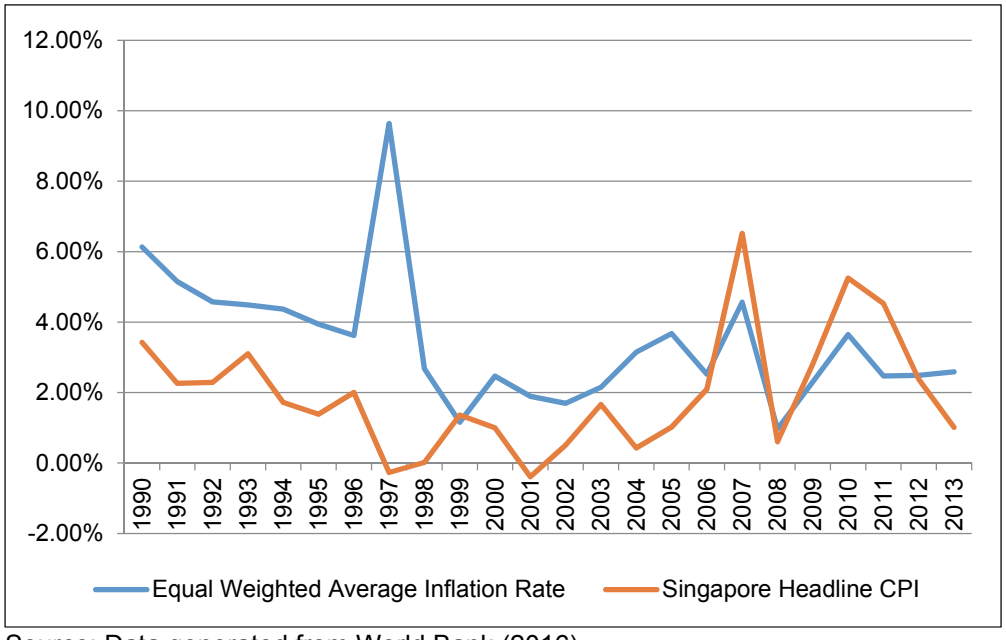
RISING CONSUMER COSTS

This section shows how inflation rose significantly during the period of high growth, driven mainly by domestic cost increases rather than global factors and resulting in Singapore becoming one of the most costly places to live in the world.

Inflation rose relative to trading partners.

Singapore's inflation rate over a long period had been typically lower than the average inflation rate of our trading partners. But in the period 2007–2013, Singapore's headline inflation rate increased noticeably, peaking at 6.51% in 2008, and 5.25% in 2011 (Figure 2.1). CPI volatility has increased markedly, from 0.0114 in 1990–2000 to 0.0208 in 2001–2014, exceeding an equal-weighted average of trading partners of 0.0095 over the period (Figure 2.2, Figure 2.3).

FIGURE 2.1: SINGAPORE HEADLINE CPI COMPARISON



Source: Data generated from World Bank (2016)

FIGURE 2.2: CPI VOLATILITY 1990–2000

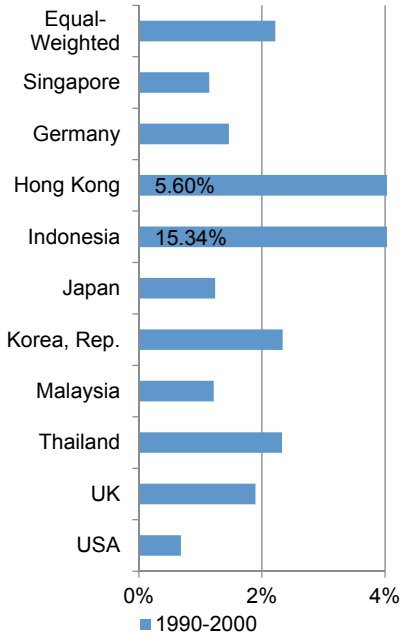
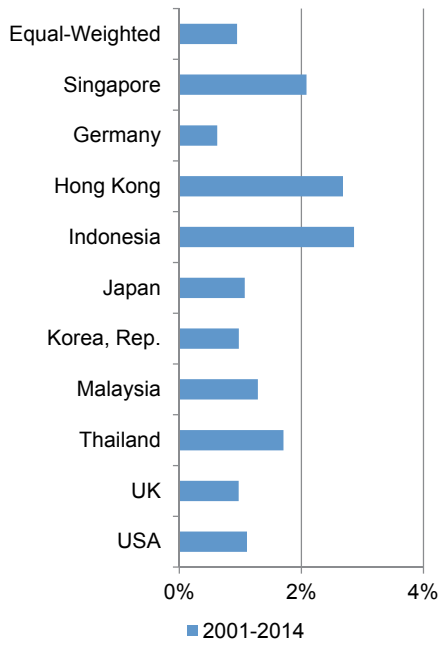


FIGURE 2.3: CPI VOLATILITY 2001–2014



Source: Data generated from World Bank (2016)

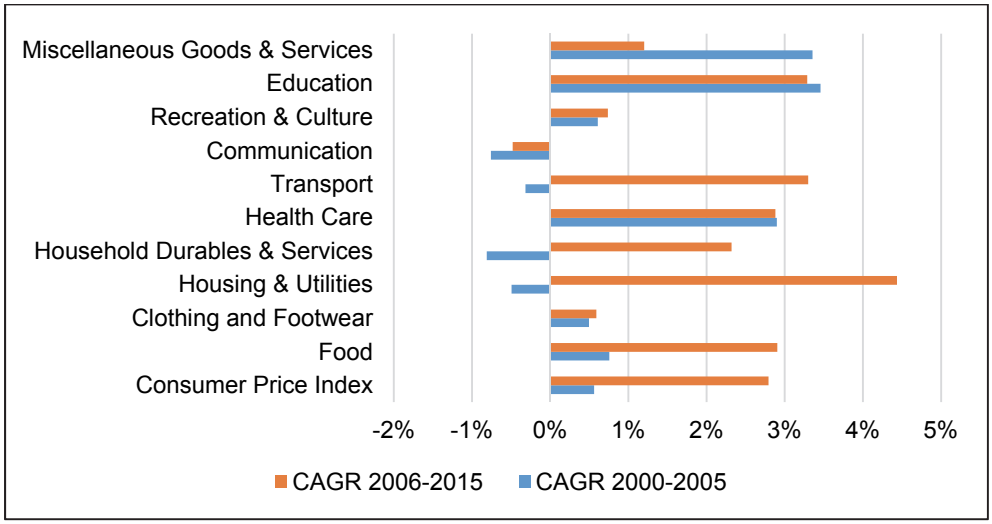
Inflation due to domestic not global factors.

Higher inflation was registered by the housing and utilities, transport, education and food sub-indices, which showed CAGR at 4.44%, 3.30%, 3.29% and 2.90%, respectively from 2006–2015, as compared to the CPI index growth at 2.79%. In a further breakdown of housing and utilities CPI, as well as other high cost components, the accommodation[1] component registered high growth rates of 4.94% from 2006–2015. This corroborates the claim that a large share of inflation had been generated from inflation within markets for domestic goods and services as opposed to imported inflation — and thereby reflected domestic supply-demand imbalances rather than global forces which were out of Singapore's control. For example, MAS Managing Director Ravi Menon said that in foreign currency

[1] Accommodation, one of the groups in the Housing & Utilities division, comprises "rented and owner-occupied accommodation", as well as "housing maintenance & repairs", Available at https://www.singstat.gov.sg/docs/default-source/default-document-library/news/press_releases/cpimar2015.pdf

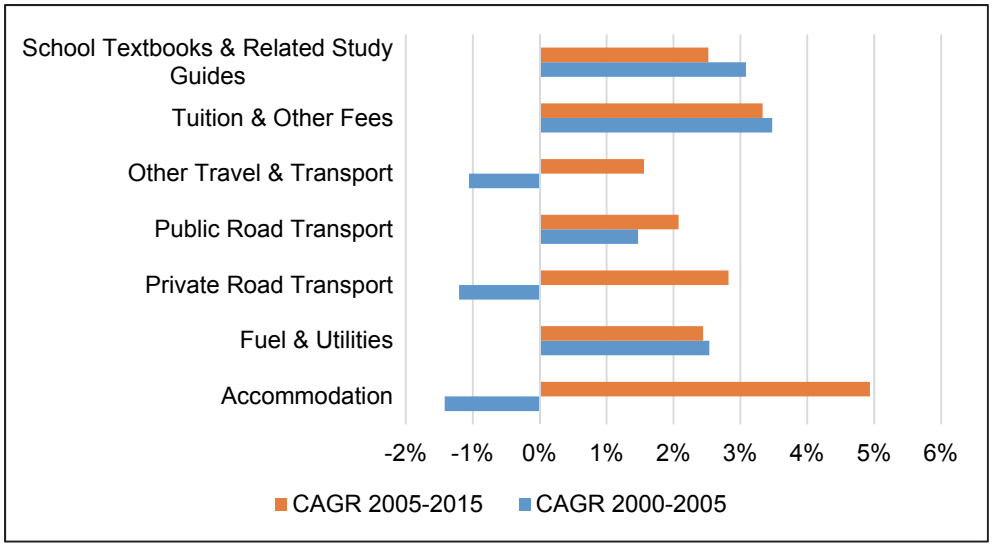
terms, wholesale price inflation among Singapore's major trading partners averaged around 5% per annum from 2010 to 2012 (Menon, 2013). In comparison, overall imported inflation in Singapore dollar terms was fairly benign, averaging slightly less than 2% per annum in this period.

FIGURE 2.4: CAGR OF CPI COMPONENTS JAN 2000–JAN 2015



Source: Singapore Department of Statistics, Monthly Consumer Price Index (various years), Retrieved from https://data.gov.sg/

FIGURE 2.5: CAGR OF HIGH INFLATION COMPONENTS JAN 2000–JAN 2015



Source: Singapore Department of Statistics, Monthly Consumer Price Index (various years), Retrieved from https://data.gov.sg/

Consequently, Singapore became one of the costliest places to live in.

The cost increases have led to the climb in Singapore's rankings in various cost of living indexes. In the Economist Intelligence Unit cost of living index, which tracked a basket of goods in a cross-country comparison survey, Singapore ranks as the world's most expensive city in 2013 and 2014, due to high transport (where car ownership is the most expensive in the world), utilities (where Singapore is third most expensive in the world) and retail costs. It was noted in the report that Singapore was "the priciest city in the world in which to buy clothes". However, the report also noted that the relative movement of exchange rates, given the decline of the Euro and Yen, have impacted the rankings.

Using New York City prices in 2003 and 2014 as the index at 100, Singapore has climbed from 98 to 130. The Mercer 2015 cost of living survey for expatriates ranks Singapore as the fourth most expensive city in the world, above Geneva, Tokyo and London. In the 2014 CLSA "*Mr & Mrs Singapore"* survey, the cost of a basket of consumer staples is 33% more expensive than Hong Kong, 53% more expensive than Malaysia, and 59% more expensive than Indonesia in US-adjusted terms.

FIGURE 2.6: MERCER COST OF LIVING CITY RANKINGS (2015)

Rank 2015	Rank 2014	City	Country
1	1	Luanda	Angola
2	3	Hong Kong	Hong Kong
3	5	Zurich	Switzerland
4	4	Singapore	Singapore
5	6	Geneva	Switzerland
6	10	Shanghai	China
7	11	Beijing	China
8	14	Seoul	South Korea
9	8	Bern	Switzerland
10	2	N'Djamena	Chad
11	7	Tokyo	Japan
12	12	London	United Kingdom

Source: Mercer Cost of Living City Rankings (2015)

In a Deutsche Bank 2014 research survey, *The Random Walk: Mapping the World's Prices*, the cost of living of a series of items was tracked. Relative to New York, Singapore prices had the following premiums/ discounts. Non-tradable items such as taxi trips, haircuts, roses and movie tickets showed discounts to comparable cities, while branded tradable

items, such as Adidas shoes, Levis jeans, subscriptions to the *Economist*, etc., showed substantial premiums.

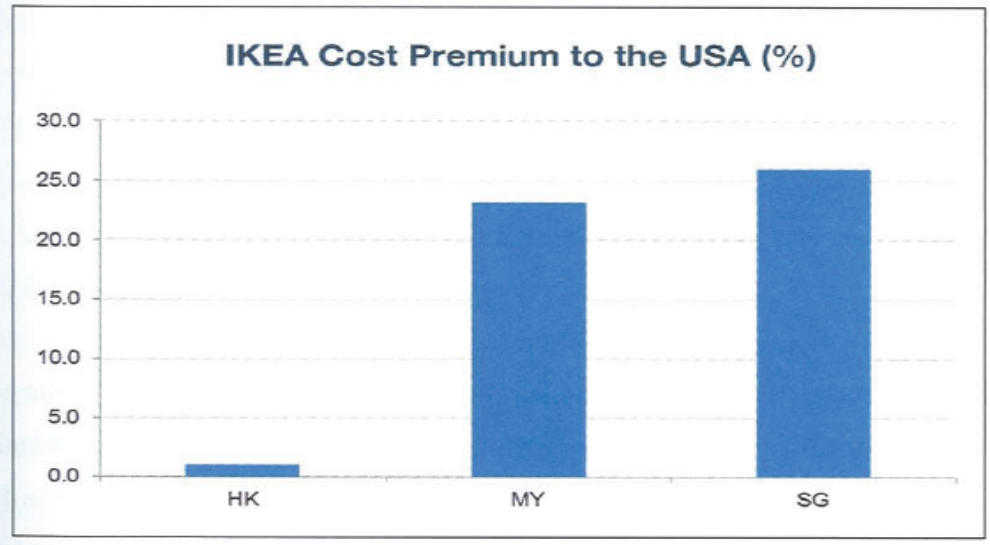
TABLE 2.1: COMPARISON OF SINGAPORE AGAINST HONG KONG AND NEW YORK (NEW YORK = 100)

Item	Singapore	Hong Kong	Item	Singapore	Hong Kong
Daily Car Rentals	110%	99%	1L of petrol	170%	217%
5-Star Hotel Room	98%	68%	Volkswagen Golf	547%	152%
2L Coke	76%	57%	Office Space (CBD)	66%	126%
1 Pint of beer	113%	103%	Movie Ticket	65%	77%
A pair of Adidas sports shoes	132%	119%	Annual Subscription to The Economist	217%	161%
A pair of Levis	149%	130%	Business School	37%	52%
A bouquet of roses	64%	82%	Apple MacBook	111%	99%
iPhone 5s	109%	100%	Marlboro Cigarette	73%	54%
Public Transport (Min. Fare)	24%	26%	Gym Membership (CBD)	112%	88%
Taxi Trip (Business Day, 8km)	48%	46%	Men's standard haircut	63%	107%

Source: DB Research (2014)

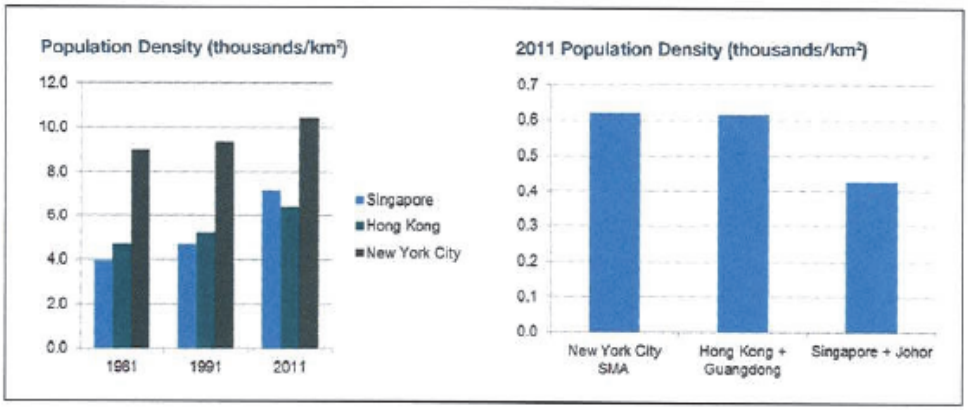
In a presentation comparing IKEA prices in Singapore, Malaysia, Hong Kong, and Brooklyn, New York, it was found that Singapore had a cost premium of 25%, while Malaysia and Hong Kong had premiums of 22% and 2%, respectively (Figure 2.7). It was noted that the usual arguments of higher factor costs due to space or labour constraints do not apply. Singapore has a lower population density than the five boroughs of New York, while Hong Kong is a small economy, with property prices and labour prices comparably higher in Hong Kong than in Singapore (Figure 2.8).

FIGURE 2.7: SINGAPORE COST PREMIUM TO NEW YORK



Source: IKEA and FLM calculations, cited in Hanna (2012)

FIGURE 2.8: COST PREMIUM NOT EXPLAINED BY POPULATION DENSITY



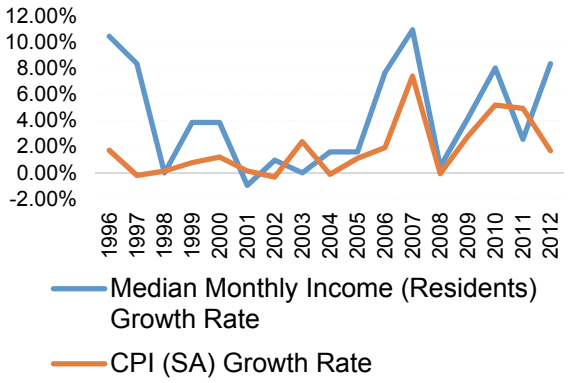
Source: Haver and FLM, cited in Hanna (2012)

As a result, standards of living were eroded.

CPI inflation has a significant impact on purchasing power. From 1996–2014, resident median monthly income (MMI) grew in total by 95.38% while CPI grew by 35.02% (Figure 2.9) Adjusted for inflation, total MMI growth from 1996–2014 is reduced by over 52%. In addition, CPI inflation has had a negative wealth distributive effect due to the higher rates of CPI inflation

on items, which form a larger share of the cost basket of the lower income groups (Table 2.2).

FIGURE 2.9: CPI, MEDIAN MONTHLY INCOME



	Monthly Median Income (MMI) Total Growth	CPI Inflation	Inflation-Adjusted MMI Total Growth
1996–2014	99.39%	35.01%	47.68%
1996–2004	28.83%	59.69%	21.58%
2004–2014	54.76%	27.41%	21.47%

Source: Ministry of Manpower (various years), Singapore Department of Statistics (various years), Retrieved from https://webcdm.ceicdata.com

TABLE 2.2: CPI FOR LOWER INCOME GROUPS ARE HIGHEST

CPI All-items 2000–2014	Lowest 20%	Middle 60%	Highest 20%
CAGR	2.62%	2.10%	1.68%

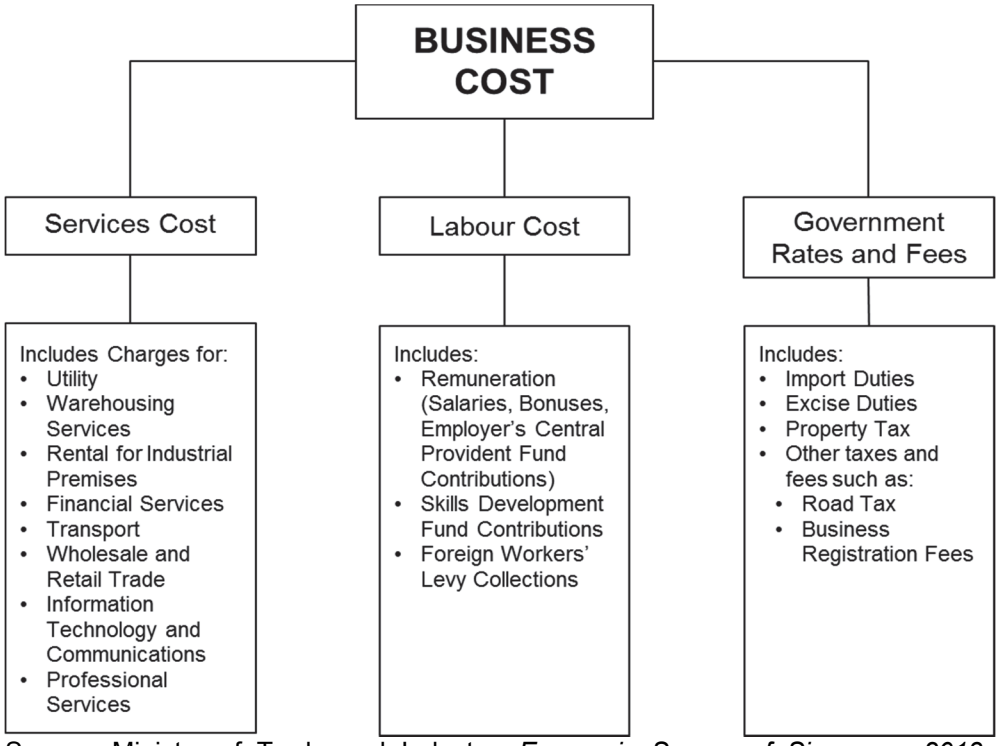
Source: Singapore Department of Statistics (2014), *CPI For Households by Income Group,* Retrieved from https://webcdm.ceicdata.com

GROWTH IN BUSINESS COSTS

In this section, we observe how most components of business costs escalated. This resulted in higher unit costs relative to Singapore's competitors. Unlike in other countries where relatively higher inflation was offset by currency depreciation to maintain competitiveness, Singapore's appreciating currency compounded the impact on competitiveness.

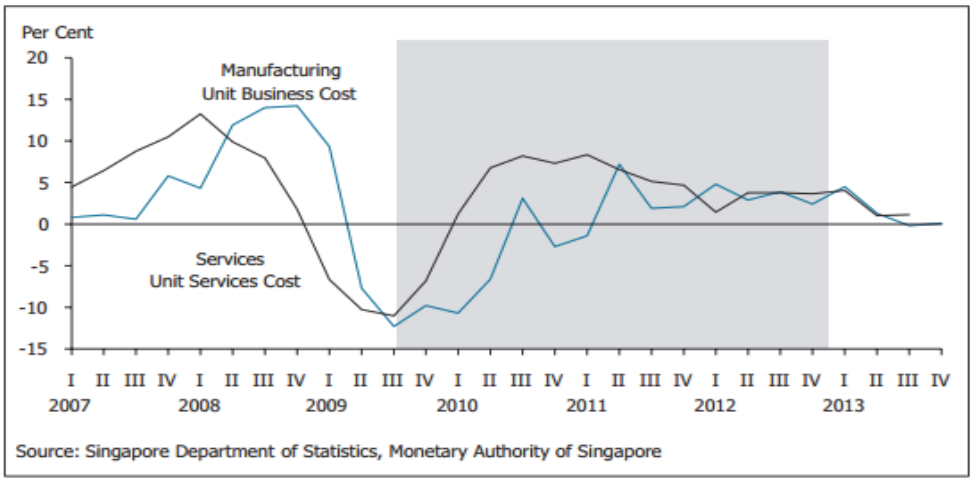
Business costs can be subdivided into three major costs components — service costs, labour costs, and government rates and fees. According to the 2013 MTI Economic Survey of Singapore (ESS), the unit business cost (UBC) index for the manufacturing sector rose by 19% cumulatively, while the unit services cost (USC) index for the services sector rose by a higher 25% between the third quarter of 2009 and the first quarter of 2013 (MTI, 2013).

FIGURE 2.10: FLOW DIAGRAM OF BUSINESS COST AND ITS MAJOR COMPONENTS



Source: Ministry of Trade and Industry, *Economic Survey of Singapore 2013* (2013)

FIGURE 2.11: MANUFACTURING UBC INDEX AND SERVICES USC INDEX

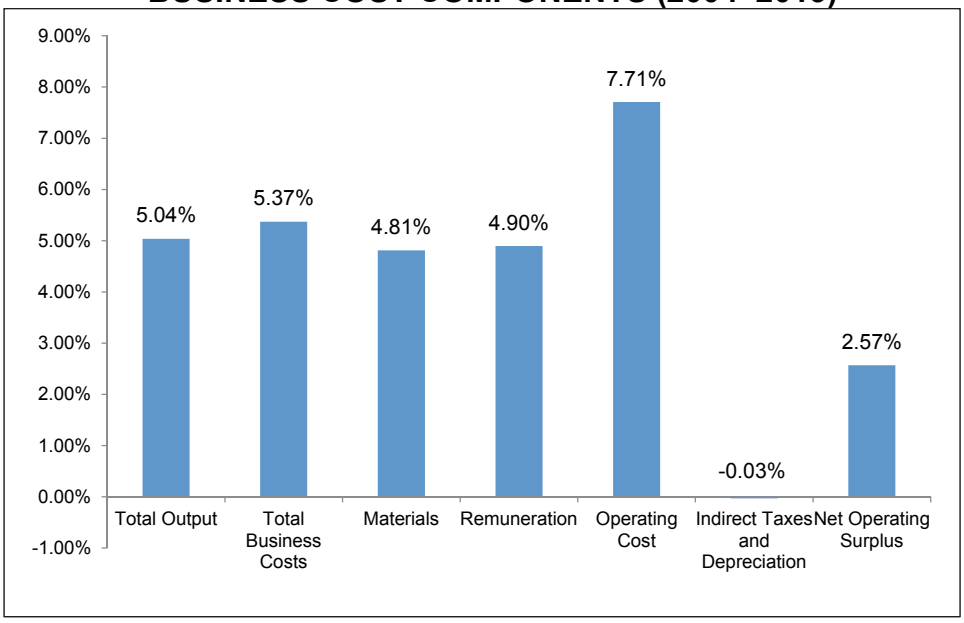


Source: *Economic Survey of Singapore 2013*, Ministry of Trade and Industry

The cost competitiveness of Singapore has come under threat due to increases in business costs. Here it is useful to have a definition of cost competitiveness. It is defined as the productivity with which a nation utilises its labour, capital and natural resources — the ratio of the value of total outputs over inputs (Porter, 2005). A growth rate in factor input costs above growth rates in real output will reduce the cost competitiveness of businesses operating in Singapore.

According to the EDB *Annual Census of Manufacturing Activities* data (Figure 2.12), the aggregate growth in total business costs at 5.37% has outpaced the growth in total output at 5.04%, indicating a loss in competitiveness and a relative decline in shares of corporate profits in the manufacturing sector. The highest growth was recorded in operating costs, at 7.71%, which includes rental costs. This is offset by the below-output growth rates in remuneration and materials.

FIGURE 2.12: ANNUAL GROWTH IN BUSINESS COST COMPONENTS (2004–2013)



Source: *Annual Census of Manufacturing Activities 2013*, Economic Development Board

FIGURE 2.13: PRODUCTION BY SECTOR

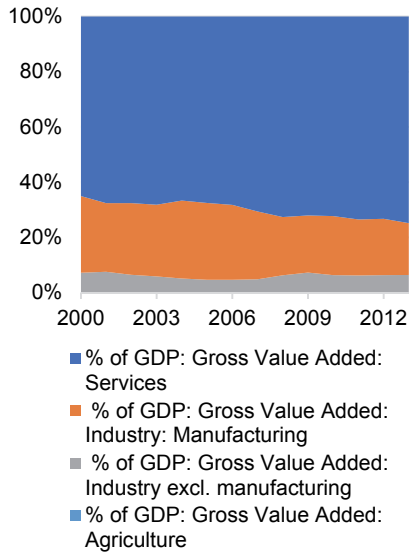
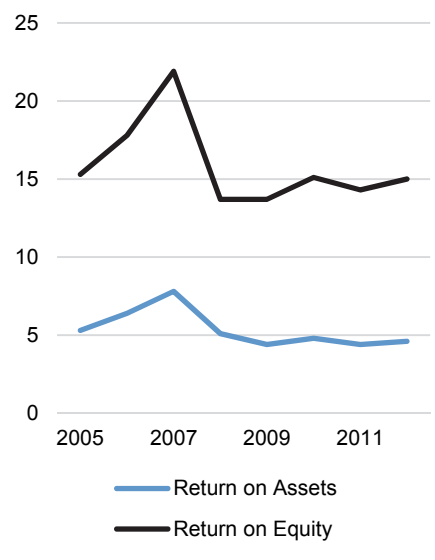


FIGURE 2.14: ROA, ROE 2005–2011



Source: *Yearbook of Statistics (various years)*, Department of Statistics Singapore, Retrieved from https://webcdm.ceicdata.com

Rising costs have led to restructuring in the economy from manufacturing into services, and the manufacturing share has fallen from 27.15% in 2006 to 18.76% in 2013, while services has increased from 68.24% to 74.86%. In the context of rising business costs, profitability remained stable in companies operating within Singapore. This suggests that overall productivity growth has just kept pace with the increase in costs within the overall economy. Return on equity for businesses in Singapore have flatlined from 2005-2012. (Figure 2.14)

Unit labour costs are a common indicator used for international comparison of cost competitiveness. It is defined as the cost of labour input required to produce one unit of output, and is computed as total nominal compensation divided by real output. It is also computed as nominal wage over real output per worker. [2] With reference to MTI (2014c), taking a sectoral approach to the decomposition of unit labour cost[3] carried out in the paper, we construct Table 2.3, based on data provided on growth in unit labour costs and real value added per worker.

As seen in Table 2.3, overall unit labour costs grew more strongly from 2010q1 to 2016q1, as productivity gains have not kept pace with nominal wage growth.

Unit labour costs (ULC) of the goods-producing industries (GPI) and services sectors in Singapore's economy have diverged in 2000-2016, where total ULC for services grew at 24.53% as compared to 3.85% for GPIs. This is driven largely by the slowdown in value-added per worker (VAPW) since 2000. Growth in value-added per worker in most industries over the period from 2000-2010, with the exception of construction, wholesale & retail trade, and information & communications, has come in below 2%. Nevertheless, reductions in labour costs growth as compared to the preceding decade meant that ULC growth was capped before 2010.

In GPIs, unit labour costs have fallen by -1.32% annually from 2000 to 2010, but ULC has risen by 2.89% annually since 2010. Manufacturing ULC fell -1.36% from 2000 to 2010 and rose 1.29% from 2000 to 2006, but ULC in the construction and utilities sector rose by 4.48% and 7.70% respectively from 2010-2016. Manufacturing VAPW growth since 2010 has

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[2] According to the definition by DOS (2016), $\text{ULC} = \frac{Total\ labour\ cost}{Real\ value\ added}$, where $Total\ Labour\ Cost = Compensation\ of\ Employees + Labour\ Income\ of\ Self - Employed + Other\ Labour\ Related\ Costs - Wage\ Subsidies$

[3] With reference to MTI (2014c), $\%\Delta ULC \approx \%\Delta Total\ Labour\ Cost\ per\ worker + \%\Delta(\frac{1}{Gross\ real\ value\ added\ per\ worker})$

largely kept pace with labour cost increases, but this is not the case in construction and utilities. This may point to differences between domestic and export-oriented sectors within the goods-producing industries, and to potential competitive issues particularly in the utilities sector. The April 2013 MAS *Macroeconomic Review* indicate that ULC in manufacturing has been reduced; due partly to restructuring into higher productivity sectors (MAS, 2013b).

The services sectors also saw relatively large increases in unit labour costs between 2000-2016, particularly in the accommodation and food services (43.58%), information and communications (47.09%), and the other services industries (73.59%). With the exception of the finance and insurance sector, value added per worker continues to exhibit a downtrend or low growth, but labour costs have increased (with the exception of information and communications), resulting in rising ULC.

MTI (2015) has found that VAPW growth after adjusting for average hours worked is noticeably higher at 1.3% CAGR from 2010-2014 as compared to 0.3% CAGR without the adjustment. It was found that this was driven predominantly by a fall in hours worked by full-time local employees. If one attributes this primarily to capacity utilisation shifts, which is plausible post-2012 (see chapter 4), this indicates the difficulties of economic restructuring in a demand-constrained and deflationary global economic environment due to its impacts revenue growth, business outlook and the appetite for investment. This should raise questions about the timing of Singapore's productivity drive post-2012 in the midst of the down-cycle, which reduces the policy effectiveness of tightening labour markets and grants for productivity and capability upgrading in pursuing the necessary policy direction of raising productivity for sustainable growth.

TABLE 2.3: CAGR IN UNIT LABOUR COSTS, TOTAL LABOUR COST PER WORKER (TLCPW) AND AVERAGE GROSS VALUE ADD PER WORKER (VAPW)

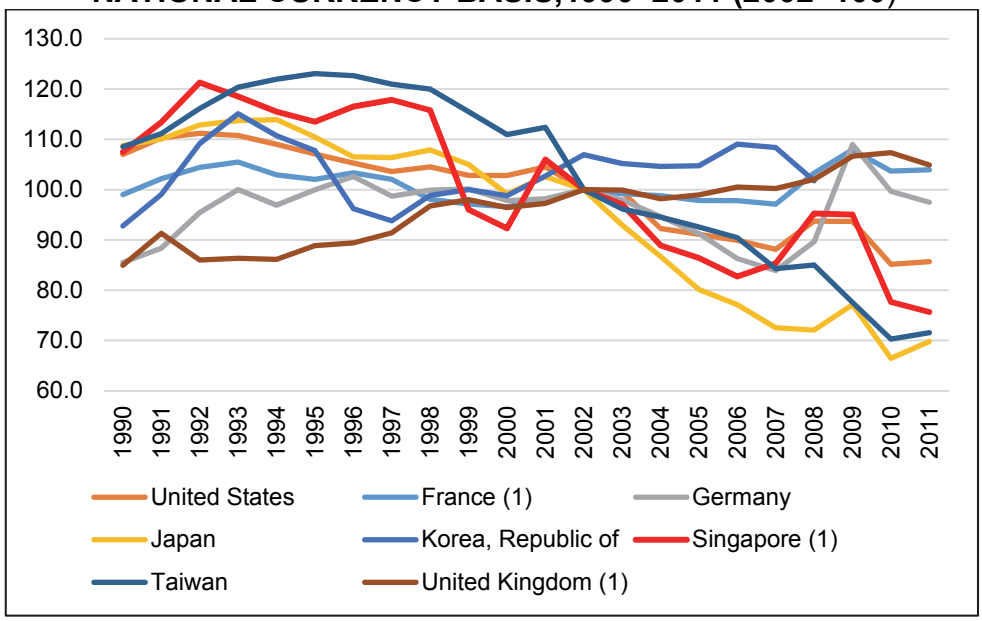
CAGR	1990-2000			2000-2010			2010-2016		
	ULC	TLCPW	VAPW	ULC	TLCPW	VAPW	ULC	TLCPW	VAPW
Overall	2.11%	5.06%	3.04%	0.40%	1.71%	1.33%	2.53%	4.65%	2.16%
Goods Producing Industries (GPI)	-0.13%	3.49%	3.76%	-1.32%	0.29%	1.64%	2.89%	6.25%	3.47%
Services Producing Industries (SPI)	3.08%	5.88%	2.88%	0.86%	2.31%	1.47%	2.26%	4.10%	1.87%
GPI									
Manufacturing	-0.82%	5.93%	7.24%	-1.36%	-0.04%	1.34%	1.29%	6.85%	5.89%
Construction	0.91%	-0.68%	-1.57%	-1.33%	0.64%	2.00%	4.48%	5.18%	0.70%
Utilities	1.00%	NA	NA	0.87%	NA	NA	7.70%	NA	NA
Other Goods Industries	1.94%	NA	NA	4.99%	NA	NA	-1.94%	NA	NA
SPI									
Wholesale & Retail Trade	1.95%	6.43%	4.69%	-2.01%	2.87%	5.13%	0.24%	4.08%	3.99%
Transportation & Storage	2.18%	5.41%	3.34%	0.64%	1.31%	0.68%	3.59%	4.19%	0.61%
Accommodation & Food Services	1.59%	3.82%	2.28%	1.29%	-0.59%	-1.85%	3.97%	4.66%	0.70%
Information & Communications	-1.61%	6.84%	9.23%	2.17%	5.42%	3.36%	2.90%	3.88%	0.99%
Finance & Insurance	7.04%	7.55%	0.52%	1.68%	1.83%	0.15%	-0.34%	3.86%	4.38%
Business Services	7.69%	7.82%	0.13%	1.11%	0.22%	-0.87%	2.47%	2.10%	-0.36%
Other Service Industries	1.67%	2.95%	1.30%	2.74%	3.13%	0.39%	4.79%	5.18%	0.39%

Source: Singapore Department of Statistics, Retrieved from Singstat Table Builder and Author's Calculations

LABOUR COST COMPETITIVENESS

Based on the Bureau of Labour Statistics International Labour Comparisons[4] data, which measures manufacturing unit labour costs, in terms of growth, Singapore's unit labour costs in Singapore dollar terms have fallen by 24.3% since 2002 (Figure 2.15), which places it well in labour cost competitiveness; taking into account currency appreciation, it has risen by 7.8% (Figure 2.16). Hence Singapore's overall manufacturing cost competitiveness position has worsened in relation to countries like the US, Taiwan, and Japan.

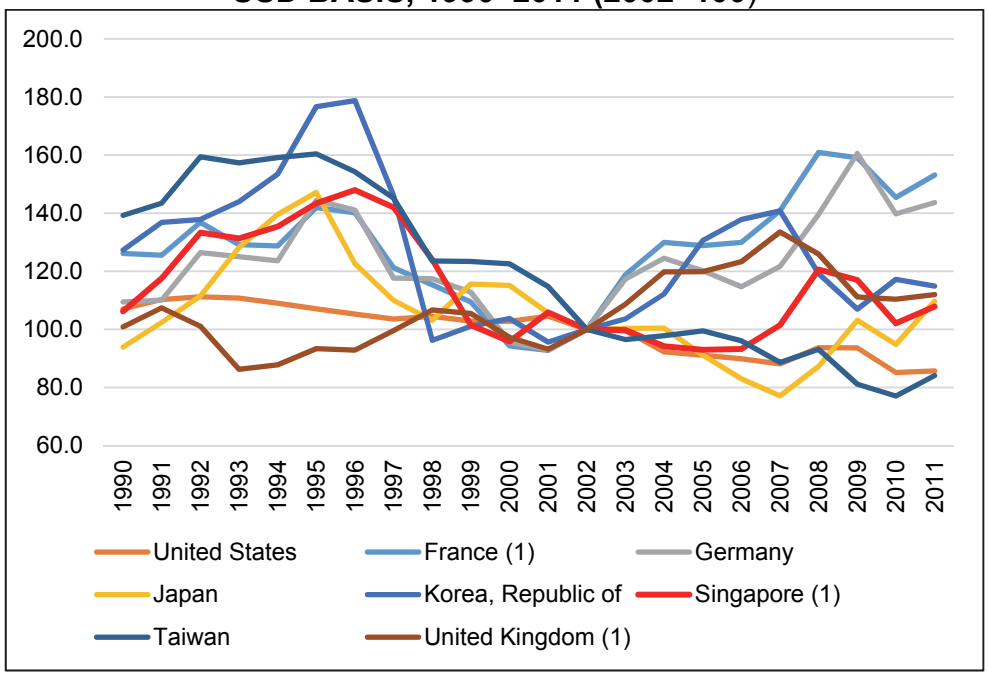
FIGURE 2.15: UNIT LABOUR COST IN MANUFACTURING, NATIONAL CURRENCY BASIS,1990–2011 (2002=100)



Source: Bureau of Labour Statistics, International Labour Comparisons (2012)

[4] Methodology and definitions can be accessed at http://www.bls.gov/fls/intl_prod_tn.pdf.

FIGURE 2.16: UNIT LABOUR COSTS IN MANUFACTURING, USD BASIS, 1990–2011 (2002=100)



Notes: (1) Compensation adjusted for employment taxes and government subsidies to estimate the actual cost to employers.
Source: Bureau of Labour Statistics, International Labour Comparisons (2012)

Singapore's labour cost competitiveness has improved over the previous decade, but this is due to lower relative cost increases rather than higher relative productivity growth. ULC growth in Singapore in 1990–2000 (see Figure 2.17) was -1.023% (relatively high to competitors), while ULC growth in 2000–2011 (see Figure 2.18) was 1.08% (relatively low), which showed an improvement in its cost competitiveness positioning in 2000–2011. However, the relatively better showing from 2000-2011 was the result not of productivity improvement, but of low growth rates in labour compensation. Productivity fell from 7.50% to 4.06% per annum (Figure 2.19, Figure 2.20), while real average annual compensation fell from 5.87% to 2.20% (Figure 2.21, Figure 2.22). This is in line with the below average growth rates in remuneration (in the *Census of Manufacturing Activities* data), which subsidised the higher rates of increase in materials and operating costs, and Singapore's hourly compensation costs in manufacturing in 2010 remained relatively low among its competitors (Figure 2.23).

FIGURE 2.17: ULC IN USD (MFG), AVERAGE ANNUAL GROWTH (%), 1990–2000

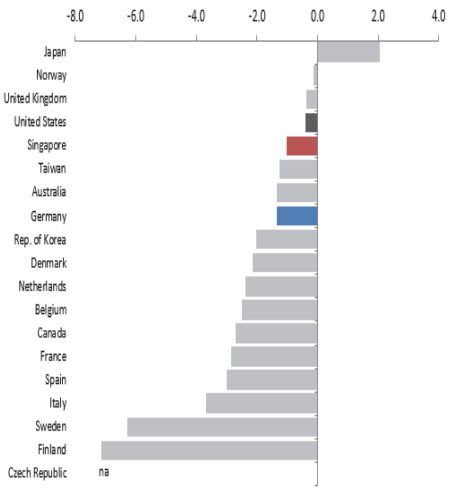


FIGURE 2.18: ULC IN USD (MFG), AVERAGE ANNUAL GROWTH (%), 2000–2011

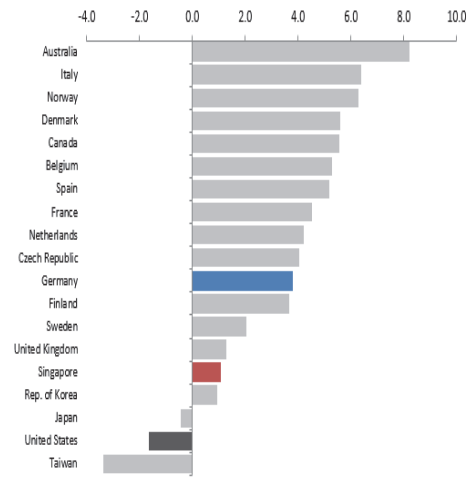
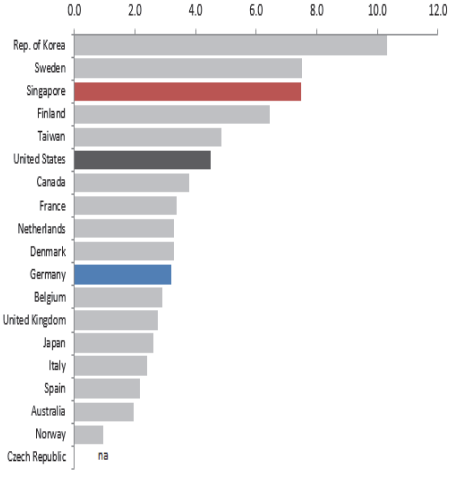
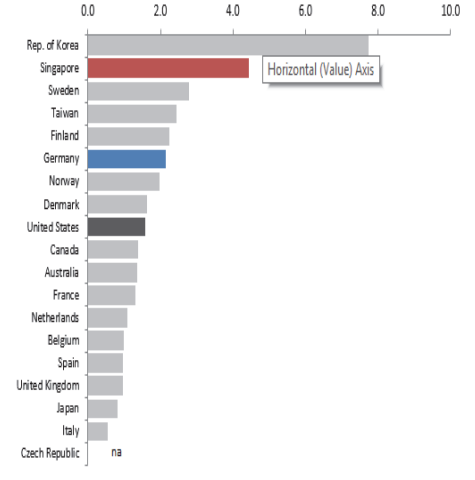


FIGURE 2.19: OUTPUT PER EMPLOYED PERSON (MFG), AVERAGE ANNUAL GROWTH (%), 1990–2000



Source: Bureau of Labour Statistics, International Labour Comparisons (2012)

FIGURE 2.20: REAL AVERAGE ANNUAL COMPENSATION (MFG), AVERAGE ANNUAL GROWTH (%), 1990–2000



Source: Bureau of Labour Statistics, International Labour Comparisons (2012)

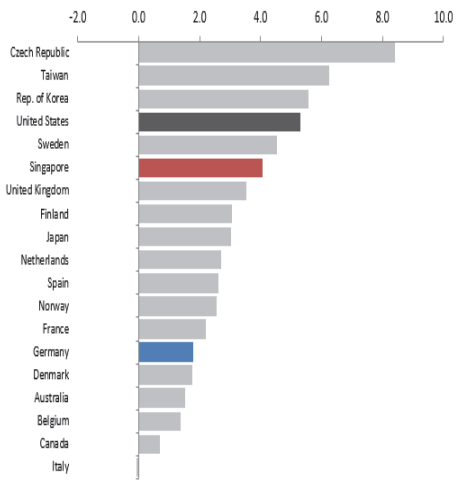
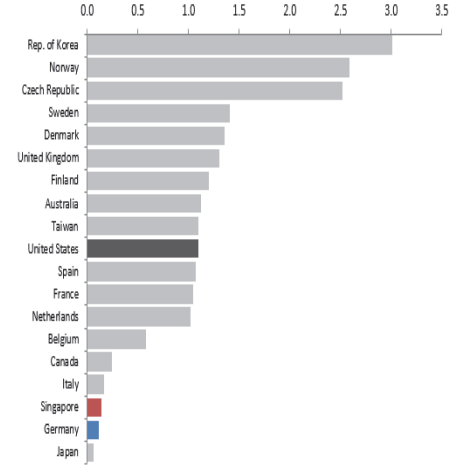
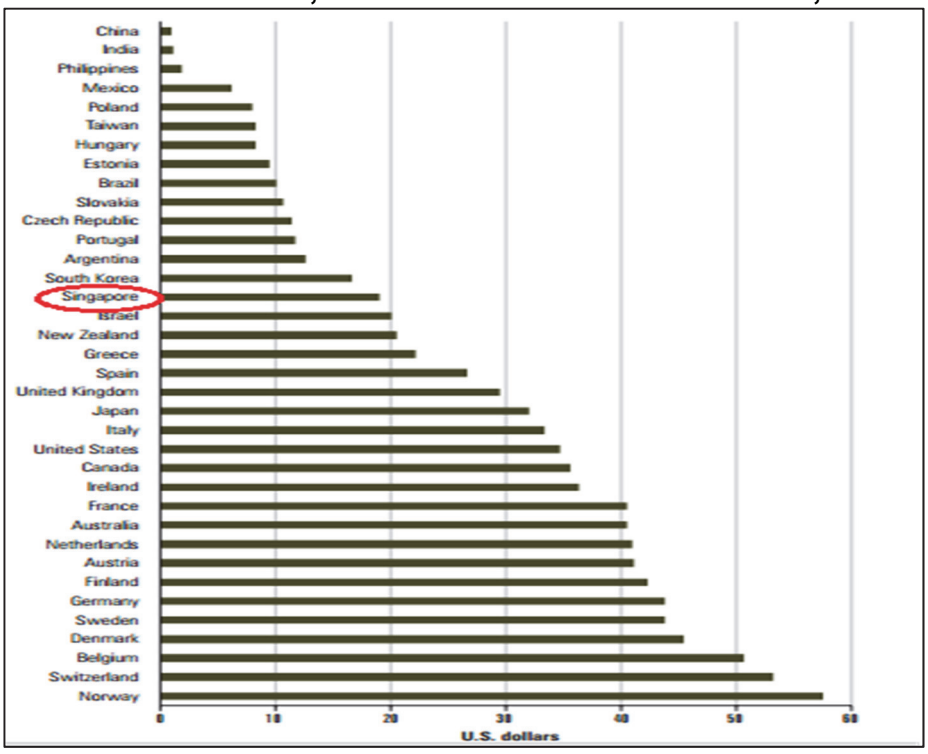
FIGURE 2.21: OUTPUT PER EMPLOYED PERSON (MFG), AVERAGE ANNUAL GROWTH (%), 2000–2011	FIGURE 2.22: REAL AVERAGE ANNUAL COMPENSATIONS (MFG), AVERAGE ANNUAL GROWTH (%), 2000–2011
	
Source: Bureau of Labour Statistics, International Labour Comparisons (2012)	Source: Bureau of Labour Statistics, International Labour Comparisons (2012)

FIGURE 2.23: HOURLY COMPENSATION COSTS IN MANUFACTURING, SELECTED COUNTRIES IN USD, 2010



Source: Bureau of Labour Statistics, International Labour Comparisons (2012)

NOMINAL EXCHANGE RATES AND COMPETITIVENESS

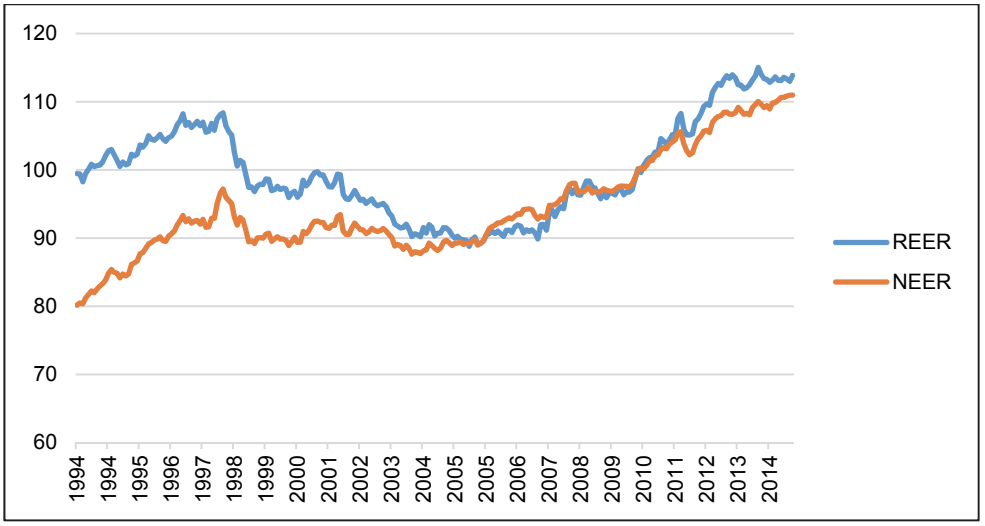
Appreciation of the trade-weighted real effective exchange rate (REER), through the dual channels of increases in NEER and increase in CPI, has contributed to the aggregate reduction of cost competitiveness.

From 2001–2005, the trade-weighted exchange rates saw the convergence of nominal effective exchange rate (NEER) and REER (Figure 2.24). This was caused by two factors: First, a CPI inflation that was below the composite CPI inflation of its trading partners, and second, the neutral policy stance of the MAS — characterised by zero-appreciation NEER — in light of weak external demand, a protracted global electronics downturn, and subsiding inflation pressures (Nordstrom et al., 2009). This corresponded with a downward trend in REER that signalled improving cost competitiveness (Figure 2.25).

Post-2005, the threat of inflationary pressures caused the MAS to shift to a tightening policy of a gradual appreciation of the NEER (Nordstrom et al.,

2009). Despite this, Singapore's CPI has continued to outpace those of its trading partners since March 2007, causing an upward divergence in REER. The REER and NEER have increased by 26.53% and 24.34% respectively since Jan 2005, which has exacerbated the loss in competitiveness of the overall economy.

FIGURE 2.24: SINGAPORE TRADE-WEIGHTED EXCHANGE RATES (2010=100)

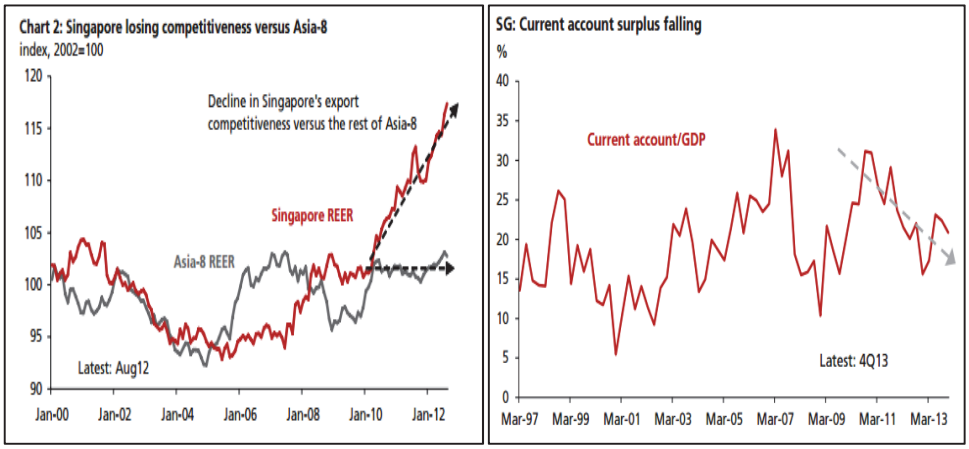


Source: Bank of International Settlements Effective Exchange Rate Indices (n.d.)[5]

According to a DBS 2012 report, Singapore's REER witnessed a significantly faster increase versus the average REER for Asia-8 countries from 2010–2012. This has reduced the overall current account surplus to 20.9% of GDP in December 2013, 24% lower than the recent peak of 30.9% of GDP in December 2010 (Figure 2.25). This came after a shift in policy stance to an appreciation of the Singapore dollar Nominal Effective Exchange Rate (NEER) in April 2010 (DBS Group Research, 2012). In the report, it was noted that the tighter Singapore dollar policy was engineered back in 2010 to cool an economy expanding at a 14.8% rate, however, higher inflation relative to other countries contributed to REER increases. It was noted that the increases were policy-induced, led by high COE premiums and rentals, property prices, and increasing labour costs due to restriction of worker inflows (DBS Group Research, 2012).

[5] NEERs are calculated as geometric weighted averages of bilateral exchange rates. REERs are the same weighted averages of bilateral exchange rates adjusted by relative consumer prices. The weighting pattern is time-varying, and the most recent weights are based on trade in 2008–10.

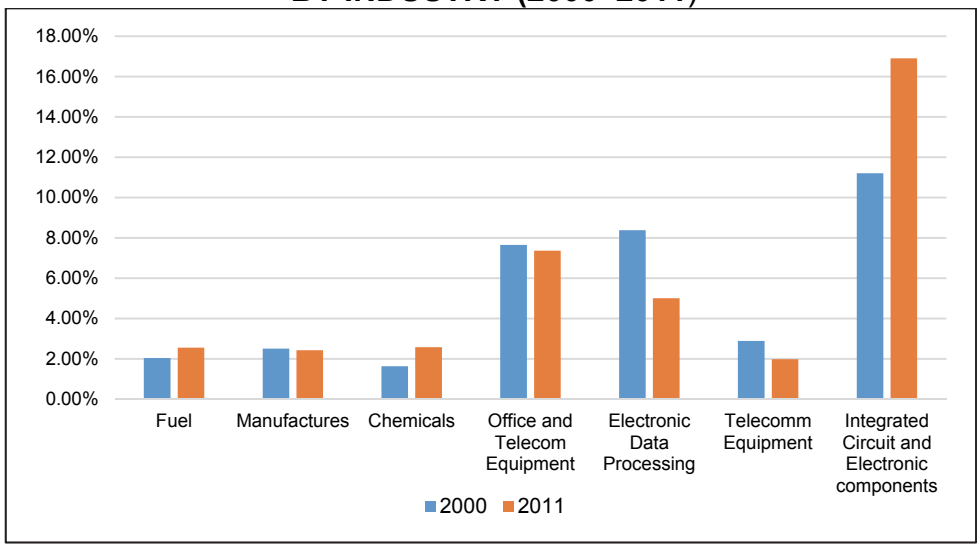
FIGURE 2.25: RISING REER AND FALLING CURRENT ACCOUNT SURPLUS



Source: DBS Group Research (2012)

As a result of rising business costs, Singapore has become less cost competitive in several industries. Its world export shares in manufactures, office telecoms and equipment, electronic data processing, and telecommunications equipment have fallen over the period 2000–2011 (Figure 2.26). The economy has restructured towards the integrated circuit and electronic components and fuels and chemicals sectors, where its world export shares have grown.

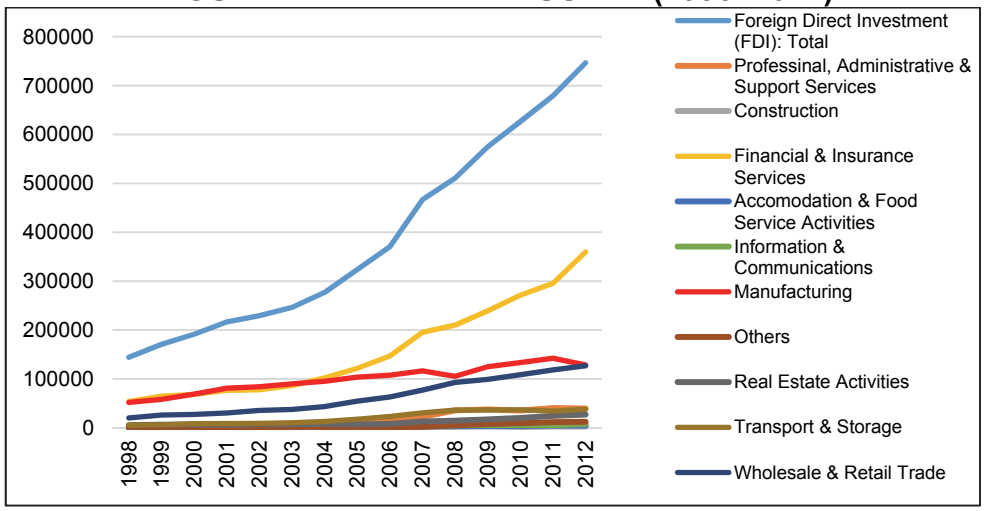
FIGURE 2.26: SINGAPORE'S WORLD EXPORT SHARES BY INDUSTRY (2000–2011)



Source: "International Trade Statistics 2000: Trade by sector", World Trade Organization (2000), "International Trade Statistics 2011", World Trade Organization

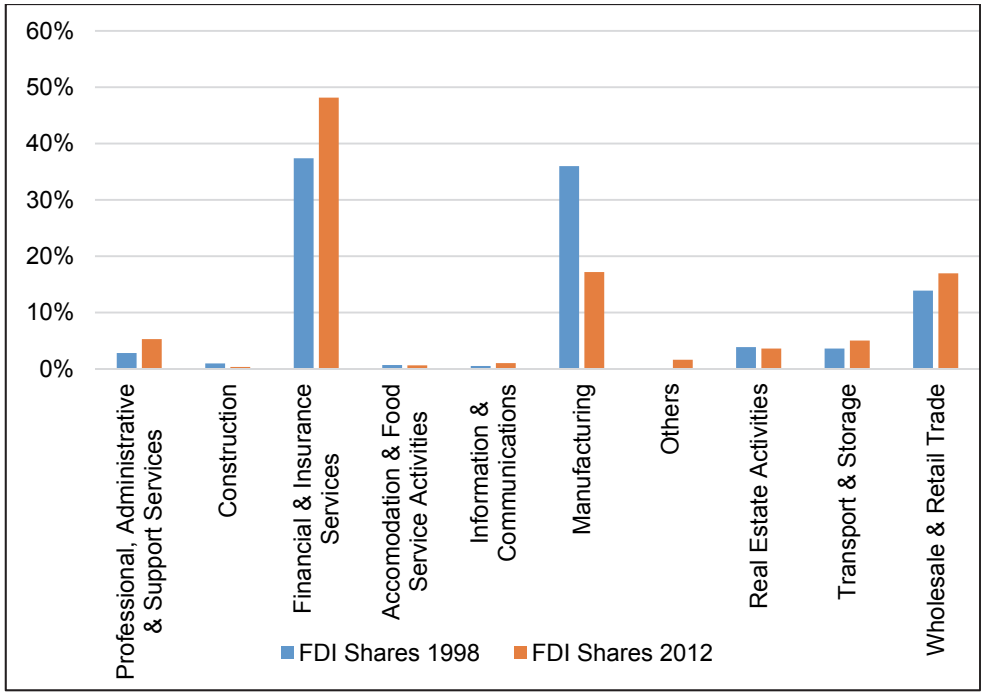
Nevertheless, growth of FDI into Singapore has remained robust. Figure 2.28 charts the changes in the relative share of FDIs into Singapore. The growth rates of Financial and Insurance, and Wholesale and Retail Trade outpaced the growth in the individual sectors of manufacturing, and the share of FDI in financial services rose from 37.40% in 1998 to 48.16% in 2012, while the share of manufacturing FDI fell from 36.01% to 17.21% (Figure 2.28).

FIGURE 2.27: FDI BY INDUSTRY (1998–2012)



Source: Department of Statistics (various years), *Foreign Direct Investment In Singapore By Industry (Stock As At Year-End), Annual*, Retrieved from https://webcdm.ceicdata.com

FIGURE 2.28: SHARE OF FDI BY INDUSTRY



Source: Department of Statistics (various years), *Foreign Direct Investment In Singapore By Industry (Stock As At Year-End), Annual*, Retrieved from https://webcdm.ceicdata.com

Chapter 3

Components of Business Costs

CHAPTER 3: COMPONENTS OF BUSINESS COSTS

BUSINESS COST STRUCTURES

This section gives a breakdown of the cost shares of firms in Singapore by size and sectors, and gives an overview of the increases in the cost components of business costs over the periods 2000–2014, including rental, labour, materials and energy costs.

Key points from this section are:

- Smaller firms tended to have larger domestic costs exposure due to higher remuneration cost shares, lower net operating surplus, and higher depreciation and indirect tax costs shares than the larger firms, while larger firms tended to have higher external cost exposures due to higher material cost shares.

- Over the period 1998–2014, using rental index data, central retail rents have increased by 20.7%, central office rents have increased 92.3%, and multiple-user industrial rents have increased 42.1%.

- Growth patterns in rentals across the retail, office and factory space sectors showed high co-movement, rising from 2004–2007, falling from 2007–2008, and rising again in 2010.

- In the labour markets, over the period 2008–2012, the inflow of foreign workers (with Work Permits) helped to counter the decrease in supply of resident low-skilled labour, which kept wages for the low-skilled down, while increases in inflow of skilled foreign labour prevented a stronger tightening in the labour markets and a corresponding increase in wages.

- Singapore's energy prices remain below the median for cities around the world, but they remain among the highest in Asia. Much of the electricity costs premiums are due to the higher prices paid for piped natural gas (PNG) in Singapore.

The business cost structures of major industry groups obtained from a 2011 MTI report is shown below. As of 2011, labour, utilities and trade and transport costs form the largest cost components in the manufacturing sectors, while labour, premise rentals and other services form the largest cost components in the service industries. Of note are higher cost shares of labour costs to SMEs in most industries, and the higher cost shares of

services (utilities, trade and transport, rentals, etc.) costs to large enterprises. Rents of premises form a larger percentage of costs to retail trade and accommodation and food services than other services industries.

FIGURE 3.1: BUSINESS COST OF MANUFACTURING SECTOR BY TYPE OF FIRM (2011)

Per Cent

	Total		Electronics		Chemicals		Biomedical Services		Precision Engineering		Transport Engineering		General Manufacturing	
	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs
Labour Cost	**40.7**	**52.5**	**52.4**	**53.6**	**12.9**	**28.1**	**49.1**	**50.1**	**60.7**	**59.2**	**66.8**	**65.4**	**49.3**	**55.6**
Services Cost	**58.6**	**46.1**	**46.9**	**45.9**	**86.5**	**70.7**	**50.0**	**48.6**	**38.5**	**38.6**	**32.4**	**33.2**	**50.1**	**43.4**
Utilities	30.1	12.4	19.3	6.6	59.8	36.5	14.0	11.5	5.9	6.3	5.8	3.1	12.7	7.7
Trade & Transport	14.5	12.8	14.4	18.0	16.3	13.3	12.8	14.4	14.7	12.3	12.4	12.0	11.6	12.5
Financial Services	2.7	4.3	3.7	5.4	2.3	5.1	1.5	4.0	2.1	4.7	2.1	3.9	3.3	3.3
Communications	1.2	1.5	1.7	1.9	0.6	1.5	1.4	2.5	2.0	1.5	1.6	1.2	1.1	1.3
Warehousing	0.9	0.9	1.1	1.6	0.7	2.3	0.8	0.4	1.9	0.2	0.4	0.2	0.7	0.9
Real estate, include rental	2.4	5.5	2.0	4.7	1.3	3.2	2.8	4.5	2.8	5.6	4.5	6.3	5.1	7.1
Business & other services	6.7	8.7	4.8	7.6	5.4	8.7	16.7	11.4	9.0	8.1	5.6	6.5	15.5	10.6
Government Rates & Fees	**0.7**	**1.4**	**0.6**	**0.5**	**0.7**	**1.1**	**0.9**	**1.3**	**0.8**	**2.2**	**0.8**	**1.4**	**0.5**	**0.9**

FIGURE 3.2: BUSINESS COST OF SERVICES SECTOR BY TYPE OF FIRM (2011)

	Wholesale Trade		Retail Trade		Accommodation & Food Services		Transportation & Storage		Finance & Insurance		Information & Communications		Business Services	
	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs	Large Enterprises	SMEs
Labour Cost	**24.2**	**25.8**	**33.9**	**36.1**	**37.7**	**42.0**	**11.5**	**10.3**	**16.0**	**12.9**	**17.7**	**34.3**	**22.9**	**27.8**
Services Cost	**73.2**	**71.5**	**60.1**	**59.0**	**53.1**	**49.8**	**79.5**	**84.3**	**82.5**	**86.1**	**76.4**	**60.3**	**71.4**	**65.3**
Utilities	0.4	0.6	5.2	2.3	7.9	6.8	0.9	0.3	0.2	0.1	0.8	1.1	0.5	1.9
Freight & Transport	17.7	22.7	0.6	1.4	0.7	0.2	34.4	47.6	–	0.2	–	0.3	–	1.6
Financial Services	0.8	2.1	2.3	2.2	1.3	1.6	0.6	0.8	3.8	4.1	0.1	0.4	0.2	0.8
Communications	0.9	1.2	0.5	0.8	0.5	0.6	0.3	0.4	0.4	0.3	4.3	14.7	0.5	0.6
Renting of Premises	5.5	5.2	31.8	32.0	15.9	20.9	0.7	2.1	1.2	1.3	1.6	3.3	1.1	3.4
Professional Services	4.1	4.6	1.0	1.3	0.7	1.1	0.6	0.5	3.1	2.1	5.4	6.1	6.9	7.3
Other Services	43.7	35.1	18.7	19.1	26.1	18.7	41.9	32.6	73.7	78.0	64.2	34.4	62.2	49.6
Contract labour & work given out	5.7	3.8	1.1	2.0	2.1	2.4	1.1	2.6	0.4	0.3	4.3	6.0	32.9	21.2
Commission & agency fees	7.0	5.6	0.3	3.0	1.2	1.0	3.9	2.4	3.0	5.9	13.0	2.5	0.5	2.5
Government Rates & Fees	**0.5**	**0.5**	**0.6**	**0.6**	**1.4**	**1.1**	**0.6**	**0.5**	**0.1**	**0.2**	**0.6**	**0.4**	**1.4**	**2.0**

Source: Singapore Department Of Statistics and Monetary Authority of Singapore

Notes:

1. SMEs refer to enterprises with operating receipts of not more than $100 million and employment of not more than 200 workers. Large enterprises refer to enterprises with operating receipts of more than $100 million and employment of more than 200 workers.
2. The cost components do not sum to 100% as depreciation cost is excluded.
3. "-" refers to nil or negligible.

Source: Singapore Department of Statistics, MAS Cited in *Economic Survey of Singapore* (Ministry of Trade and Industry, 2013)

Figure 3.3 shows the evolution of cost shares in the manufacturing sectors, from data supplied by the EDB's CMA, over the period from 2003–2012. In terms of cost shares, the share of materials rose from 53.9% to 55.9%; the share of remuneration fell from 8.1% to 6.5%; operating costs increased from 22.8% to 24.0%; and net operating surplus rose from 10.4% to 10.9% (Figure 3.4).

FIGURE 3.3: GROWTH IN COSTS

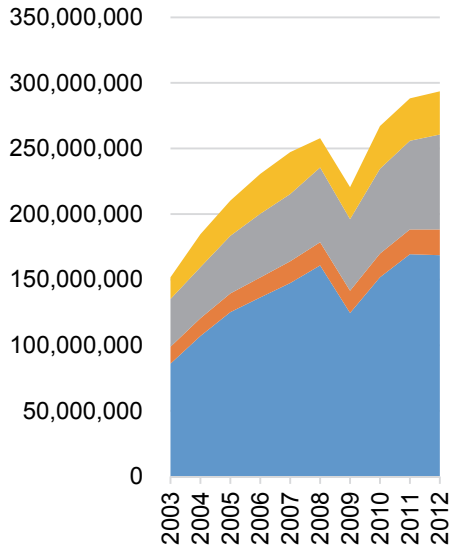
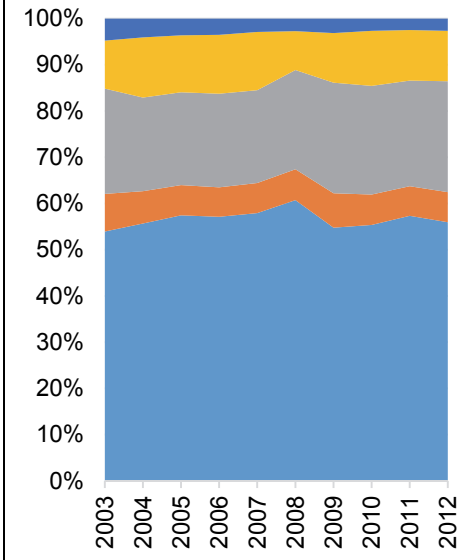


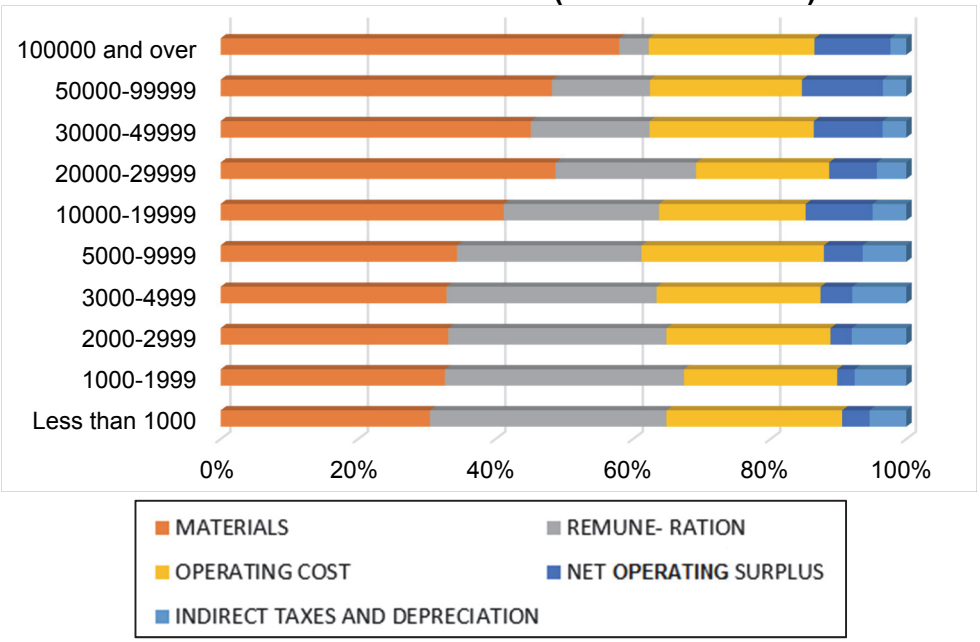
FIGURE 3.4: SHARE OF TOTAL OUTPUT



Source: Economic Development Board, *Census of Manufacturing Activities (2013)*[6]

[6] For clear and detailed definitions, please refer to the technical appendix from EDB: https://www.edb.gov.sg/content/dam/edb/en/resources/pdfs/others/CMA2014-TechnicalNotes.pdf

FIGURE 3.5: PERCENT COST BREAKDOWNS BY SME VALUE OF OUTPUT (IN THOUSANDS)

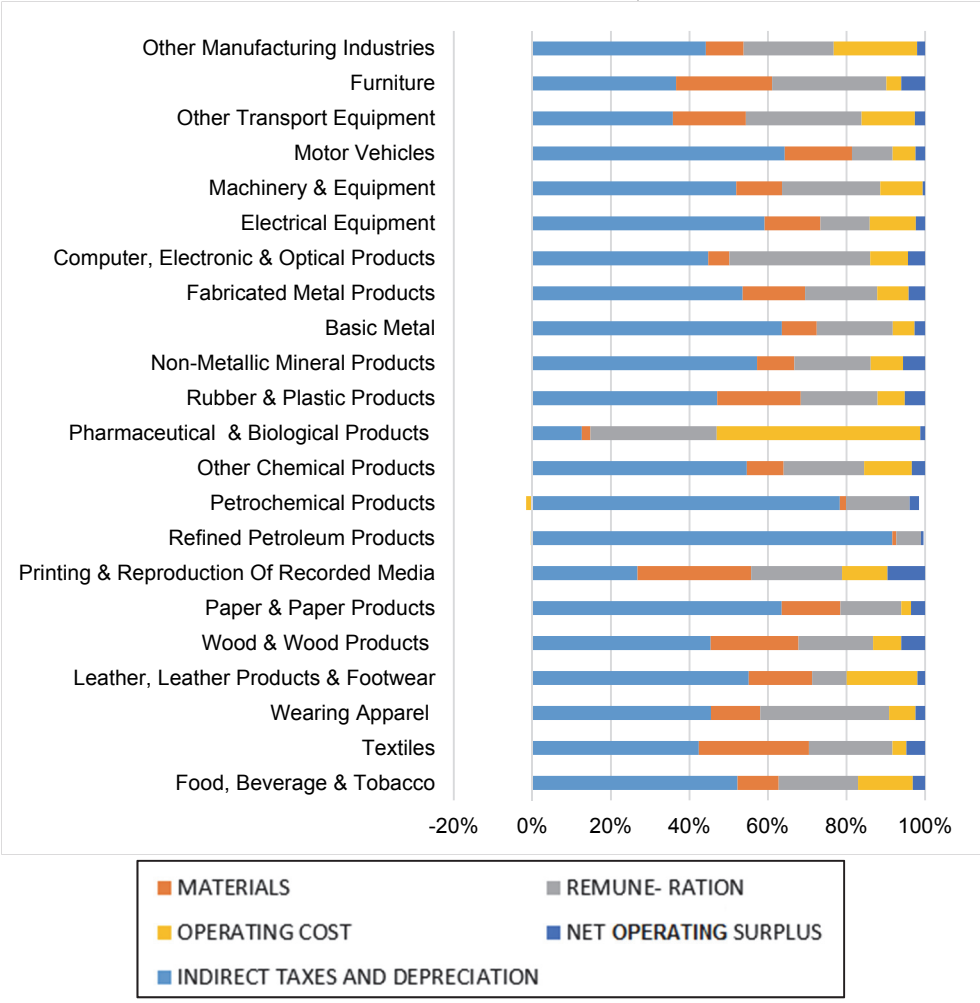


Source: Economic Development Board, *Census of Manufacturing Activities* (2013)

In terms of the cost shares of Singapore firms by size, it was found that smaller SMEs with turnover of less than S$5 million had higher remuneration cost shares, lower net operating surplus, and higher depreciation and indirect tax costs shares than the larger firms. Materials cost shares in contrast, increased with firm size, and formed a large share of costs of large firms with output of S$100 million and over. This suggests that large firms were more exposed to external shocks than smaller firms, while small firms were more exposed to domestic cost conditions. The trends in the chart provide support for potential economies of scale in labour, as well as gross capital investments. In contrast, operating cost shares (which includes rentals) remained constant over the distribution of output levels.

In the breakdown of the cost and profit shares of output in 2012 (Figure 3.6), the lower value-added industries like wood and wood products, textiles, etc., were earning below average cost of capital, while computer, electronic and optical products, which was the largest sector in Singapore with 30.7% of the share of total output, was highly exposed to operating costs. However, data on rental cost shares, which form a component of operating costs is unavailable.

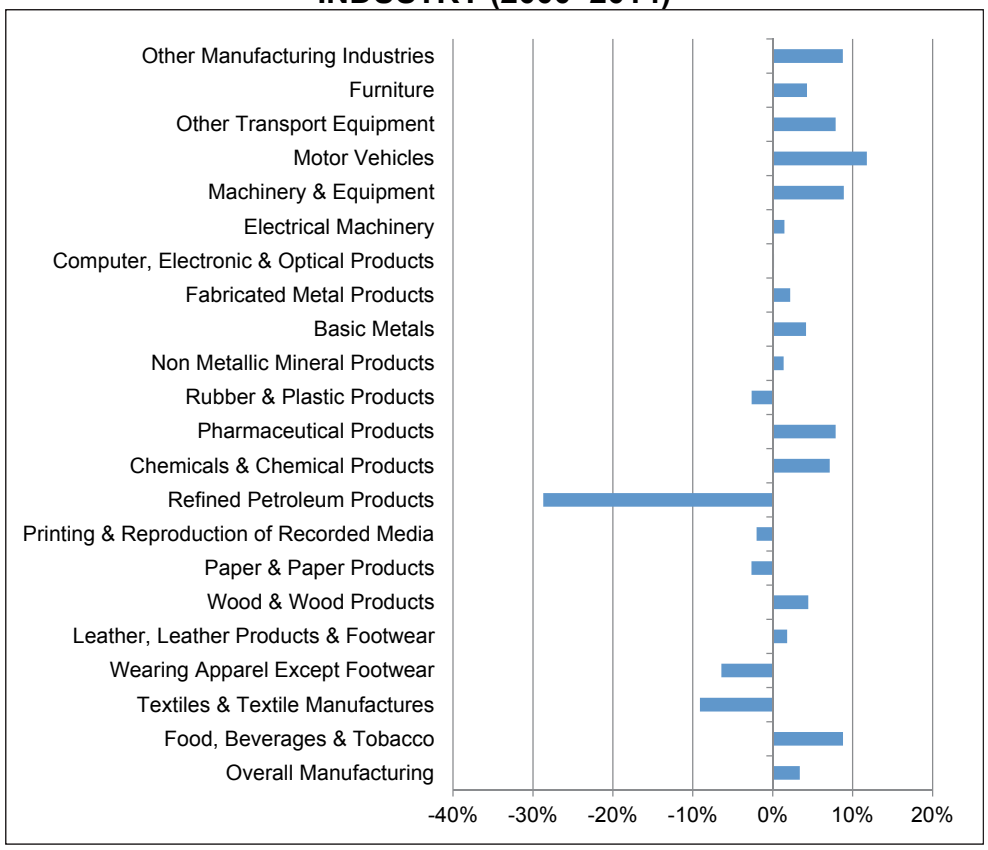
FIGURE 3.6: BREAKDOWN OF COST AND NET OPERATING SURPLUS BY INDUSTRY, 2012



Source: *Census of Manufacturing Activities* (Economic Development Board, 2013)

Due to rising costs, the overall value add of manufacturing, which saw a CAGR of 3.8% from 2000–2014 was outpaced by GDP growth of 5.35% from 2000–2014, while six industries saw negative value-add, and computer, electronic and optical products (which comprises a wide range of businesses) saw stagnating value added (Figure 3.7). The sector, which is the largest employer in manufacturing in Singapore, comprising 21.8% of total share of manufacturing employment in 2012, is highly sensitive to a further rise in business cost.

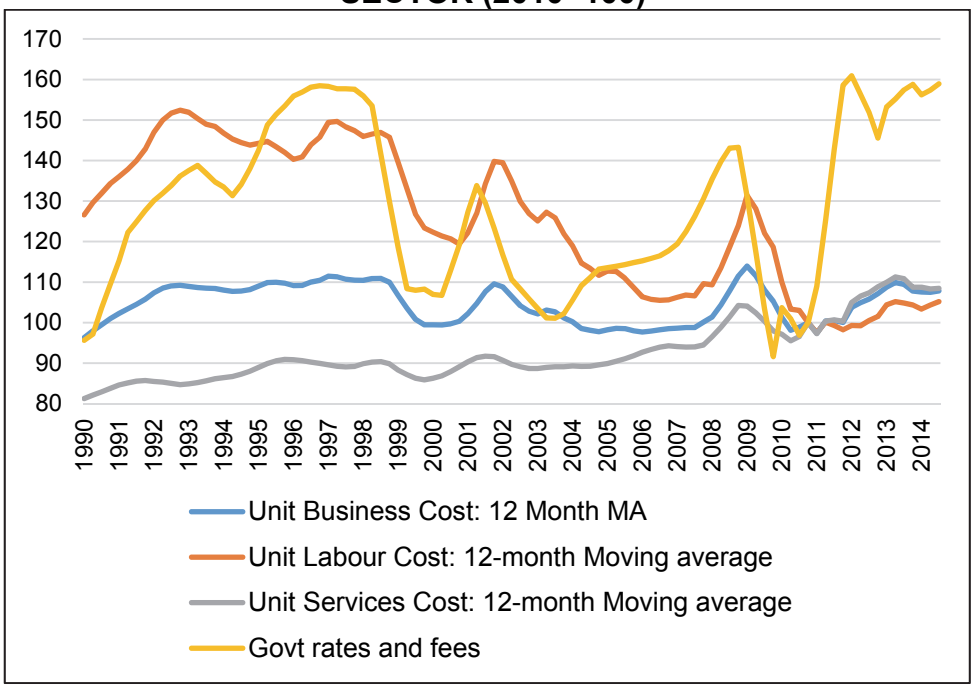
FIGURE 3.7: CAGR OF VALUE ADD OF MANUFACTURING BY INDUSTRY (2000–2014)



Source: Economic Development Board, *Census of Manufacturing Activities* (2013)

Figure 3.8 shows the growth in unit business costs for the manufacturing sector from 1990–2014. Of note are the substantial increases of 58.95% of government rates and fees since 2010, and the uptrends in unit business costs and unit services cost over the period from 1990-2014. Unit business costs have increased by 7.83% since 2010, while unit service costs have increased by 8.45%, unit labour costs by 5.18% respectively. Unit business costs for the services sector are unavailable.

FIGURE 3.8: UNIT BUSINESS COSTS FOR MANUFACTURING SECTOR (2010=100)

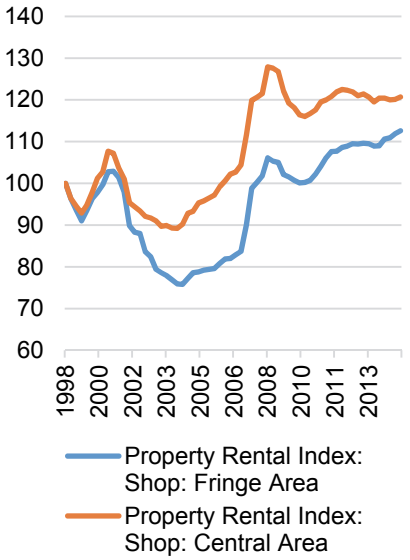
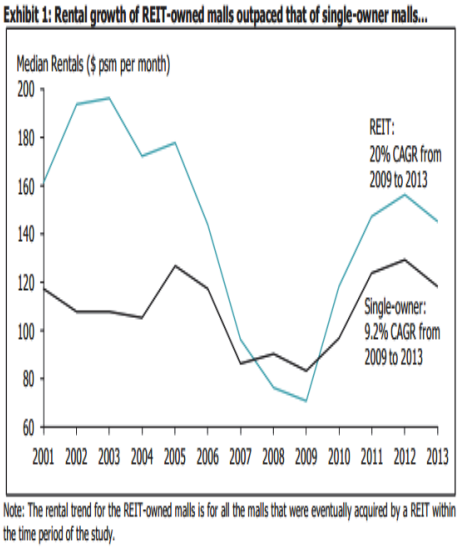


Source: Ministry of Trade and Industry, *Economic Survey of Singapore (2014)*

RENTAL COSTS

Based on the 2011 MTI business costs report, rental costs comprise 5.5% of total business cost shares for SMEs in manufacturing (in aggregate), and 20.9% to 32.0% of business costs for SMEs in the retail trade and F&B sector in services.

Rental costs for commercial retail have increased by 20.7% and 12.6% in Central Area and Fringe Area, respectively since December 1998 (Figure 3.9). This despite the high CAGR in rentals for single-owner and REIT-managed retail spaces from 2009–2013, suggesting that strata-titled rentals have declined in real terms over the period (Figure 3.10).

FIGURE 3.9: PROPERTY RENTAL INDEX: SHOP (DEC 1998=100)	FIGURE 3.10: RENTAL GROWTH OF REIT-OWNED MALLS OUTPACED THAT OF SINGLE-OWNER MALLS
	
Source: Urban Redevelopment Authority (n.d.) via https://webcdm.ceicdata.com	Source: Ministry of Trade and Industry (2014a)

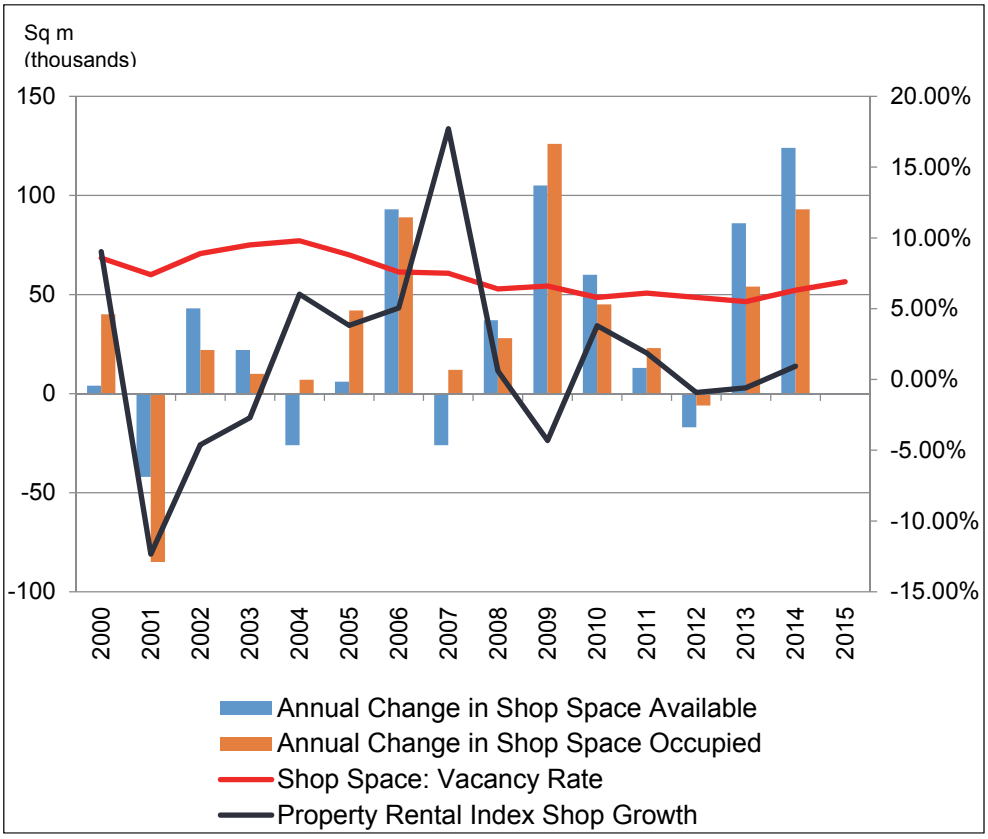
Based on supply and demand trends in the markets (Figure 3.11), vacancy rates have been below the long–term average since 2007, signalling strong demand growth and a protracted under-capacity in the markets following the supply pipeline dips from 1998–2004; but supply increases post-2005 have managed to moderate net rental index growth. However, based on the comparison between the annual change in shop space available and the annual change in shop space occupancy, it is seen that periods of undersupply or oversupply tend not to persist beyond two years.

However, using quarterly data from 2000Q1 to 2015Q4, the correlations between vacancy rates and the property price index for shops are -0.802, while the correlation between vacancy rates and the rental price index is -0.866. While correlation is not causation, this suggests that supply and demand factors may be a strong driving force in markets.

Market segmentation and local factors, such as mall quality and location, tenant services, footfalls and catchment areas, retail concepts and the

penetration of high street brands, etc., as well as market pricing power also play a key role in growth differentials in shop rentals in Singapore. For example, REITS rentals have grown 20% CAGR from 2009–2013. The comparative levels of retail rents in prime areas by CBRE (Figure 3.12) show that Singapore is ranked in 18th place in the world, while CBRE's 2013Q3 Asia reports note that Singapore has one of the highest prime retail rents in Asia at US$465psf per annum.

FIGURE 3.11: GROWTH IN SHOPS AVAILABLE AND OCCUPIED



Source: Urban Redevelopment Authority (n.d.), Retrieved from: https://webcdm.ceicdata.com [7]

[7] URA releases data on retail space, as well as shop space. URA has traditionally provided data on shop space, which does not include spaces that are used for food and beverage (F&B), entertainment, and health and fitness uses. Shops make up about 60% of the total stock of retail space as at 2013Q4.

FIGURE 3.12: SHOPPING CENTRE PRIME RETAIL RENTS

Country	City	Local Rent Currency and Measurement	Prime Rent (Local Currency and measurement)	Prime Rent (US$ psf/annum)	Last 3 months q-o-q (%)	Last 12 Months y-o-y (%)
China	Beijing	Rmb sq. m. p. d.	122	672	0.0	0.0
China	Shanghai	Rmb sq. m. p. d	90	497	0.0	0.0
China	Guangzhou	Rmb sq. m. p. d	107	592	0.0	-2.3
China	Shenzhen	Rmb sq. m. p. d	56	309	0.0	6.3
Malaysia	Kuala Lumpur	RM sq. ft. p.m.	150	581	0.0	0.0
Philippines	Manila	PHP sq. m. p. m.	1400	37	3.7	24.4
Singapore	Singapore	S$ sq. ft. p. m.	49	465	0.0	1.9
Thailand	Bangkok	THB sq. m .p. m.	3100	114	0.0	3.2
Vietnam	Ho Chi Minh City	US$ sq. m. p. m.	200	223	0.0	0.0
Vietnam	Hanoi	US$ sq. m. p. m.	125	139	0.0	-13.8
India	New Delhi	INR sq. ft. p. m.	1100	233	0.0	22.2
India	Mumbai	INR sq. ft. p. m.	650	138	0.0	8.3

Source: CBRE Research (2013)

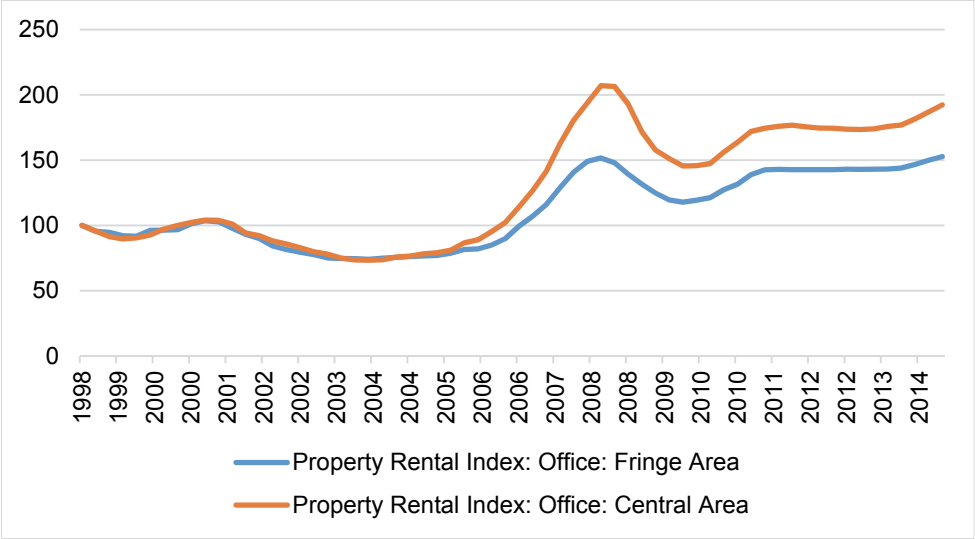
In the office rental markets, suburban and prime office rents have grown 2.68% and 4.17% CAGR and 52.8% and 92.3% in total growth, respectively, over the period 1998–2014, with much of the increases occurring during 2005–2014 (Figure 3.13).

Historically, the data points to three distinct cycles: pre-1997, characterised by strong supply and moderate rental growth; 1997–2005, with excess capacity and rental decline; and 2005–2014, with above average rental growth, moderate supply and average levels of occupancy.

Using quarterly data from 2000Q1 to 2015Q4, the correlation between vacancy rates and the property price index for offices is -0.729, while the correlation between vacancy rates and the rental price index is -0.783.

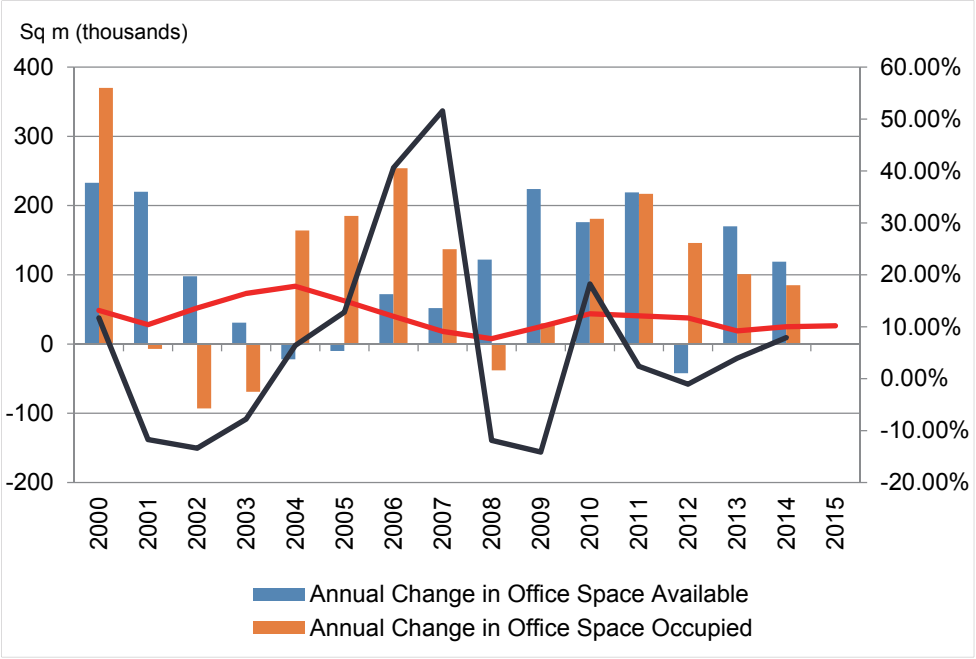
Singapore's CBD office rents are the fifth highest in Asia (and 11th in the world) at an average US$102.84 psf per annum, based on a Cushman and Wakefield 2014 report (Figure 3.15). This is among the highest in rental growth in the world, 19% after adjusting for exchange rates.

FIGURE 3.13: PROPERTY RENTAL INDEX: OFFICE (DEC 1998=100)



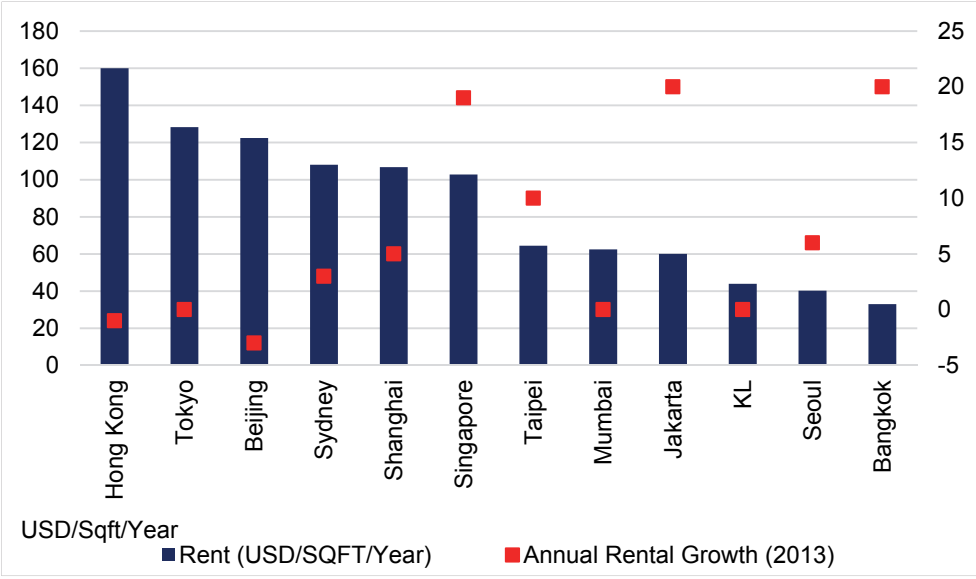
Source: Source: Urban Redevelopment Authority (n.d.), Retrieved from: https://webcdm.ceicdata.com

FIGURE 3.14: GROWTH IN OFFICE AVAILABLE AND OCCUPIED



Source: Urban Redevelopment Authority (n.d.), Retrieved from: https://webcdm.ceicdata.com

FIGURE 3.15: CBD AVERAGE OFFICE RENT 2013 — ASIA PACIFIC

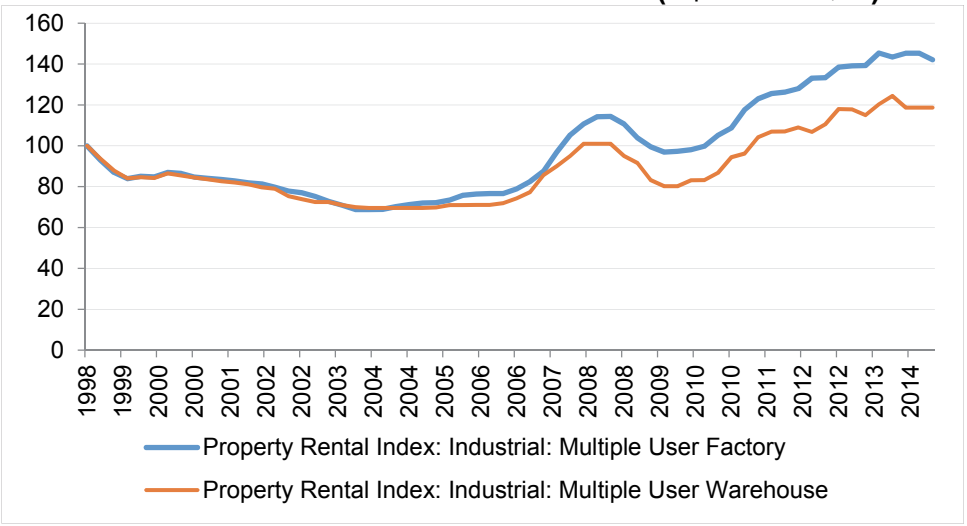


Source: Cushman & Wakefield (2014)

In the industrial space, the property rental index for multiple-user factory and warehouse space rose by 42.1% and 18.7%, respectively, between 1998 and 2014 (Figure 3.16). The market from 2004–2010 (with the exception of 2009) was characterised by undersupply and a declining vacancy rate (Figure 3.17). This reversed in 2011; however, rental cost growth remained positive until 2014.

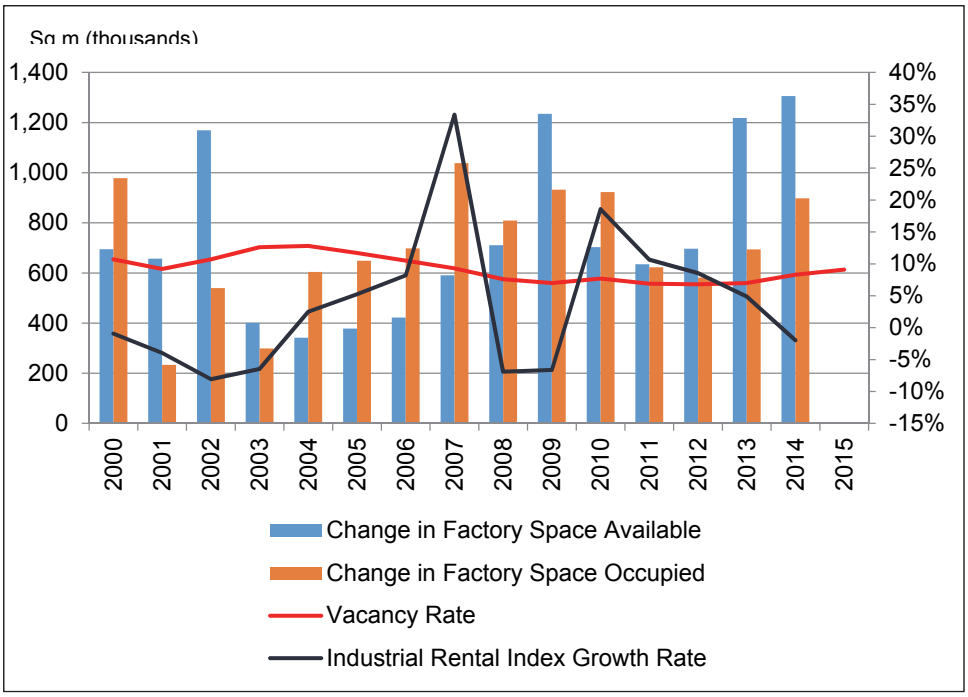
Using quarterly data from 2000Q1 to 2014Q3, the correlations between vacancy rates and the property price index for Multiple-user Factory Space (not including warehouse) is -0.615, while the correlation between vacancy rates and the rental price index is -0.794.

FIGURE 3.16: MULTIPLE USER FACTORY, MULTIPLE USER WAREHOUSE — MEDIAN RENTALS (S$ PER SQ M)



Source: Source: Urban Redevelopment Authority (n.d.), Retrieved from: https://webcdm.ceicdata.com

FIGURE 3.17: GROWTH IN FACTORY SPACE AVAILABLE AND OCCUPIED



Source: Source: Urban Redevelopment Authority (n.d.), Retrieved from: https://webcdm.ceicdata.com

LABOUR COSTS

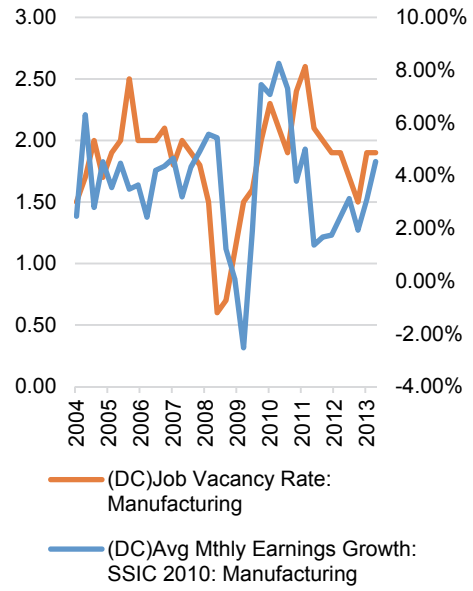
Figure 3.18 shows that job vacancy rates across the manufacturing, services and construction sectors have been averaging 1.86%, 1.135% and 2.8% for the manufacturing, construction, and services sectors, respectively, while wage growth has moved in line with vacancy rates, growing a total of 36.45%, 35.42% and 35.95%, respectively, over the period 2004–2013.

Job vacancies refer to unmet demand for labour; hence, one may expect vacancy rates to reflect a frictional vacancy rate component, a cyclical excess demand component, as well as a structural component. Rising vacancy rates exhibit co-movement with earnings growth rate, seen in Figure 3.18.

It should be noted that sector level statistics do not reflect considerable heterogeneities across industries in the same sector. For example, accommodation and food services, which have the lowest mean average nominal earnings, increased by 22.0% between 2005 and 2012 while the

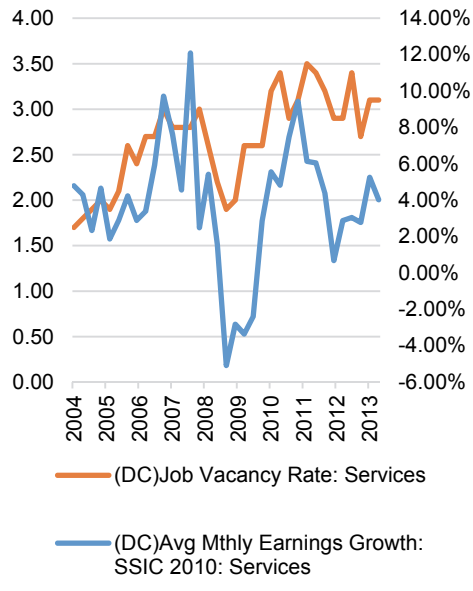
earnings in financial and insurance services increased by 42.2% (Figure 3.21). Together, the mean wage statistics point to the fact that cost pressures due to labour compensation vary significantly across industries. An important point to note is that the wage data considers only resident labour and hence neglects the foreign labour component of the local workforce. This omission is likely to result in the data being an inaccurate reflection of labour compensation conditions in industries, such as construction and less skill-intensive services, which have a large foreign labour component.

FIGURE 3.18: MANUFACTURING VACANCY AND EARNINGS GROWTH



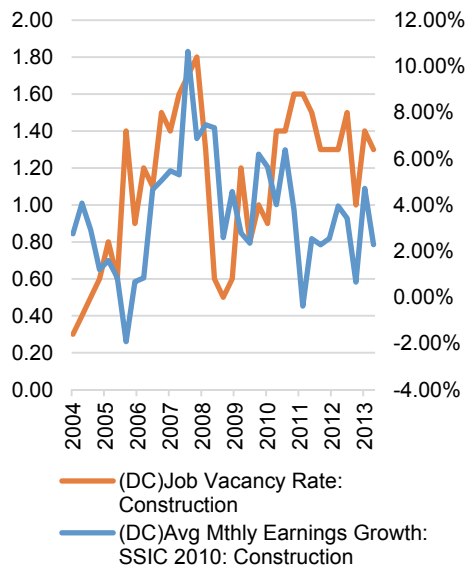
Source: Ministry of Manpower (2014)

FIGURE 3.19: SERVICES VACANCY AND EARNINGS GROWTH



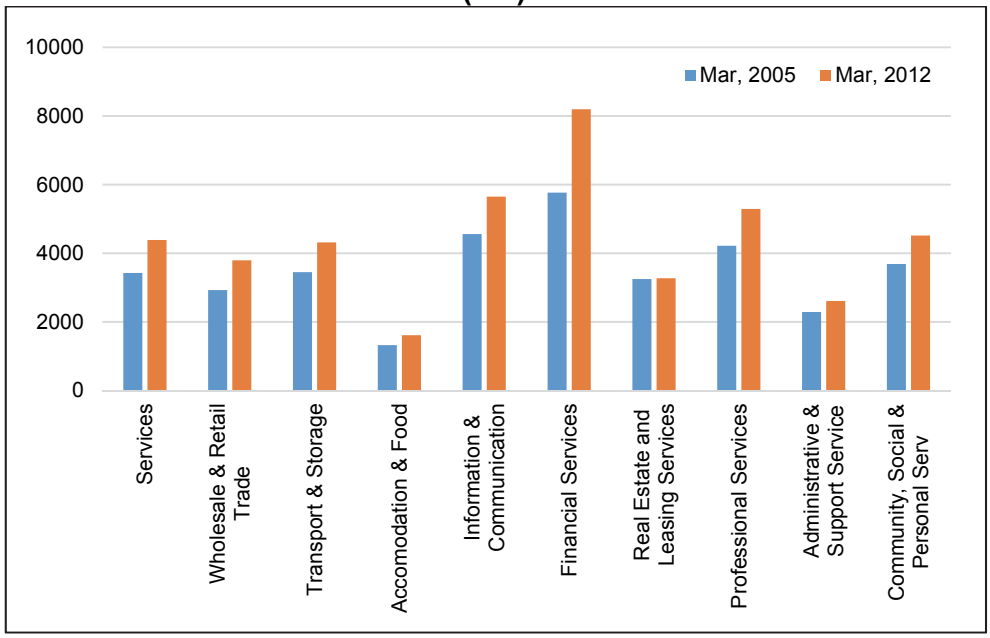
Source: Ministry of Manpower (2014)

FIGURE 3.18: CONSTRUCTION VACANCY AND EARNINGS GROWTH



Source: Ministry of Manpower (2014)

FIGURE 3.21: AVERAGE NOMINAL EARNINGS BY INDUSTRY (SA)



Source: Department of Statistics (2012), Retrieved from https://webcdm.ceicdata.com

GOVERNMENT POLICY AND LABOUR COSTS

Government policy in Singapore exerts significant influence on the labour market due to its control over the supply of foreign labour. Foreign workers make up a substantial portion of the local workforce, with some industries, such as construction, relying almost exclusively on foreign workers for positions at the operator level and below. Labour inflow into Singapore is controlled through the issue of various classes of permits/passes, which are granted based on the qualifications of the applicant and the type of job to be taken up. Thus, through these segregated classes of permits, the government's foreign labour policy plays a key role in determining the general supply of labour in various segments of Singapore's workforce.

Between 2008 and 2012, the size of the aggregate workforce increased by about 14.0%. Within the "low-skilled" labour segment, the number of foreign Work Permit holders increased concurrently with a decrease in low-skilled resident labour, defined as workers with secondary or lower qualifications (Figure 3.22). Overall, these countervailing flows resulted in the size of the low-skilled labour pool remaining largely stable. In contrast, the pool of "high-skilled" labour expanded rapidly, with increases in both the number of skilled foreign workers, holding Employment Passes and S Passes, and the number of skilled residents, defined as those having diplomas and higher qualifications.

The demand for low-skilled workers has outstripped supply, as seen by the strong recovery in vacancy and recruitment rates after the crisis in 2008–2009 (Figure 3.24). Hence, it is clear that the inflow of foreign workers (with Work Permits) helped to counter the decrease in supply of resident low-skilled labour, which has kept down wages for the low-skilled. The increase in the number of S Pass holders had arguably the same effect for mid-level wages (defined as clerical, sales and services workers), as the number of equivalent resident workers (with post-secondary qualifications) remained largely stagnant throughout our period of observation (Figure 3.25)

FIGURE 3.22: FOREIGN WORKER EMPLOYMENT ('000)

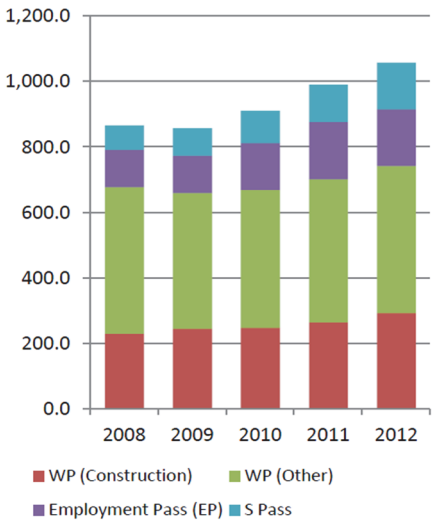
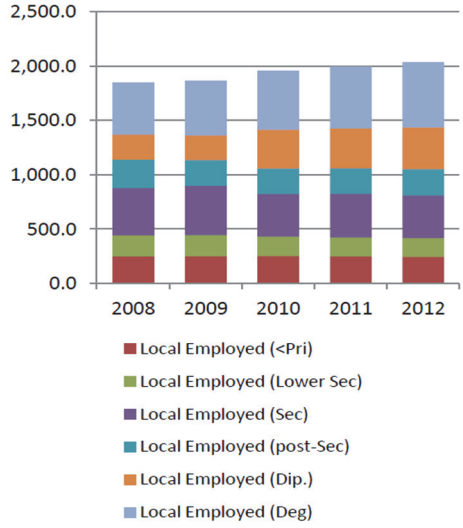


FIGURE 3.23: RESIDENT EMPLOYMENT ('000)



Source: Ministry of Manpower, *Foreign Workforce Numbers* (2013)

FIGURE 3.24: VACANCIES, VACANCY RATE AND RECRUITMENT RATE (LOW-SKILLED)

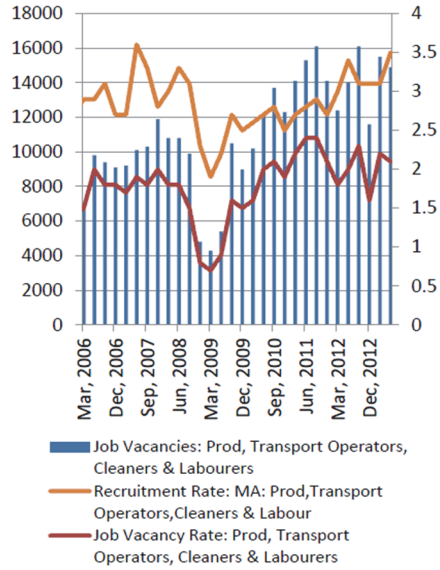
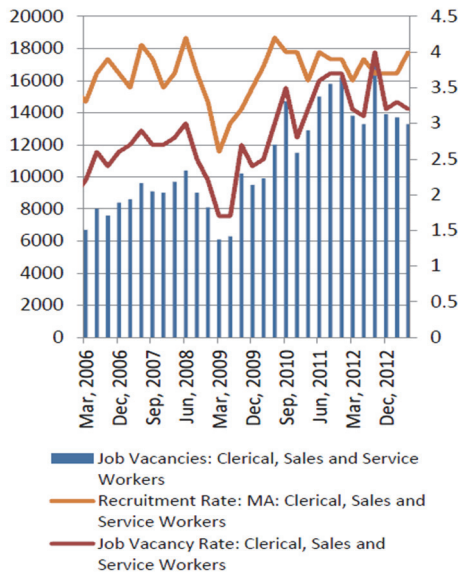


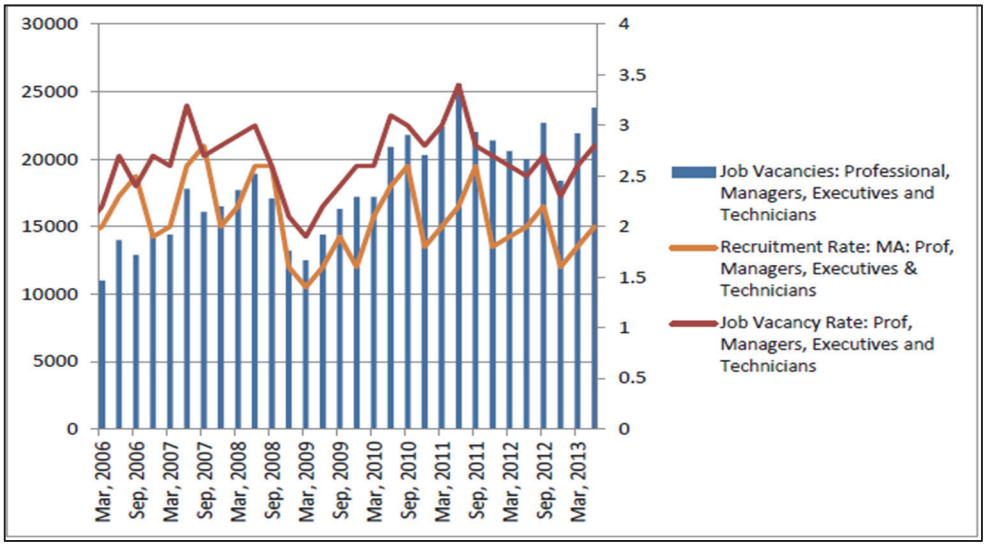
FIGURE 3.25: VACANCIES, VACANCY RATE AND RECRUITMENT RATE (S PASS)



Source: Ministry of Manpower (2014)

The demand for highly skilled workers (Figure 3.26) shows a weaker recovery in 2010 and appear to be in decline from 2011 to 2013. These trends suggest that demand for high-skilled labour had stabilised since 2010, with no remaining excess demand. This suggests that the increases in inflow of skilled foreign labour has prevented a stronger tightening in the labour markets and a corresponding increase in wages.

FIGURE 3.26: VACANCIES, VACANCY RATE AND RECRUITMENT RATE (HIGHLY-SKILLED)



Source: Ministry of Manpower (2014)

RAW MATERIALS AND MANUFACTURED IMPORTS

Raw material costs form a large component of total costs in the construction sector and many manufacturing industries. Since Singapore is not a producer of any raw materials, almost all feed material used in the manufacturing and construction sectors have to be imported. Hence, the Import Price Indices (ImPI) are useful indicators of the changes in the prices of raw material inputs. Figure 3.27 shows that the price of crude material and mineral fuel imports increased between 2005 and 2012, with the crude materials and fuel ImPIs rising by 19.5% and 42.5%, respectively. In contrast the price of chemicals imports remained relatively stable, increasing by only 2.7%.

Beyond materials, manufactured goods such as plant machinery and transport equipment are also important inputs for businesses. According to Figure 3.28, the price of machinery and transport equipment imports decreased by 22.4% between 2005 and 2012, while the price of other manufactured imports increased or remained stable.

FIGURE 3.27: IMPORT PRICE INDICES (MATERIALS)

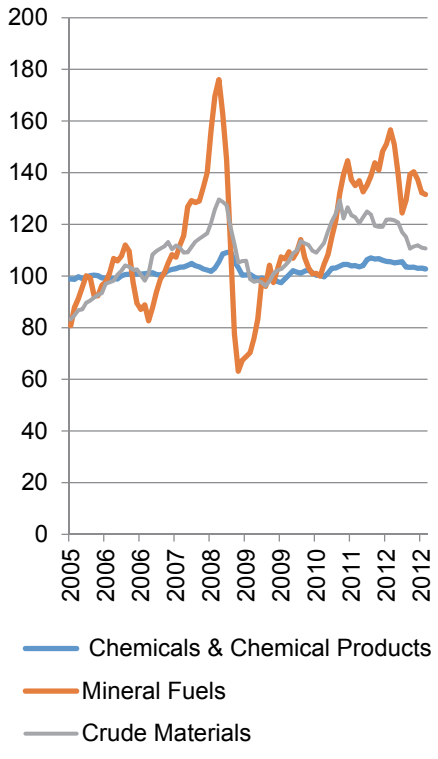
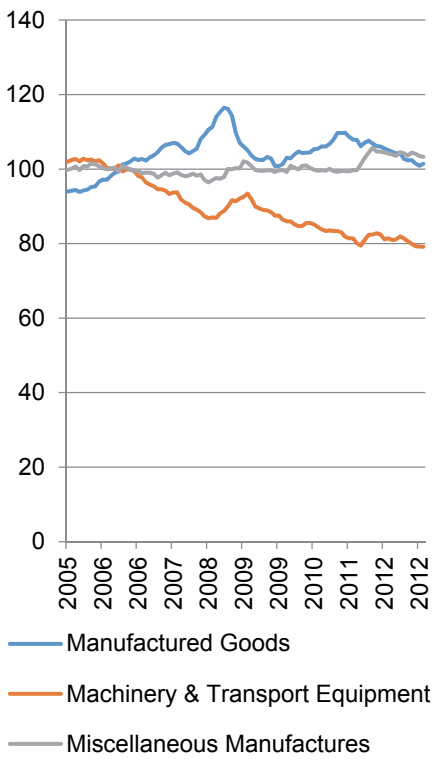


FIGURE 3.28: IMPORT PRICE INDICES (MANUFACTURED GOODS)



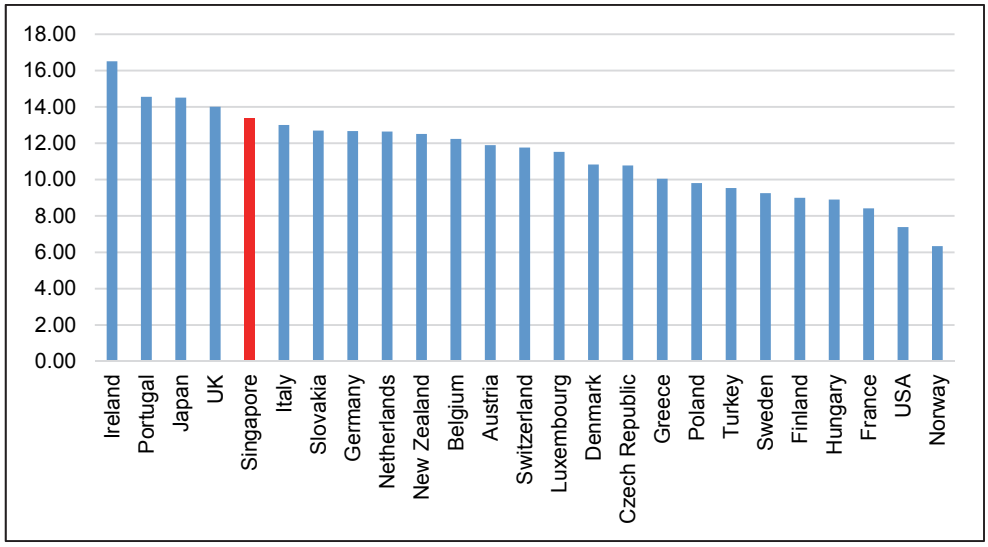
Source: Department of Statistics (n.d.), Retrieved from https://webcdm.ceicdata.com

ENERGY PRICES

Singapore's energy prices are below the median for cities around the world, but they remain one of the highest in Asia. Domestic electricity tariffs, not including taxes averaged 26.25¢/Kwh in 2013, placing it above several EU nations including Germany (Figure 3.29). In a city-based comparison commissioned by EMA, Singapore is middle-ranked among cities as of Jan 2013, at 28.12¢/kwh, which places it below the median of

33.5¢/kwh (Figure 3.32). However, its electricity tariffs are higher than most cities in Asia, including Bangkok, Hong Kong, Shanghai, Taipei and Seoul. In terms of growth, wholesale electricity prices (WEP) have grown at CAGR 3.5% from 2003–2014 (Figure 3.30).

FIGURE 3.31: DOMESTIC ELECTRICITY PRICES (2013) (NOT INCLUDING TAXES) IN PENCE/KWH



Source: International Industry Energy Prices via Uk.gov (2015)

FIGURE 3.30: WEP PRICES 2003–2014 (¢/KWH)

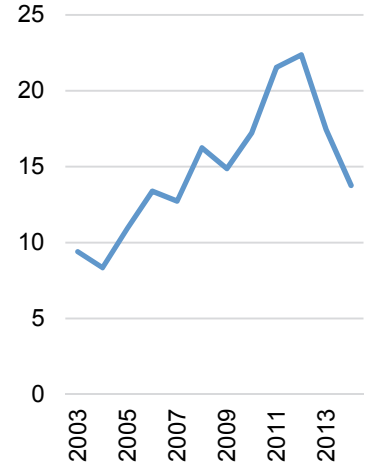
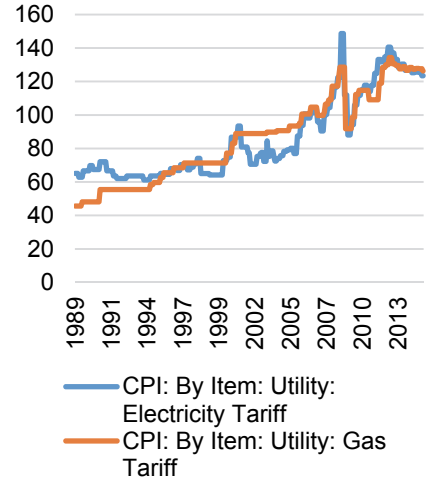


FIGURE 3.31: ELECTRICITY, GAS TARIFF CPI INDEX (2009=100)



Source: Energy Market Company (n.d.)	Source: Department of Statistics (n.d.), Retrieved from https://webcdm.ceicdata.com

FIGURE 3.32: CITY-BASED RESIDENTIAL TARIFF, JANUARY 2013

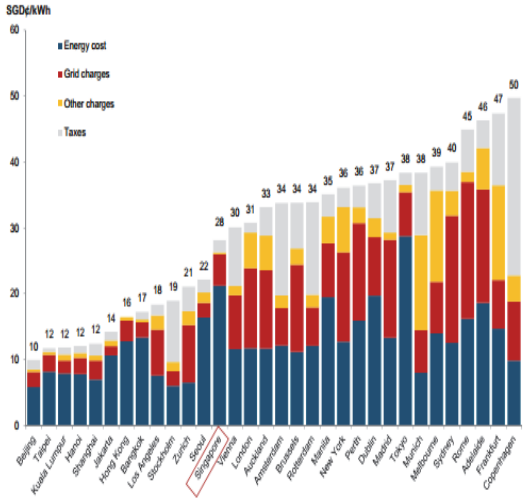
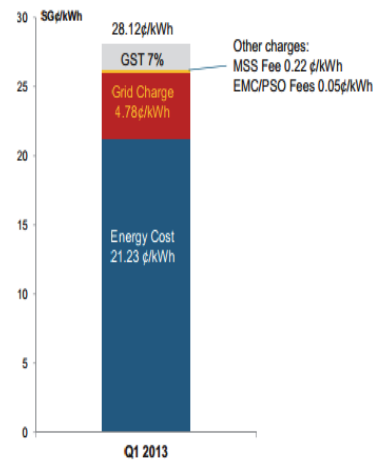


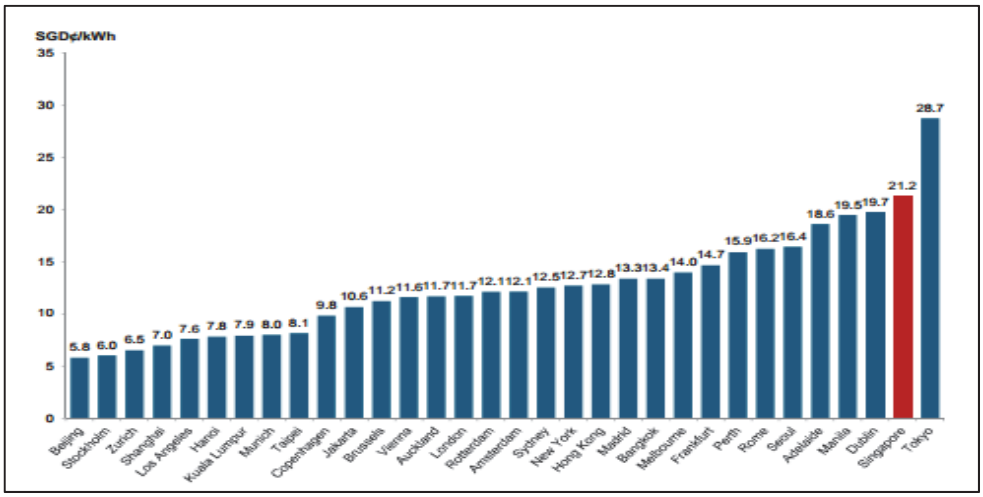
FIGURE 3.33: TARIFF COMPONENTS



Source: "Global Benchmark Study of Residential Electricity Tariffs" (Lantau Group, 2013)

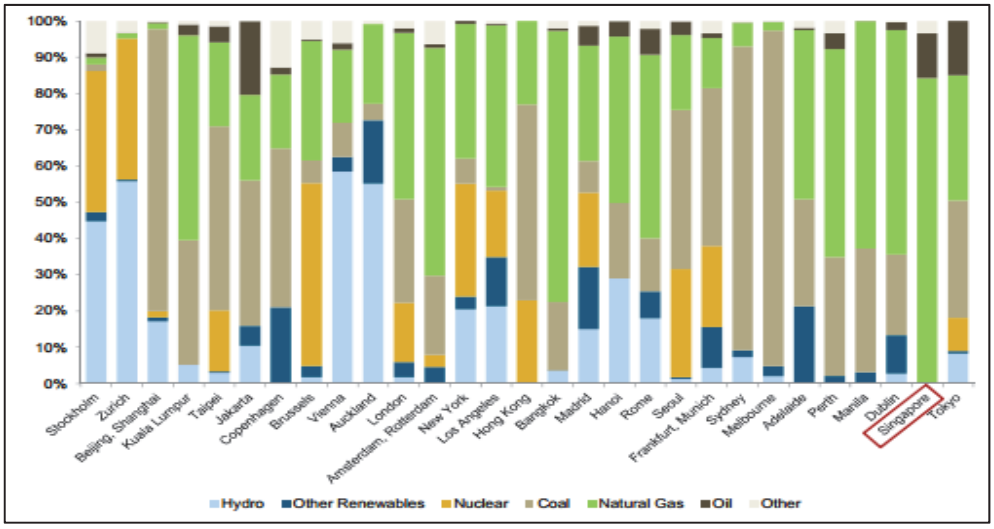
Singapore's energy generation costs is one of the highest in the world, which contributes to the above-average rates of domestic electricity prices (Figure 3.34), as seen in the relatively high blue bars, compared with other cities. The figure shows that the energy mix in Singapore is largely skewed towards PNG-based energy generation. High prices are due to the price paid for PNG in Singapore.

FIGURE 3.34: SINGAPORE DOMESTIC ELECTRICITY PRICES



Source: "Global Benchmark Study of Residential Electricity Tariffs" (Lantau Group, 2013)

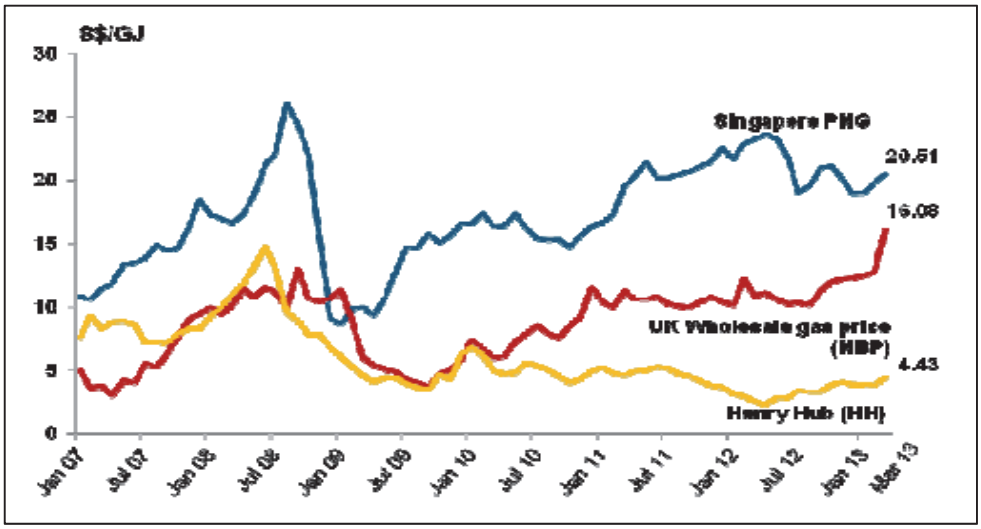
FIGURE 3.35: SHARE OF POWER GENERATION BY SOURCE



Source: "Global Benchmark Study of Residential Electricity Tariffs" (Lantau Group, 2013)

Based on the Lantau Group study (2013), the price of Singapore's pipeline-supplied PNG is compared with the price of natural gas sold at either the UK's National Balancing Point ("NBP") or the US Henry Hub ("HH") gas markets. Based on the 2012Q4 prices, Singapore paid a 23% (UKNBP) to 46% (USHH) premium on its energy charge due to the prices paid on its pipeline natural gas (Figure 3.36).

FIGURE 3.36: GAS PRICES OF NORTH AMERICA, UK AND SINGAPORE



Source: "Global Benchmark Study of Residential Electricity Tariffs" (Lantau Group, 2013)

FIGURE 3.37: ESTIMATION OF NATURAL GAS PRICE IMPACT ON RETAIL TARIFF

Components (¢/KWh)	Singapore PNG	UK NBP	US Henry Hub
Energy Charge	21.23	15.23	9.23
Grid Charge	4.78		
Other	0.27		
Tariff before Taxes	**26.28**	**20.28**	**14.28**
Tax	1.84	1.42	1.00
Total Tariff	**28.12**	**21.70**	**15.28**
Percent Difference		*- 23%*	*- 46%*

Source: "Global Benchmark Study of Residential Electricity Tariffs" (Lantau Group, 2013)

Chapter 4

Hypotheses to Explain Rising Costs in Singapore

CHAPTER 4: HYPOTHESES TO EXPLAIN RISING COSTS IN SINGAPORE

OVERHEATING ECONOMY

Hypothesis 1: The economy was operating at *a high rate of capacity utilisation (overheating)*, which led to sustained inflation. This was facilitated through several factors:

- **Growth of GDP components, including consumption, capital investments and exports:** The overall economy saw increased growth over the period from 2006–2014. Consumption, gross fixed capital expenditure and exports growth show moderate to strong correlations with inflation growth.

- **Increased global liquidity:** Loose global credit conditions before 2008 and the flow of credit to emerging markets post-2009 contributed to reductions in risk and liquidity spreads and increased credit lending, spurring asset inflation and business cost pass-through as well as increased business activity that contributed to the output gap.

- **Reduced effectiveness of exchange rate policy in controlling inflation:** Population growth and lags in infrastructure development resulted in a lower slack in the domestic economy, which increased the severity of the trade-offs inherent in an exchange rate-based monetary policy. The policy of gradual appreciation of the MAS to reduce imported inflation led to domestically-sourced inflation; which were exacerbated by conditions of land scarcity that increased transport and accommodation rents.

- **Low productivity growth and high employment rates:** The easing of labour supply from 2006–2008 led to a decline in productivity growth and a rising ratio of nominal wage growth over labour productivity growth, which led to an increase in the non-accelerating inflation rate of unemployment (NAIRU) in the period 20072013. This resulted in a below-NAIRU rate of unemployment and increased pressures on wage-push inflation.

GDP GROWTH IN SINGAPORE

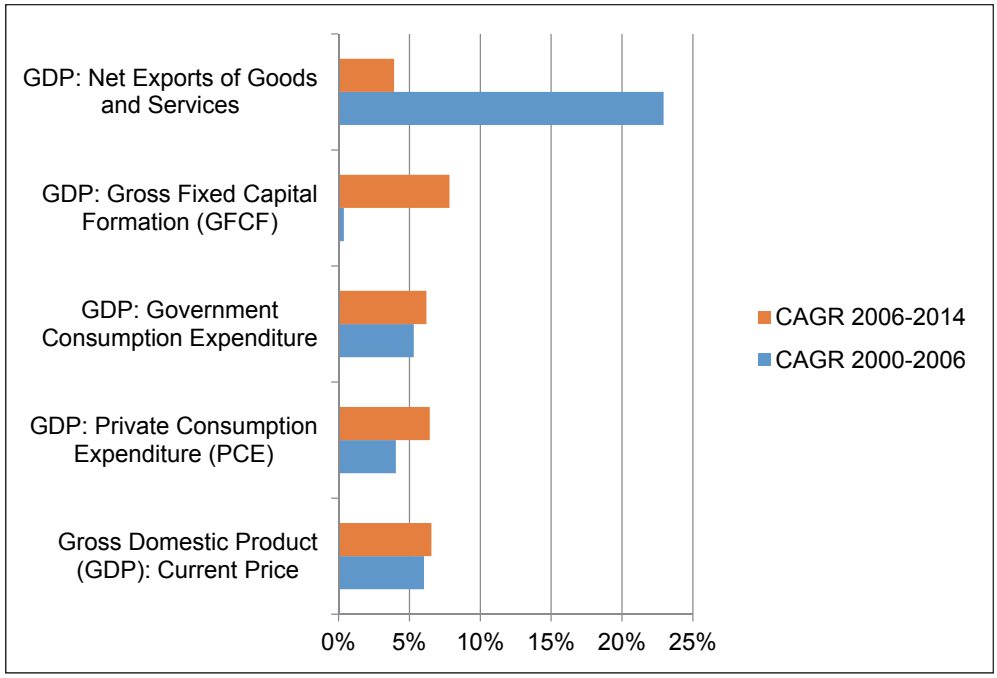
GDP grew by CAGR 6.04% from 2000–2006 and 6.55% from 2006–2014. This was accompanied by a pickup in growth rates across several

categories, including private consumption expenditure, government consumption expenditure, and gross fixed capital expenditure, while net export growth slowed substantially over the period, in line with the slowdown in world trade over the period during and after the 2008 global financial crisis.

Hence, growth clearly shows a stronger relation to increasing CPI over the period from 2006–2014. This suggests that the composition of growth, both in terms of the expenditure categories, as well as growth in different sectors, had a major role in inflation. In particular, the growth in gross fixed capital formation seems to have triggered rising costs.

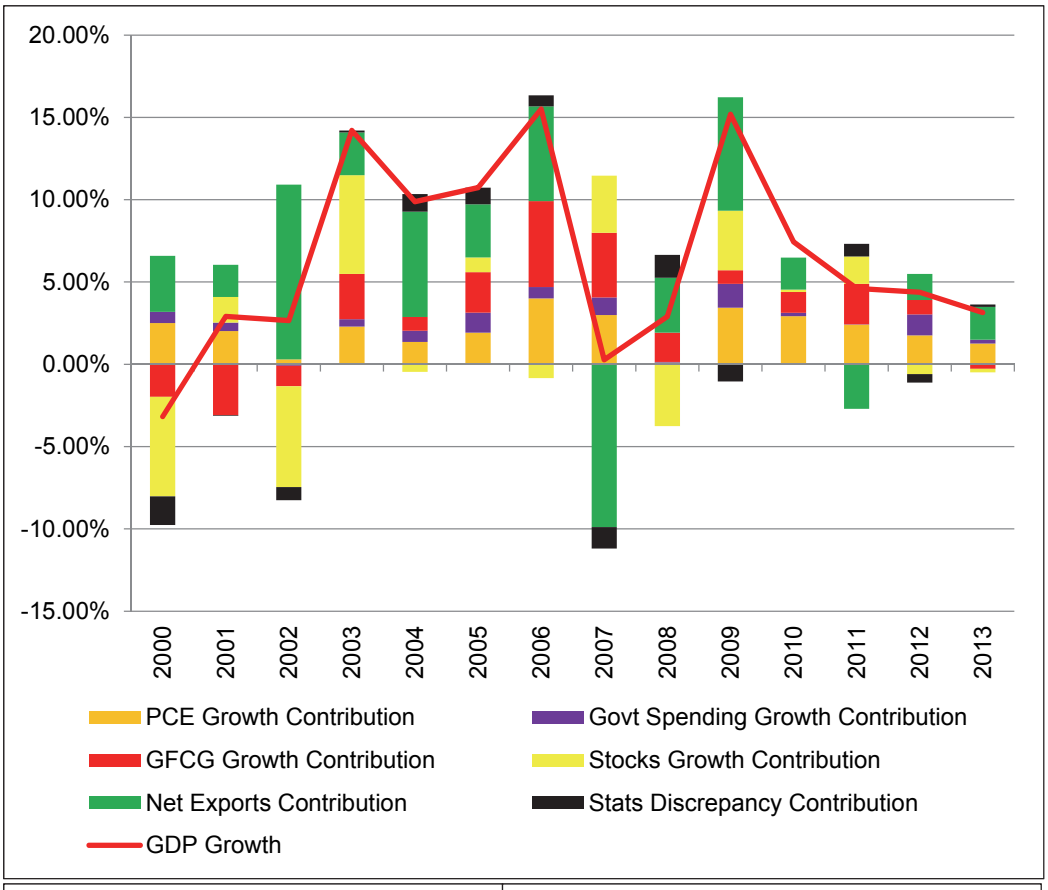
In terms of expenditure components of growth (Figure 4.1), private consumption expenditure grew moderately (in compounded annual rates) at 4.04% for 2000–2006 and 6.43% for 2006–2014, while government consumption expenditure grew from 5.31% for 2000–2006 to 6.20% for 2006–2014. Gross fixed capital expenditure saw a rapid acceleration in growth, from 0.38% for 2000-2006 to 7.83% for 2006–2014, while net export growth fell from 22.93% for 2000-2006 to 3.92% in 2006–2014.

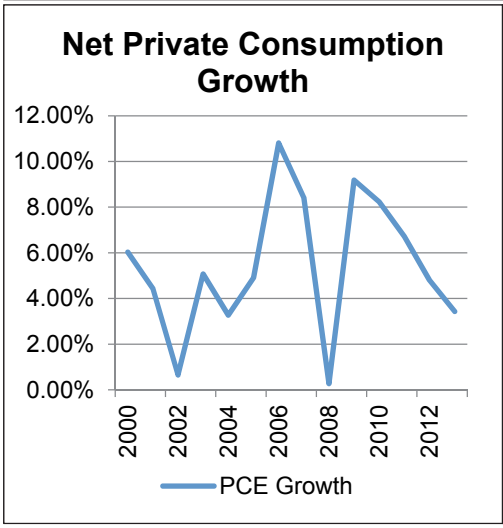
FIGURE 4.1: CAGR OF GDP COMPONENTS

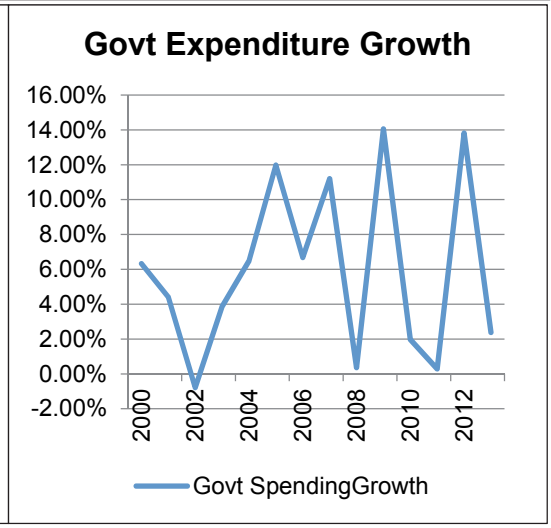


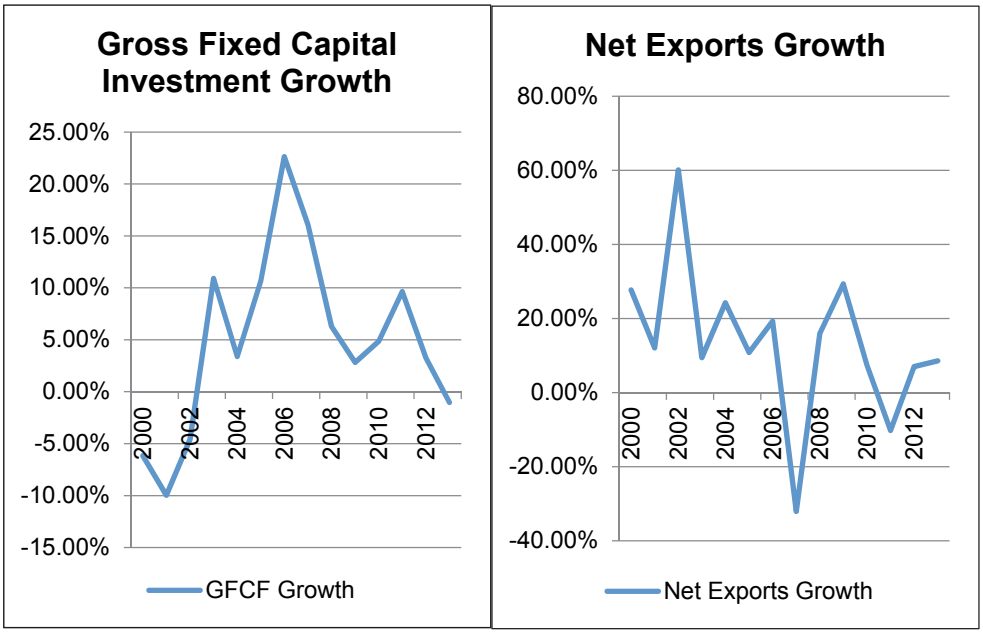
Source: Ministry of Trade and Industry (n.d.), Retrieved from: https://webcdm.ceicdata.com

FIGURE 4.2: GDP GROWTH BY CONTRIBUTION









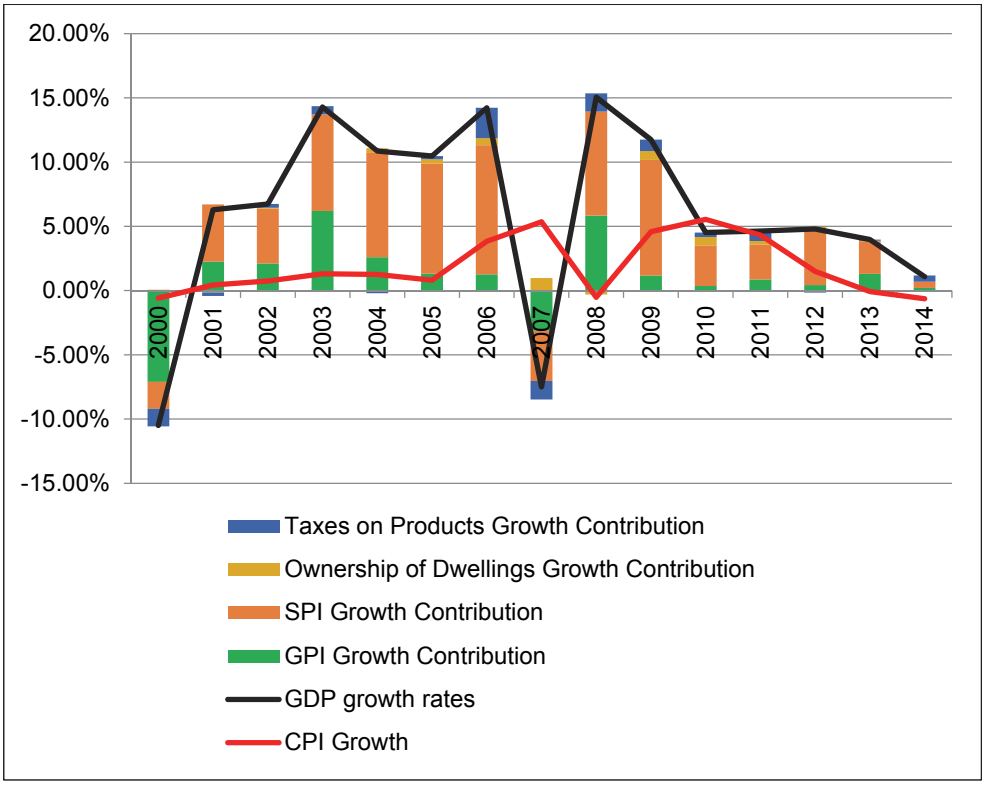
Source: MTI, Department of Statistics (n.d.), Retrieved from https://webcdm.ceicdata.com

At the sectoral level, the services producing industries (SPI) have contributed to a larger proportion of GDP growth by output as compared with the goods producing industries (GPI) (Figure 4.3) from 2000–2014. Taking averages of the CAGR of the growth contribution, the GPI averaged 1.42% while SPI averaged 4.66%. Over the period 2000–2014, the GPI grew at compounded annual rate of 3.41%, while manufacturing and construction grew at 2.85% and 5.98%, respectively.

Within the GPI sectors, the manufacturing sector's average contribution to GDP growth was 1.13%, while the construction sector's contribution to growth is 0.24% (Figure 4.4). The manufacturing sector constituted 17.8% of total GDP by output in 2015, as compared with construction, at 4.90%. However, using quarterly data from 1975 to 2015, the growth rates in the construction industry showed the largest correlations with CPI growth rate at 0.231, while the manufacturing (0.128), utilities (-0.092), and other goods industries (0.202) showed low to negative correlation with CPI. Overall, the goods producing industries showed a correlation of 0.175 with CPI. This may reflect the possibility of transmission lags from higher capacity utilisation to higher costs in the manufacturing sector. Additionally, it suggests that the growth in the construction sector has a disproportionate effect on CPI. This may be due to the relatively higher output multiplier in the construction sector, 2.08 as compared to 1.423 for manufacturing as measured in the input-output tables in 2010 (MTI, 2010). The construction

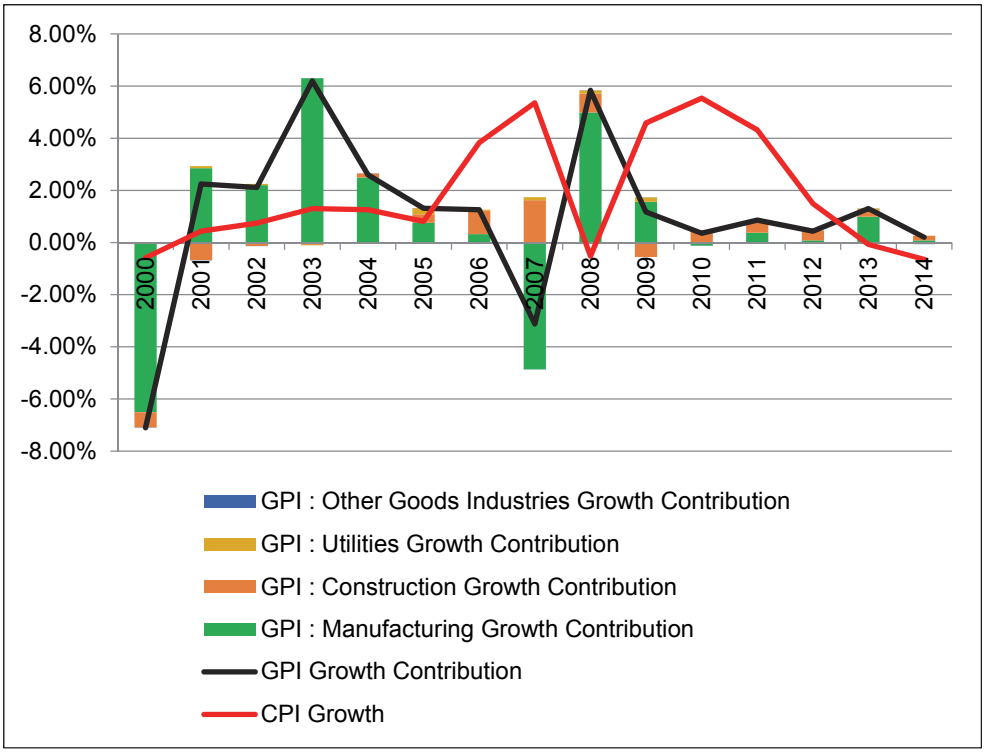
sector also had strong backward (1.3477) and forward (1.0622) linkages, and a lower import multiplier (0.390) than manufacturing. Correspondingly, the income multiplier for the construction sector was stronger at 0.303 as against 0.118 for manufacturing. In contrast, the manufacturing sector displayed high import content (import multiplier of 0.641) with relatively low backward (0.922) and forward (0.856) linkages, due to high export content, despite the large share of GDP. Hence overheating in the construction industry will tend to have a disproportionately large inflationary impact in Singapore.

FIGURE 4.3: GROWTH CONTRIBUTION OF INDUSTRIES



Source: Ministry of Trade and Industry (various years), Retrieved from https://webcdm.ceicdata.com

FIGURE 4.4: GOODS PRODUCING INDUSTRIES (GPI) GROWTH CONTRIBUTION



Source: Ministry of Trade and Industry (various years), Retrieved from https://webcdm.ceicdata.com

Driven by rising total value of construction contracts awarded in new works after 2005 (Figure 4.4), the residential, non-residential and other construction works sectors grew very strongly in terms of gross fixed capital investments made over 2006–2014, with CAGRs of 12.96%, 6.29% and 8.59%, respectively, reversing the declines seen in the earlier period (Figure 4.5). This suggests that growth in capital investments in the real estate sector was a major factor in the strong correlations observed between fixed capital investment growth and CPI growth.

According to Lum (2011), the construction sector during the period faced severe capacity constraints due to population growth and public spending on construction. The state initiated and promoted iconic infrastructural developments to position Singapore as a global city, including the two integrated resorts in 2005, which accentuated construction lags and house price inflation (Figure 4.6).

FIGURE 4.5: CAGR OF CAPITAL INVESTMENTS

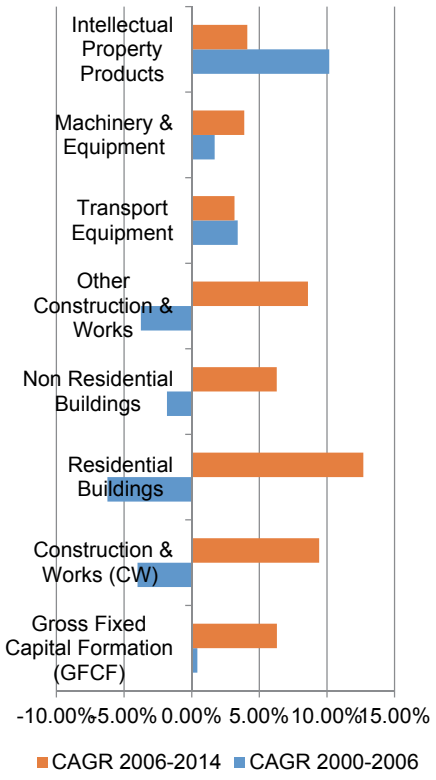
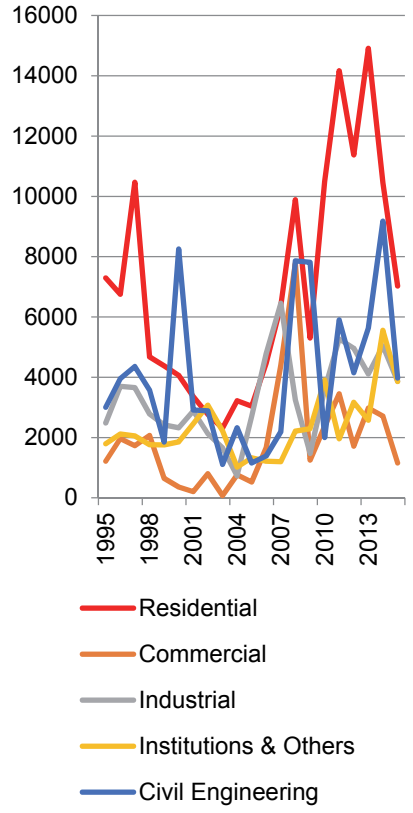


FIGURE 4.6: CONTRACTS AWARDED: NEW WORKS (MILLION S$)



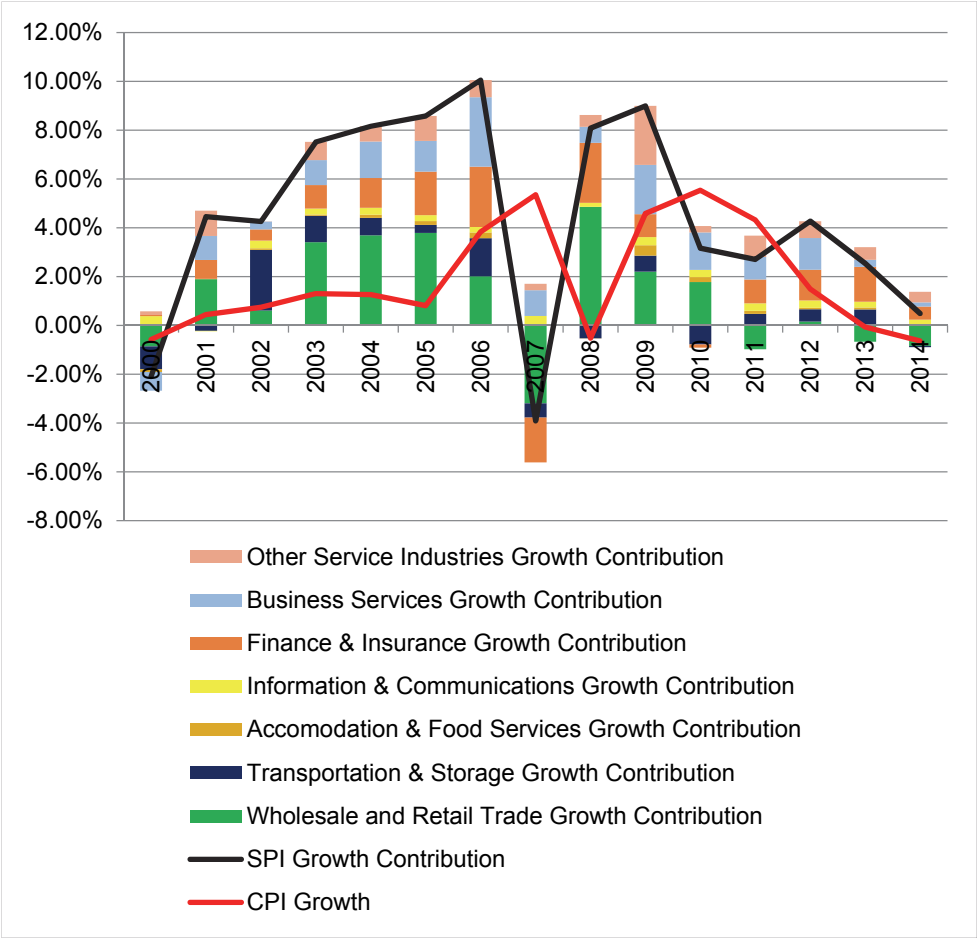
Source: Ministry of Trade and Industry (various years), Retrieved from https://webcdm.ceicdata.com

Overall, the service producing industries grew at a CAGR of 6.92%, with sectoral growth rates of wholesale and retail (6.89%), transportation and storage (3.91%), accommodation and food services (5.18%), information and communications (6.99%), finance and insurance (8.44%), business services (8.17%), and other service industries (6.65%), respectively.

The wholesale and retail trade sector is the largest contributor to GDP growth, at an annual average contribution of 1.29% from 2000–2014, while contributions of the respective sectors are transportation and storage (0.43%), accommodation and food services (0.10%), information and communications (0.24%), finance and insurance (0.83%), business services (1.07%) and other services (0.69%). However, in terms of

correlation of sectoral growth with CPI inflation growth, using data from 1975–2015, the accommodation and F&B services (0.305) and business services (including real estate services, at 0.218), showed the strongest correlations. This relation strengthened over the period 2000–2015, with correlations in accommodation and F&B (0.346) and business services (0.430) increasing (Table 4.2). The accommodation and food services sectors in particular displayed strong output multipliers of 1.582 and employment multipliers of 15.69, as well as backward linkages (1.025). Business services showed strong output multipliers (1.580) and forward linkages (1.093). However, this might not have taken into account the lags in transmission between output growth and CPI growth.

FIGURE 4.7: GDP: SERVICES PRODUCING INDUSTRIES (SPI) GROWTH CONTRIBUTION



Source: Ministry of Trade and Industry (various years), Retrieved from https://webcdm.ceicdata.com

TABLE 4.2: CORRELATION OF CPI GROWTH WITH SECTOR GROWTH USING QUARTERLY DATA

1975-2015		Manufacturing	Construction	Utilities	Other Goods Industries	GPI				
	CPI	0.12788	0.23172	-0.09230	0.20202	0.17549				
		Wholesale Retail	Transportation and Storage	Accommodation and Food Services	Information & Communication	Finance & Insurance	Business Services	Other Service Industries	Ownership of Dwellings	SPI
	CPI	0.07385	0.18025	0.30495	0.17489	0.16752	0.21768	0.04301	-0.07950	0.30118
2000-2015		Manufacturing	Construction	Utilities	Other Goods Industries	GPI				
	CPI	-0.00065	0.23799	-0.06541	0.04631	-0.07309				
		Wholesale Retail	Transportation and Storage	Accommodation and Food Services	Information & Communication	Finance & Insurance	Business Services	Other Service Industries	Ownership of Dwellings	SPI
	CPI	-0.04086	0.14162	0.34564	0.09862	-0.13681	0.42978	0.24333	0.06997	0.15788

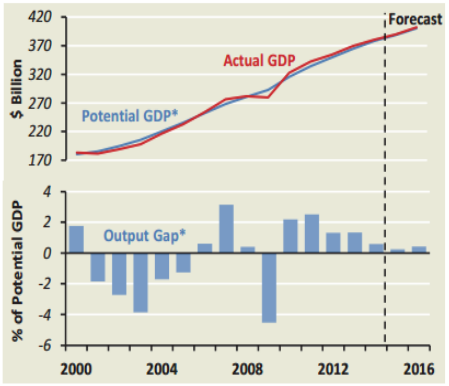
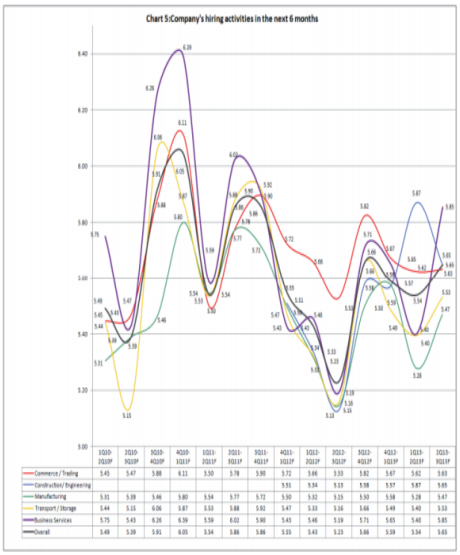
Source: Ministry of Trade and Industry (various years), Retrieved from https://webcdm.ceicdata.com, Singapore Department of Statistics, Monthly Consumer Price Index (various years), Retrieved from https://data.gov.sg/

Estimating the Output Gap

The IMF defines the output gap as an economic measure of the difference between the actual output of an economy and its potential output (Jahan & Mahmud, 2013). Potential output is the maximum amount of goods and services an economy can turn out when it is most efficient. A positive output gap occurs when actual output is more than full-capacity output. This happens when demand is very high and, to meet that demand, factories and workers operate far above their most efficient capacity (Jahan & Mahmud, 2013). All else being equal, if the output gap is positive over time, so that actual output is greater than potential output, prices will begin to rise in response to demand pressure in key markets. Similarly, if actual output falls below potential output over time, prices will begin to fall to reflect weak demand (Jahan & Mahmud, 2013).

Conventional methods to estimate output gaps in the literature include Hodrick-Prescott filters (Hodrick & Prescott, 1997), which decompose GDP growth into a trend and cycle component, Blanchard-Quah SVAR estimations (Blanchard & Quah, 1989), which decompose GDP growth into trend (caused by supply side productivity shocks) and cycle (money demand shocks), and estimation of potential output through production function outputs based on detrended inputs. Other methods used to indicate utilisation rates include a comparison of the natural rate of employment and the unemployment rate, as well as surveys on capacity utilisation rates.

According to the Singapore Business Federation (SBF) and DP Information's SME 2012/2013 survey, most SMEs have been operating at above capacity over the past four years with an overall capacity utilisation at 7.24 (on a scale of 1 to 10, where 5 represents average capacity utilisation). The business services (7.51) and transport/storage (7.44) sector are operating well above average capacity utilisation due to the shortage of skilled labour (Figure 4.8). Notably, capital investment expectations, which should be a factor behind productivity growth to offset labour shortages, fell in 2012 (Figure 4.9)

FIGURE 4.8: MAS GDP AND OUTPUT GAP	FIGURE 4.9: HIRING EXPECTATIONS
 Note: EPG's estimate of Singapore's output gap is derived from a weighted average of three methods—a structural vector autoregression (SVAR) approach using the Blanchard-Quah decomposition, the Friedman variable span smoother and a simple univariate Hodrick-Prescott filter. * EPG, MAS estimates.	(E) Hiring Expectations 
Source: MAS *Macroeconomic Review* Oct 2014	Source: Singapore Business Federation (2013)

Using the methodology as laid out by Hodrick and Prescott (1997), we decompose the time series data of the GDP growth numbers into a cycle and trend component. Following convention, we use a smoothing parameter of 1,600 for quarterly data and estimate the cycle for the period June 1980 to September 2014. Table 4.3 shows the correlations of the components of the cycle and the cycle, in terms of the real and monetary variables. We estimate the correlations between the cycle and the growth rates in the CPI (seasonally adjusted), CPI ex accommodation, and GDP deflator, with data from March 2004 to June 2015.

Based on correlations conducted using a Hodrick and Prescott (HP) filter, it is seen that headline CPI growth correlated strongly with cycles in private consumption expenditure (0.427), gross fixed capital investment (including real estate) (0.376), exports (0.462) and imports (0.315) (Table 3.3).

Additional observations from the HP filter and the derived correlation include (Table 4.3):

1) There is evidence of overheating in the period 2005–2007 and 2009–2012. This corresponded to high inflation rates not seen since the 1980s.
2) There is evidence of positive correlation (0.581) between CPI growth rates and the cycles in the GDP, while correlation between CPI ex-Accommodation and GDP is 0.442.
3) There is evidence of a strong procyclical effect played by accommodation markets in Singapore linking GDP growth overheating to CPI inflation. The correlation of CPI and GDP growth rates, as well as GDP growth components, is considerably stronger than the correlation of CPI ex-accommodation and GDP growth rates.
4) The volatility in cycles has increased markedly post 1996.
5) In terms of correlation of GDP cycles to GDP (expenditure) components, notable were the falls in the correlation of private consumption, long-term investment and inventories after 1999 compared to before 1999, and the increase in correlation of exports to cycles in GDP after 1999.
6) In terms of correlation of CPI growth to GDP (expenditure) components, private consumption and exports cycles display the highest positive correlations, exceeding gross capital formation cycles, while inventories cycles display the highest negative correlations.

FIGURE 4.10: GDP (SEASONALLY-ADJUSTED) 1980Q1–2014Q3

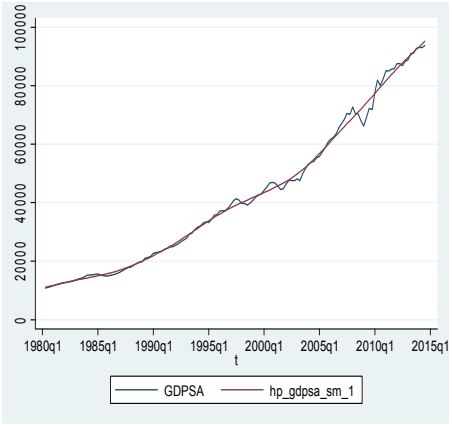


FIGURE 4.11: DEVIATIONS FROM TREND (CYCLES), HP-FILTERED 1980Q1–2014Q3

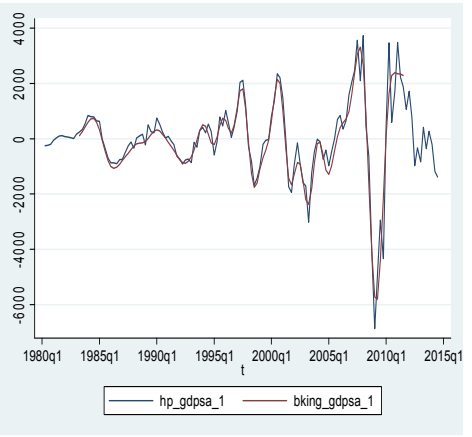


FIGURE 4.12: CYCLICAL DEVIATIONS AND CPI LESS ACCOMMODATION GROWTH, 2004–2014

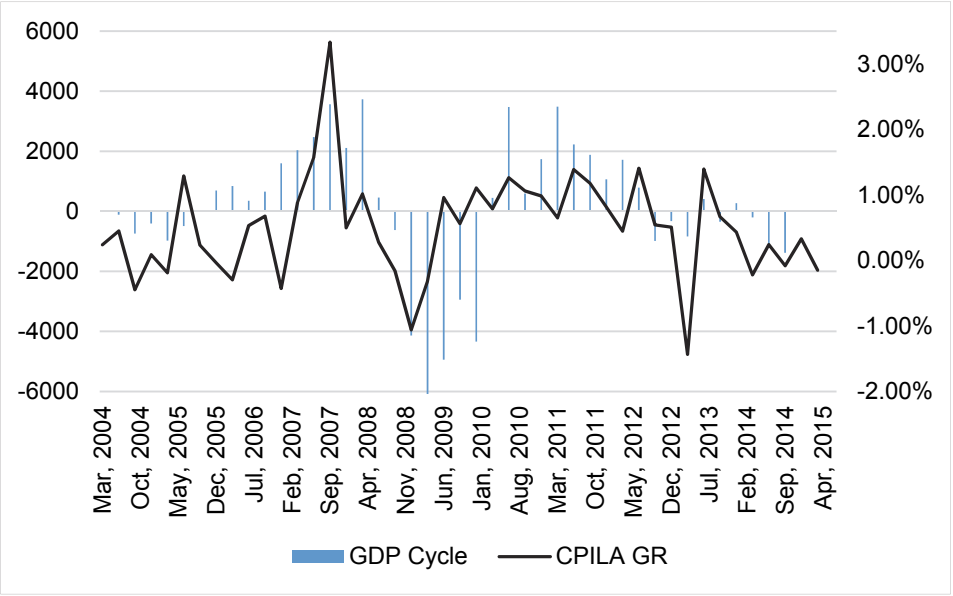


FIGURE 4.13: CYCLICAL DEVIATIONS AND CPI GROWTH, 2004–2014

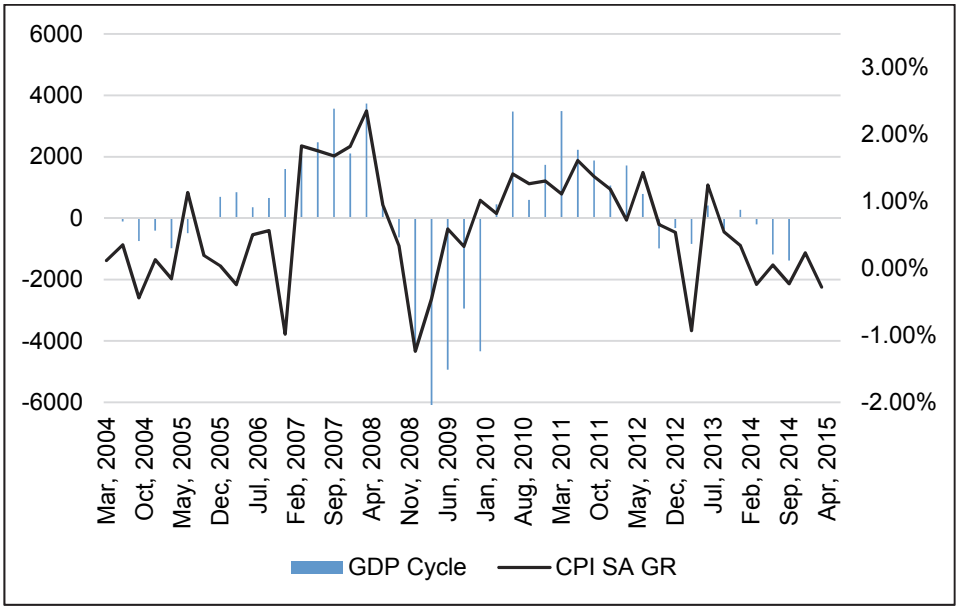
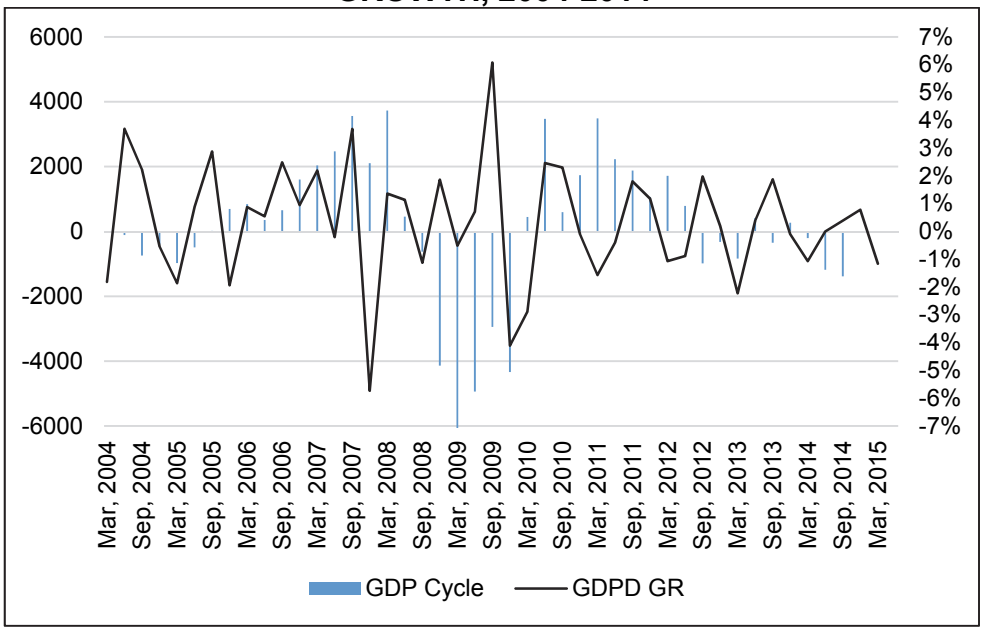


FIGURE 4.14: CYCLICAL DEVIATIONS AND GDP DEFLATOR GROWTH, 2004-2014



Source: Author's calculations based on data generated from URA (n.d.), MTI (various years), and data retrieved from https://webcdm.ceicdata.com

TABLE 4.3: CORRELATIONS OF GDP CYCLES AND GDP EXPENDITURE COMPONENTS AND CPI

Correlations	CPI less accommodation growth rate	CPI growth rate	GDP deflator growth rate
Correlation with GDP seasonally-adjusted cycle	0.442794805	0.581387084	0.035941
Lag 1 GDP	0.224882545	0.426701434	-0.00716
Lag 2 GDP	0.108817109	0.299042383	-0.07986
Lag 3 GDP	0.088259886	0.096292968	0.097134
Lag 4 GDP	0.072179823	0.077884698	0.07619

Correlations							
Variables used are deviations from trends with equivalent smoothing parameter of 1,600 on quarterly data	Private Consumption Expenditure Cycle	Government Expenditure Cycle	Gross Fixed Capital Formation Cycle	Changes in Inventories Cycle	Exports Cycle	Imports Cycle	SIBOR (3 month)
GDPSA	0.988070075	0.981666971	0.976675489	(3.41049E-05)	0.994311861	0.99377068	(0.783853836)
GDPSA (cycle)	0.52472344	(0.003633342)	0.362627566	0.222791319	0.861454805	0.761995962	NA
GDPSA (cycle before 1999)	0.843097933	(0.1437976)	0.627472609	0.51482945	0.748003077	0.784024354	NA
GDPSA (cycle after 1999)	0.514534688	0.008671535	0.328169704	0.186591209	0.879193409	0.763726042	NA

Correlations						
Variables used are deviations from trends with equivalent smoothing parameter of 1600 on quarterly data	Private Consumption Expenditure Cycle	Government Expenditure Cycle	Gross Fixed Capital Formation Cycle	Changes in Inventories Cycle	Exports Cycle	Imports Cycle
CPI Less Accommodation Growth Rate	0.20635937	0.112818887	0.075764656	-0.268579131	0.259221969	0.050570896
CPI Growth Rate	0.426900359	0.142789137	0.375536483	-0.199098883	0.462118171	0.314912512
GDP Deflator Growth Rate	-0.092415318	0.099301668	-0.204264239	-0.240175615	-0.020510339	-0.100221686

GLOBAL LIQUIDITY AND CREDIT GROWTH

Introduction

This outline of the section is as follows:

- Post-GFC, developed countries' QE and related policies led to huge capital inflows into EMs including Singapore.
- This compounded the difficulties that Singapore had in managing inflation via the SGD NEER BBC framework.
- These global conditions produced (a) strong inflows into Singapore real estate which caused asset prices to surge; and (b) low rates in Singapore but low rates alone is unlikely to have caused excessive loan growth. The growth in loans was demand-driven, buoyed by strong broad-based economic growth and growth in capital investments.
- In the next section, it is shown that in the housing markets, rising property prices triggered by rising population growth Granger-caused housing and construction loan growth, which contributed to inflationary pressures in the economy.

Growth in Global Liquidity

In response to the Great Recession, the US Federal Reserve implemented several unconventional monetary policies intended to foster a more robust economic recovery. Of these policies, large-scale asset purchases (LSAPs), popularly known as "quantitative easing", or QE, led to the largest expansion of the Fed balance sheet since World War II (Ricketts & Waller, 2014). The LSAPs have collectively expanded the Fed balance sheet by close to US$3 trillion from December 2007 to November 2013 (Ricketts & Waller, 2014). QE1 involved the purchase of US$1.45 trillion of mortgage-backed securities (MBS) and agency debt to increase credit availability in private markets, and $300 billion in long-term Treasuries was designed to put downward pressure on interest rates in general in order to bolster economic activity (Ricketts & Waller, 2014). QE2 involved the purchase of US$600 billion in long-term Treasury Securities from November 2010 to June 2011 at a pace of US$75 billion per month (Ricketts & Waller, 2014), which stimulated the US economy by lowering yields and initiating portfolio rebalancing towards riskier assets, pushing up asset prices in riskier market segments inducing positive wealth effects (Fratzscher et al., 2012).

The QE3 programme, which began in September 2012, involved US$40 billion in agency MBS per month; and after Operation Twist ended, added US$45 billion in long-term Treasury Securities to the monthly purchase

(Ricketts & Waller, 2014). Advanced economies' central bank assets more than doubled over the period after the GFC, despite slow growth (Figure 4.15).

According to Mohanty (2014), international spillovers effects of simulative monetary policy in developed countries can be classified into five channels: namely, the exchange rate, the policy rate, long term interest rates, international cross-border bank lending and portfolio flows. Strong capital inflows from developed markets from January 2010 to April 2013 placed upward pressure on emerging market currencies and forced central banks in emerging markets to lower the policy rate to prevent currency overshooting, which reversed following the May 2013 Fed tapering announcement (Mohanty, 2014). Operation Twist and QE2 flattened the global benchmark yield curve, raising risk appetite and causing a large portfolio rebalancing out of bond markets globally and into emerging equity markets (Fratzscher et al., 2012), and resulting in a depreciation trend in the USD.

Driven by strong net inflows (Figure 4.18) and capital appreciation, the value of aggregate cross-border bond and equity investment increased from USD 3.29 trillion at the end of 2007 to USD 4.46 trillion, of which USD 994 billion was in the form of debt, and USD 170 billion in the form of equity (Mohanty, 2014). The period witnessed strong non-bank debt issuance in emerging markets (Figure 4.17), as well as growth in domestic and cross border credit in Asia (Figure 4.16). Over the period, Asian economies saw strong capital inflows accompanying the broad-based weakness in the US dollar and a relatively positive outlook (Ong, 2013).

FIGURE 4.15: CENTRAL BANK ASSETS (US$ TRILLIONS)

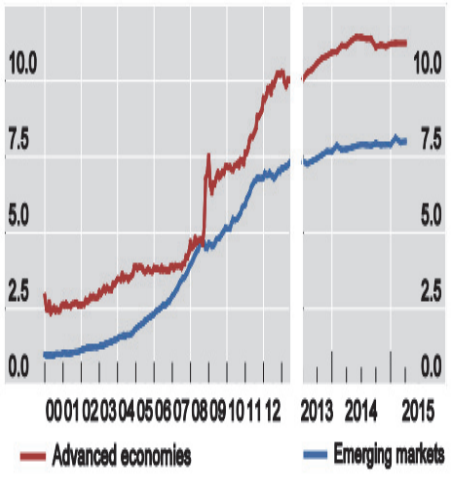
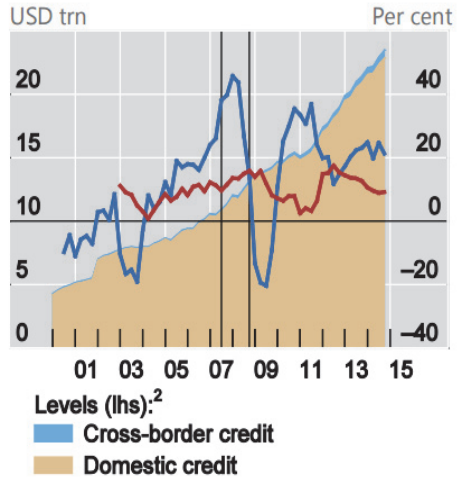


FIGURE 4.16: DOMESTIC AND CROSS-BORDER CREDIT (ASIA-PACIFIC)



Source: IMF (2015), International Financial Statistics, BIS international banking statistics, cited in BIS (2015)

FIGURE 4.17: NET NON-BANK DEBT ISSUANCE (EMERGING MARKETS)

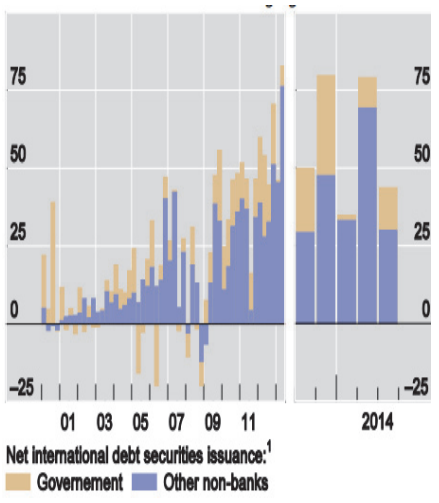
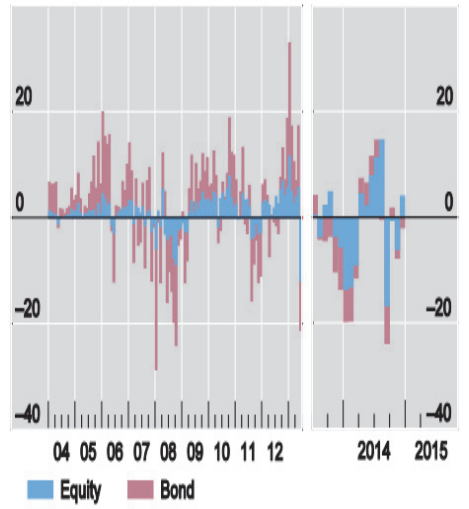


FIGURE 4.18: BOND AND EQUITY FLOWS INTO EMERGING MARKETS



Source: EPFR (2015), cited in BIS (2015)

Singapore's NEER system

The MAS operates a managed float regime for the Singapore dollar, which incorporates several features of a band, basket and crawl regime, aimed at price stability over the medium term as the basis of sustainable economic growth. The trade-weighted exchange rate is allowed to fluctuate within a policy band, the level and slope of which are announced semi-annually to the market (Khor et al., 2007). The band provides a mechanism to accommodate short-term fluctuations in the foreign exchange markets and flexibility in managing the exchange rate (Khor, 2007). It incorporates a crawl feature where the exchange rate policy is periodically reviewed to ensure that it remains consistent with the underlying fundamentals of the economy (Khor, 2007). Due to the Open Economy Trilemma, Singapore's open capital account and exchange rate-based monetary policy imply that domestic interest rates and money supply are necessarily endogenous (MAS, 2013). Hence the MAS' liquidity management framework does not target any level of interest rate or money supply, but aims merely to ensure that there is an appropriate amount of liquidity in the banking system sufficient to meet banks' demand for precautionary and settlement balances, but not excessive (MAS, 2013).

The MAS has cited several advantages of the managed float exchange rate policy rule over an interest rate policy rule, including large export and import shares in the economy rendering exchange rates more effective as a policy tool; reduction of NEER volatility in the context of time-varying risk aversion and market tendency to currency overshooting; building long-term confidence in the Singapore dollar and its purchasing power; and lowering hedging costs in the private sector (Menon, 2013). The share of the external economy has been on an uptrend, with exports increasing as a share of total demand. Chow et al. (2012) note that the choice of policy trades off exchange rate volatility with interest rate volatility, and in terms of overall inflation volatility, the exchange rate rule has a comparative advantage over the Taylor rule when export price shocks are the major sources of real volatility; while a Taylor rule dominates when domestic productivity shocks drive real volatility. The exchange-rate rule also dominates the Taylor rule for reducing inflation persistence. Khor et al. (2004) note the importance of a supporting framework of consistent macroeconomic and microeconomic policies as well as strong institutions, as well as flexible labour and product markets, for the successful implementation of the managed float. Chow et al. (2012) add that given the high level of wage and price flexibility in Singapore, "it should make little or no difference which type of monetary regime is adopted", although Chang and Velasco (2000) suggest it as an optimal policy for developing countries

as they seek to build credibility for their currencies and yet reserve the ability to insure themselves from foreign shocks (Tan, 2008).

Pressures on Singapore's Exchange Rate Policy

Limits in the effectiveness of monetary policy in controlling inflation through the operating instrument of a BBC exchange rate band was evidenced in the latter half of 2000s. Despite pursuing a NEER band that tended to correlate with the GDP cycle, inflation outpaced those of trading partners.

The NEER exchange rate policy (Ong, 2013) has been characterised into Boom (–October 2008), with modest and gradual appreciation, Great Recession (October 2008–April 2010), with a neutral policy stance, including a flattened policy band in Oct 2008, and downward re-centring in April 2009. The recovery phase began in April 2010, with an upward re-centring and appreciation path, as well as increased slope and widened band in October 2010. Restructuring phase began in Oct 2011, with a reduced slope and a narrower policy band in April 2012. NEER policy setting shows a counter-cyclical tendency, with growth in the NEER index correlating moderately with GDP output gap and CPI growth.

TABLE 4.4: CORRELATIONS OF NEER GROWTH, GDP CYCLE AND CPI GROWTH

	GDP Cycle	CPI Growth
NEER Growth (2007-2014)	0.139	0.156
L1 (1 quarter)	0.264	0.208
L2	0.314	0.220
L3	0.123	0.116
L4	0.194	0.028

Source: *The Business Times* (2015), IMF, Retrieved from https://webcdm.ceicdata.com, Singapore Department of Statistics, Retrieved from https://data.gov.sg/

Policy tightening through a higher slope or upward re-centring of the band in nominal exchange rates led to tightening in net exports and price deflation in imports. However, the expectation of a gradual appreciation path of the NEER creates a downward adjustment in the interest rate (measured by the SIBOR) that leads to expansionary effects within the domestic economy through consumer and corporate debt spending, which in turn exacerbates domestically-sourced inflation. Studies have found that the uncovered interest rate parity (UIRP) condition is efficient in the context

of a small and open economy like Singapore (Khor et al., 2007; Mihov, 2013).

The trade-off between external and domestic tightening inherent in controlling inflation through the exchange rate may have become more severe during the period of 2006–2014, given conditions of high population growth and hence lower slack in the domestic economy; a greater share of household and corporate debt; the effects of the zero lower bound in interest rates; and global liquidity conditions which increased capital inflows into Singapore. In this context, low interest rates may have been a contributing factor to credit growth, and additional macroprudential policies were required to cool the housing sector.

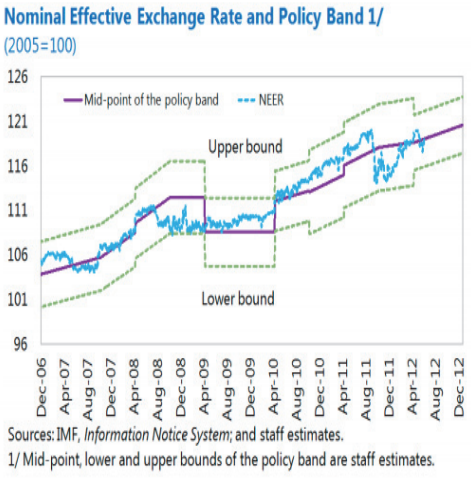
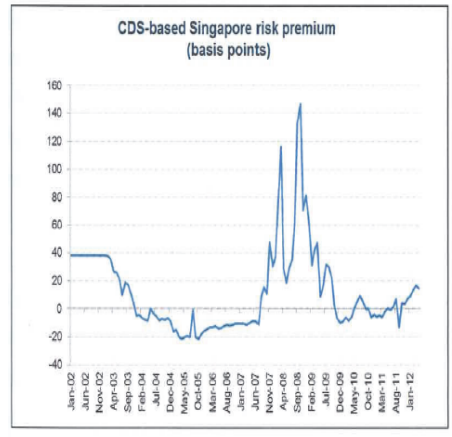
NEER appreciation creates disinflationary effects by reducing the impact of imported inflation and reducing external demand volume for Singapore exports (although this is partially offset by price effects). NEER appreciation also generates inflationary effects through two channels, through the interest rate channel, and the volume effect from increasing imports due to increasing real incomes (which is offset by price effects). In a study conducted by MAS (Chew et al., 2009), the overall exchange rate pass-through to consumer prices was estimated, where a 1% appreciation in the S$ NEER would lead to a 0.1% decline in the domestic CPI in the short run and a 0.4% decline in the long run. Based on the BIS NEER (Narrow), lagged NEER growth had a high correlation with consumption and investments in the domestic economy (see Appendix 1) — although this may be interpreted in various ways.

Uncovered interest rate arbitrage transmits expectations of rising NEER to a risk-adjusted interest rate differential between global interest rates, through movements in the SIBOR and the SOR as well as longer-term rates.[8] Expectation of Singapore dollar appreciation has kept the long-term yields on Singapore bonds below the US long-term yields, and the three-month SIBOR below the LIBOR up till the end of 2014 (see Figure 4.21 and 4.22). Hanna (2012) calculates a Singapore risk premium based on five-year credit default swap spreads that DBS faces, which has been hovering at a low of 14 basis points (Figure 4.20).

[8] According to Hanna (2012), interest arbitrage provides some guidance on the relation between Singapore rates and global rates: $i = i^* + E(\hat{e}) + p$, where i = Singaporean interest rate, i^*= NEER-weighted global exchange rate, $\hat{e}$= percentage change in the inverse of the NEER, p= Singaporean country risk premium

Combined with very low global interest rate conditions (<1%) and a gradual appreciation path, a sustained arbitrage opportunity exists given an appreciating SGD and the zero interest rate bound in Singapore (Mihov, 2013). This is despite the notable accumulation of foreign reserves which keeps the appreciation of the NEER in check, which had been trading close to the upper bound of the policy band in 2010–2011 (Figure 4.19). This illustrates the vicious cycle of sustained arbitrage and capital inflows leading to increased liquidity and higher inflationary pressures, which called for stronger appreciation and so on, creating an unstable dynamic (Mihov, 2013).

Capital inflows resulted in higher inflationary pressures in the real estate sector (Lum, 2011). Inflows of portfolio investments grew strongly in the lead-up to 2007 (US$18.6 billion in 2006, US$27.8 billion in 2007), and US$10.9 billion in 2010 (Figure 4.24).

FIGURE 4.19: NEER AND POLICY BAND	FIGURE 4.20: SINGAPORE RISK PREMIUM
	

Source: "Macro-Economic Outlook for Singapore and Implications for Policy" (Hanna, 2012, p. 24)

FIGURE 4.21: LIBOR, SIBOR AND EXCHANGE RATE INDEX

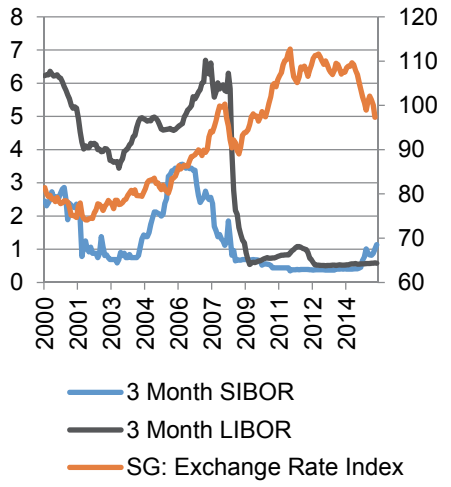
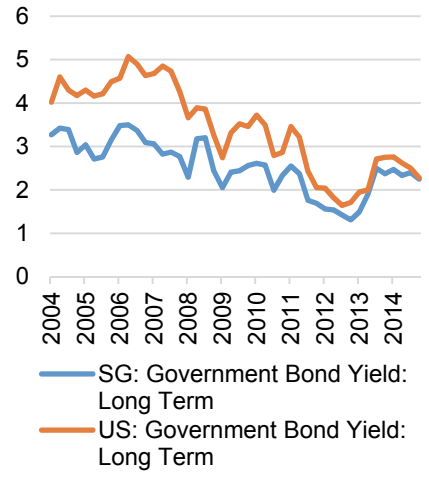


FIGURE 4.22: SG, US LONG-TERM YIELD



Source: IMF (n.d.), MAS (n.d.), Intercontinental Exchange Benchmark Administration (n.d.), US Dept. of Treasury (n.d.), Retrieved from CEIC

FIGURE 4.23 : BOP BALANCE COMPONENTS

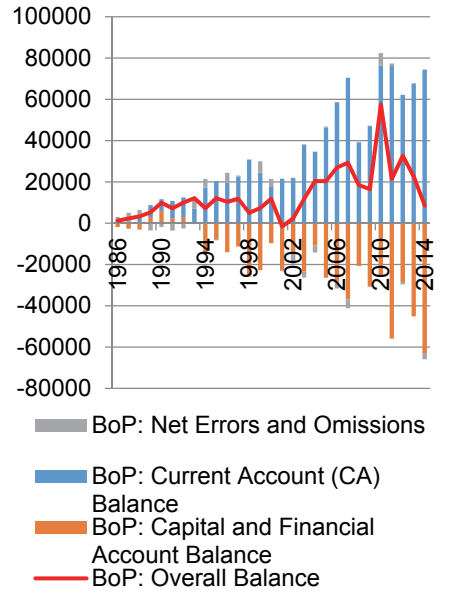
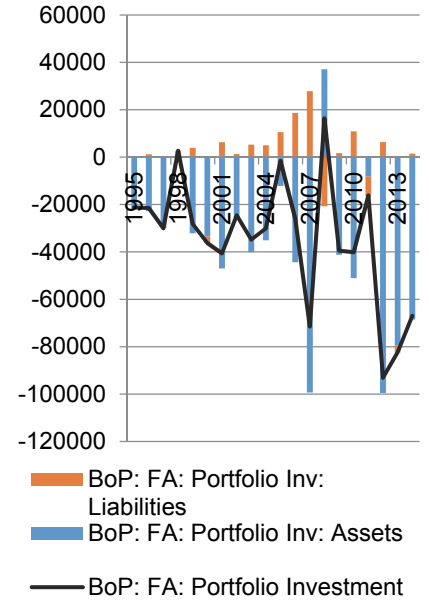


FIGURE 4.24: FINANCIAL ACCOUNT: PORTFOLIO INVESTMENT



Source: IMF International Financial Statistics (n.d.), Retrieved from https://webcdm.ceicdata.com

At the domestic level, the SIBOR remained below 1% from November 2008–February 2015 (Figure 4.21). Domestic credit[9] grew at CAGR 15.56% from 2008–2015, while the share of credit of private sector to GDP has increased from 98.57% of GDP in 2008 to 131.46% of GDP in 2015 (Figure 4.26). Net domestic credit grew from SGD 126.64B in 2000 to SGD 492.62B in 2014. Net expansion in bank's liability base in the private sector grew by more than S$143 billion from 09/10 to 11/12 (Table 4.5).

In the housing sector loans space, DBU housing and bridging loans (Figure 4.25) grew very strongly y-o-y at 15.85%, 8.47%, 15.82%, 23.06%, 16.19% and 16.15% in 2007-2012 respectively, and building and construction loans grew 45.74%, 27.86%, -2.81%, 9.65%, 27.93%, and 16.70% in 2007-2012, which indicates an rapidly growing property sector.

FIGURE 4.25: DBU LOANS AND ADVANCES

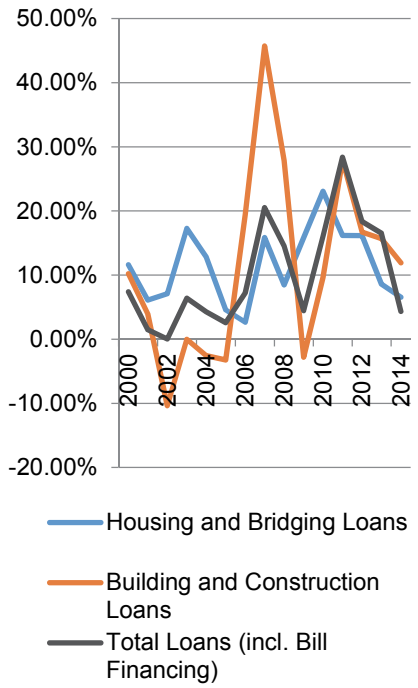
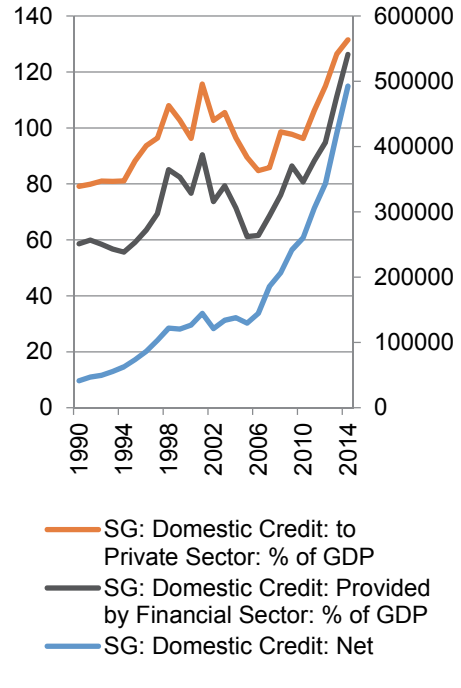


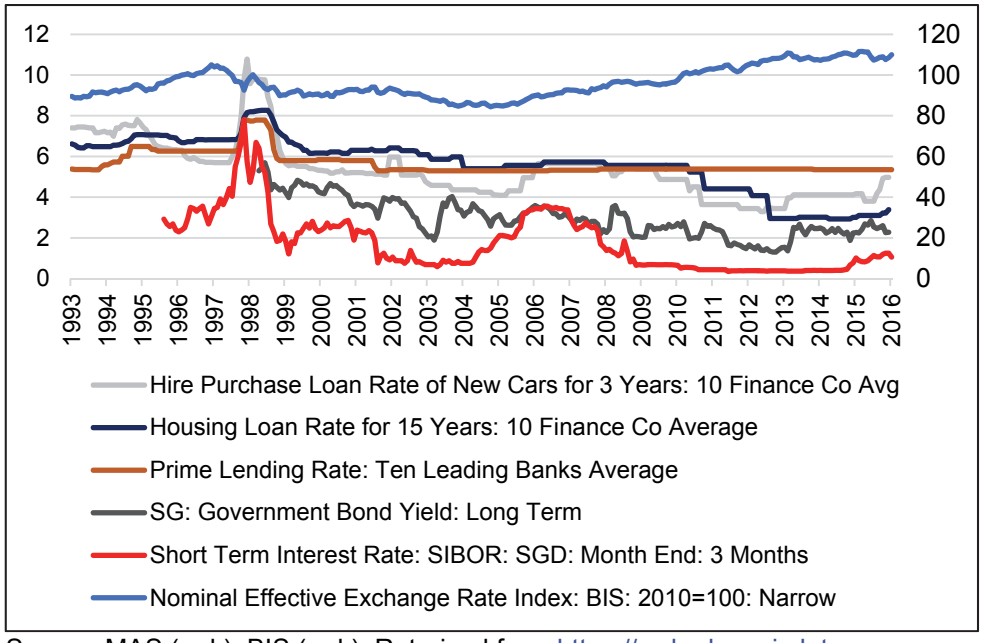
FIGURE 4.26: DOMESTIC CREDIT GROWTH



[9]Includes claims on government, public enterprises, private sector, other banking institutions, and nonbank financial institutions (International Financial Statistics, IMF (2015)).

Source: MAS (n.d.), IMF (n.d.), Retrieved from https://webcdm.ceicdata.com

FIGURE 4.27: NEER AND LENDING RATES



Source: MAS (n.d.), BIS (n.d.), Retreived from https://webcdm.ceicdata.com

While low rates may have contributed to credit growth, it is highly unlikely that lending rates were the root cause of loan growth, as real demand factors from a broader economic overheating needed to be present. For example, housing and prime lending rates plateaued from 2001-2010 (Figure 4.27), while net domestic credit growth took off only after 2006 (Figure 4.26). In addition, the differential between lending and deposit rates remained constant over the period, suggesting that declining net interest income was not a major factor in loan growth.

FIGURE 4.28: MONETARY AGGREGATES AND CPI

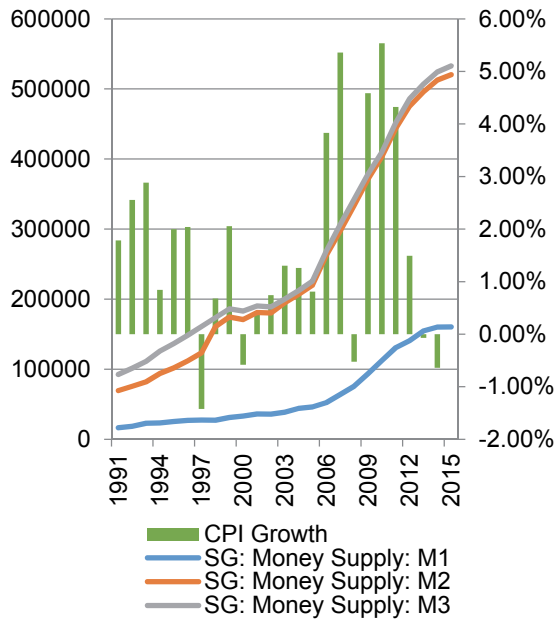
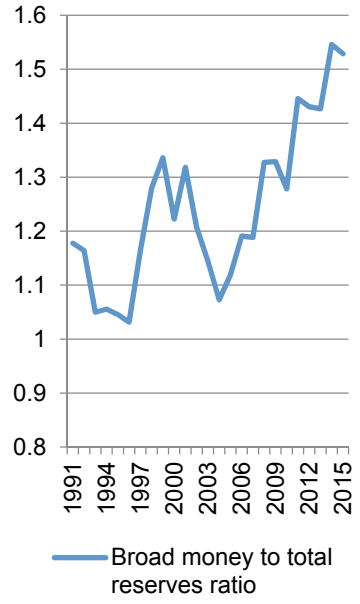


FIGURE 4.29: BROAD MONEY[10] TO TOTAL RESERVES[11] RATIO



Correlations*	M1[12]	M2	M3
Quarterly CPI Growth	0.1390	-0.0287	0.0882
Annual CPI Growth	0.4585	-0.0277	0.3497

Source: MAS (n.d.), Retreived from https://webcdm.ceicdata.com, IMF International Financial Statistics (n.d.), Data Generated from World Bank (2016)

CPI growth took off after 2006 alongside growth in M2 and M3 (Figure 4.28). Expansion in M1 and M3 displayed positive correlations with CPI

[10] Broad money is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveller's checks; and other securities such as certificates of deposit and commercial paper.

[11] The monetary base or reserve money of the banking system defined here includes currency in active circulation, banks' vault cash, and banks' cash balances with MAS.

[12] M1 includes currency in active circulation and Demand Deposits. M2 includes M1, Fixed Deposits, and Singapore dollar negotiable certificates of deposits and savings. M3 includes M1, M2 and Net Deposits with Finance Companies. See MAS glossary at http://www.mas.gov.sg/Statistics/Monthly-Statistical-Bulletin.aspx.

growth.[13] Growth in M3 is in line with the growth in broad money, and increases in the ratio of broad money to total reserves rose from a low of 1.073 in 2004 to 1.529 in 2015 (Figure 4.29). Previous studies from the 1986 — 1998 period show a significant bidirectional association between money supply and exchange rates, indicating that money supply has not been made completely endogenous (Tan & Chen, 1999); with M1 and M2 having a significant effect on both the real economy and general prices (Tan & Chen, 1999). However, money and CPI growth in more recent years remains an area for further study.

Based on the accounts in the annual reports of the major local banks[14], major macroeconomic factors for demand-driven loan growth over the 2003-2014 period were attributed to the strong economic environment, the buoyant property market, the construction of the two integrated resorts and the boom in the oil and gas sector (OCBC, 2007), which led to good loan growth in several sectors including marine engineering, transportation and logistics, and real estate development and investment (OCBC, 2007). This was broad-based, and the banks recorded strong growth across consumer banking, enterprise or SME lending and corporate and investment banking divisions over the period (DBS, OCBC, various years).

From a liquidity standpoint, despite large liquidity injections due to FX operations (which corresponded with heightened short term capital inflows) in 2007 and 2010, offsetting high levels of net liquidity withdrawals from public sector operations (AGD and CPF), as well as monetary sterilisation by the MAS, ensured that net liquidity injection due to rising exchange rates was not a major contributor to growth in money. Net cash injected due to money market factors and MAS foreign exchange and money market operations peaked at S$6.2 billion in 2010/11 (Table 4.5). Foreign exchange operations, including swaps amounted to S$65,983 million in 2007/08 and S$62,052 million of injections in 2010/11, while sterilisation through direct borrowing and lending amounted to –S$11,800 million in 07/08 and –S$13,600 million of withdrawals in 2010/11 (Table 4.5). Nevertheless, change in bank's liabilities base rose significantly over the period.

[13] In this case, M2 growth displays a negative correlation with CPI growth, indicating the possibility of negative effects of CPI growth on fixed deposit growth.
[14] These are the Development Bank of Singapore (DBS), Oversea-Chinese Banking Corporation (OCBC), and United Overseas Bank (UOB).

TABLE 4.5: NET IMPACT OF MONEY MARKET FACTORS AND MONETARY POLICY OPERATIONS ON THE DOMESTIC BANKING SYSTEM

	S$ million per financial year								
	02/03	**03/04**	**04/05**	**05/06**	**07/08**	**08/09**	**09/10**	**10/11**	**11/12**
Money Market factors									
Public sector operations (AGD, CPF)	-8,370	-15,593	-16,687	-17,505	-40,008	-23,676	-12,185	-40,258	-38,069
Currency in circulation	256	48	-281	-93	-1,111	-1,323	-908	-962	-1,793
SGS issuance, redemption, interest	-1,423	674	-2,314	-829	-11,063	2,643	-11,234	-494	-5,662
Sub-total	**-9,897**	**-14,871**	**-19,282**	**-18,427**	**-52,182**	**-22,356**	**-24,327**	**-41,714**	**-45,524**
MAS Foreign Exchange and Money Market Operations									
FX operations, including FX swaps	9,375	35,695	12,269	23,558	65,983	8,881	52,977	62,052	25,749
SGS repos and reverse repos	-376	-1,146	2,738	157	-1,800	1,800	-2,300	-500	-1,600
Direct borrowing and lending	500	-19,787	4,909	-4,767	-11,800	13,000	-23,800	-13,600	17,234
Sub-total	**9,499**	**14,762**	**19,916**	**18,948**	**52,383**	**23,681**	**26,877**	**47,952**	**41,383**
Net Cash Injected (+) or Withdrawn (-)	**-398**	**-109**	**634**	**521**	**201**	**1,325**	**2,550**	**6,238**	**-4,141**
Less: Change in banks' required MCB	188	188	484	482	977	1,314	1,230	1,352	1,710
Net Liquidity Impact: Expansionary (+) or Contractionary (-)	**-586**	**-297**	**150**	**39**	**-776**	**11**	**1,320**	**4,886**	**-5,851**
Memo item: Change in banks' liabilities base	6,264	6,263	16,145	16,064	32,572	43,807	41,009	45,057	57,016

Source: MAS (2007, 2013a)

SHIFTING NATURAL RATE OF UNEMPLOYMENT AND INFLATION

The trade-off between unemployment and inflation due to aggregate demand shocks is modelled by a Phillips curve, which determines the rate of inflation (or acceleration of inflation) given a deviation in the rate of unemployment from the natural rate. The natural rate of unemployment is defined as the level of unemployment that arises from all sources other than changes in aggregate demand associated with the business cycle (MAS, 2014). The natural rate concept captures the long-run real equilibrium determined by the structural characteristics of the labour and product markets, while the NAIRU is defined solely in relation to the level of unemployment that is consistent with a stable rate of inflation and so may be affected by the adjustment of the economy to past economic shocks (Greenslade et al., 2003; King, 1999). This distinction is less important in the long run, as the effects of adjustment to shocks wash out and the NAIRU tends towards the natural rate.

An economy with an unemployment rate below the NAIRU tends to face accelerating inflation as real wages and factor costs tend to increase when the output gap remains positive. The increase in nominal factor prices above the inflation rate may lead to an increasing rate of inflation over time.

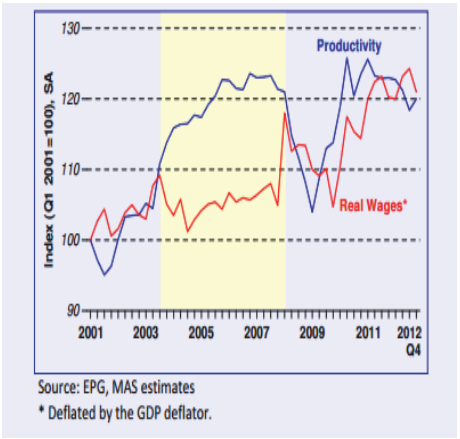
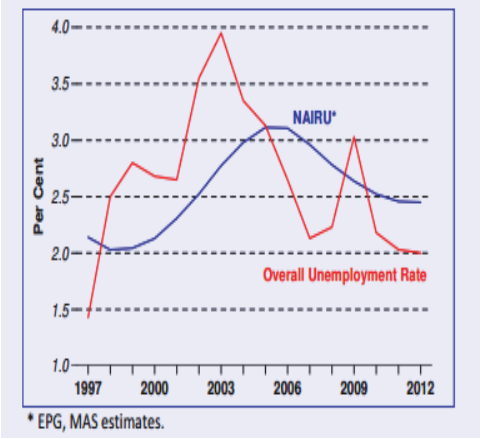
The concept of the NAIRU has its critics (see Stiglitz [1997] for a discussion) — it tends to be very uncertain in estimates (with high standard errors) and is recognised as a temporary trade-off between inflation and unemployment (Friedman, 1968). Nonetheless, it remains within conventional use by several countries due to its effectiveness in predicting inflation (Stock & Watson, 1999). However, the MAS notes that unemployment indicators in Singapore may misrepresent labour market conditions and capacity utilisation in the economy more generally due to: 1) the large foreign labour component in the workforce, which absorbs the effects of cyclicality in the labour markets; and 2) active government involvement in wage-setting through CPF adjustments and counter-cyclical government actions in the markets such as the Wage Credit Schemes during the GFC (MAS, 2014).

The NAIRU is time-varying, and changes over time according to the structural conditions that determine labour market efficiency, including search costs, matching efficiency and turnover rates (MAS 2014), assuming that all supply-side shocks are temporary. A rise in the natural rate increases the rate of inflation for a given output level, while a fall in the natural rate decreases the rate of inflation for a given output.

In the US, the wage-aspirations model has been used to explain the fall in the NAIRU that created conditions for a combination of low inflation and low unemployment in the 1990s (Ball & Mankiw, 2002). The main idea was that inflation was the mechanism through which real wage growth adjusted to productivity growth in the economy, in the presence of sticky nominal wages. Productivity growth in the 1990s had consistently outpaced wage expectations and hence nominal wage growth, leading to the fall in the NAIRU.

We may hypothesise that real wage growth rates that outpaced productivity growth led to an increase in the NAIRU that triggered rising inflation. Rising labour costs would cause businesses to raise prices, while cutting the demand for workers as corporate profits shrank. This would drive labour productivity up and real labour costs down through an adjustment process accompanied by rising inflation.

During the period from 2001–2007, real wage growth trended below productivity growth (Figure 4.30). This corresponded to a relatively low CPI inflation rate of less than 2% over the period. Conversely, trend growth in real wages outpaced productivity growth from 2007–2012, corresponding to a noticeable rise in inflation. However, the increase in real wages after 2009 did not correspond to a rising NAIRU (Figure 4.31 and Figure 4.35). The NAIRU has risen over the period from 2001–2007 (Figure 4.31), and fell from 2007–2012, indicating either a) that the choice of smoothing parameter allowed NAIRU to capture spillovers from business-cycle (demand-side) induced movements in the unemployment rate; or b) that labour market efficiency gains in 2007–2012 dominated effects of rising unit labour costs (MAS, 2014); or c) that the key takeaway is that the NAIRU had trended upwards over the entire period due to higher nominal earnings growth relative to productivity growth.

Figure 4.30: Labour Productivity and Real Wages (including Employer CPF contributions)	Figure 4.31: NAIRU and Overall Unemployment Rate
	

Source: *MAS Macroeconomic Review*, April 2013

As a further investigation, it is possible to conduct a regression using a triangular model based on Gordon (1998) with a time-varying NAIRU. Similar studies for reference include Greenslade et al. (2003), and Iordache et al. (2016).

PROPERTY PRICES, RENTS AND INFLATION

Rising property prices and rentals in the residential, commercial and office sectors contributed directly and indirectly to the cost escalation in several ways:

- Residential property price escalation arose from a confluence of low interest rate and risk premiums, infrastructural bottlenecks that created supply-demand imbalances, a tight rental market, and the promotion of public housing as an investment good.

- As home prices rose sharply, employees' desired salary levels rose, causing wages to rise.

Residential property prices increased substantially from 2003 to mid-2013, before falling in the end of 2013 to 2015. The URA private non-landed property prices and rents index grew by 83.29% and 85.01%, respectively, from 2004Q1 to 2013Q1, before falling by 3.43% and 4.35% from 2013Q1 to 2015Q1, respectively (Figure 4.32). After a long period of stagnation, growth in the HDB resale index escalated in 2007Q2, growing by 91.29% from 2007Q2 to 2013Q2, before falling 9.63% from 2013Q2 to 2015Q2 (Figure 4.33). The Singapore Residential Price Index (SRPI) showed even greater volatility in the real estate markets, where it appreciated 73% (26.5% CAGR) from July 2005 to November 2007, subsequently declining 22% and hitting a low in March 2009, before rebounding by about 45% (20.4% CAGR) by March 2011 (Lum, 2011).

FIGURE 4.32: PRIVATE NON-LANDED INDEX

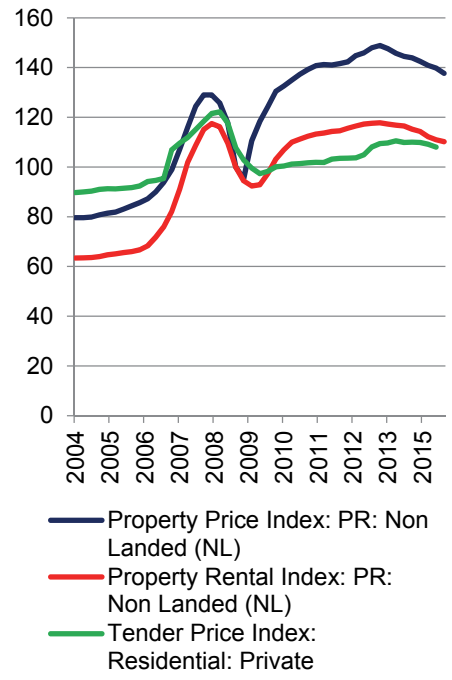
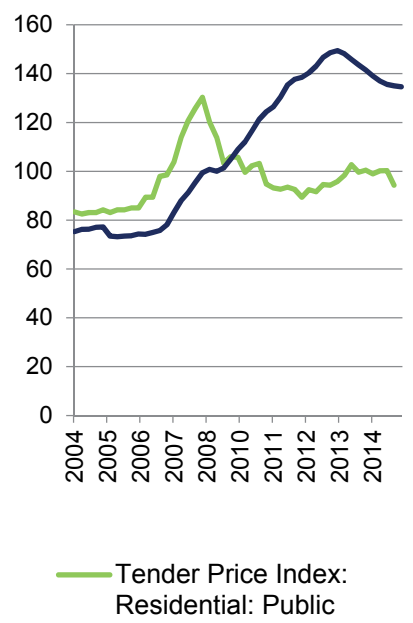


FIGURE 4.33: HDB RESALE INDEX



Source: URA (n.d.), Retrieved from REALIS, and https://webcdm.ceicdata.com

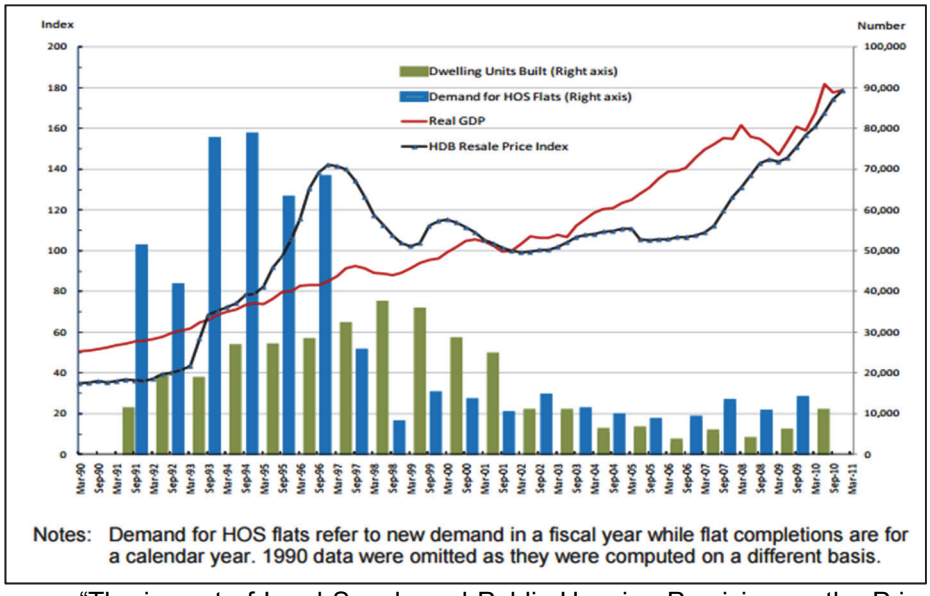
This section summarises some of the findings from an excellent article by Lum (2011), which explained the increase in prices from 2006–2014 as a result of weaknesses in the design and implementation of policy levers aimed at countering the prolonged downturn and oversupply of flats in the earlier part of the decade, which presents a cautionary tale for supply-side and macroprudential policy.

On the demand side, the liberalisation of the financial system and accommodative immigration policies led to rapid growth in consumption and asset demand for housing (Lum, 2011). The private housing market was successively liberalised to foreign ownership after the Asian Financial Crisis, while in the HDB resale markets, measures aimed at reducing the stock of unsold HDBs that had accumulated in the early half of 2000s inadvertently promoted the use of the product as an investment and speculative vehicle, leading to rapid and sustained increases in HDB resale prices from 2007-2012, as investors moved in to capture the yield spreads between HDB resale and private properties (Lum, 2011; see Figure 4.34).

However, on the supply side, land and housing supply schemes were unable to anticipate and respond adequately to the demand shocks (Lum, 2011). New flat production and land sales remained curtailed, and in contrast to the prior first-come-first-served "Registration for Flat" system that required no downpayment and tended to overstate demand, the ballot-based BTO system tended to understate actual demand, which contributed to the undersupply of flats 2007–2013 (Lum, 2011; see Figure 4.35).

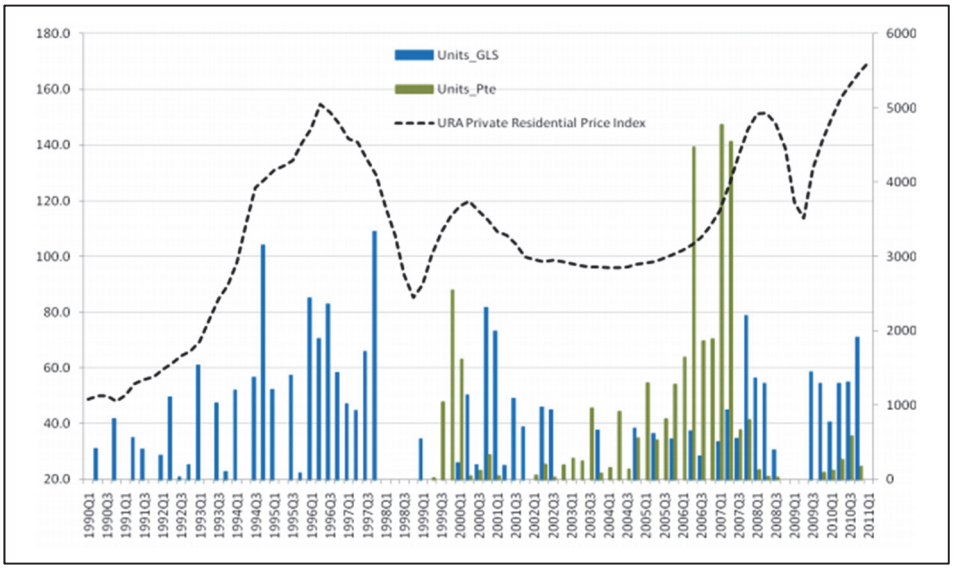
In early 2007, stable Asian economies saw large speculative capital inflows due to a combination of bullish sentiment, abundant liquidity, and capital flight from the US due to a cooling housing market, which reduced risk premiums and interest rates that encouraged risk taking. Immigration spurred residential sales, and non-citizens accounted for a record 25% of total residential sales in 2007, which led to private house prices (SRPI) increasing 53% in 2007 (Lum, 2011).

FIGURE 4.34: DEMAND FOR AND COMPLETIONS OF HDB FLATS (MAR 1991–MAR 2010 AND HDB RESALE PRICE INDEX (2001Q4=100) AND REAL GDP (2001Q4=100)



Source: "The impact of Land Supply and Public Housing Provision on the Private Housing Market in Singapore" (Lum, 2011)

FIGURE 4.35: SUPPLY OF STATE-OWNED LAND UNDER THE GLS, SUPPLY OF PRIVATELY-OWNED LAND AND THE URA PRIVATE RESIDENTIAL PRICE INDEX (2001Q4=100)

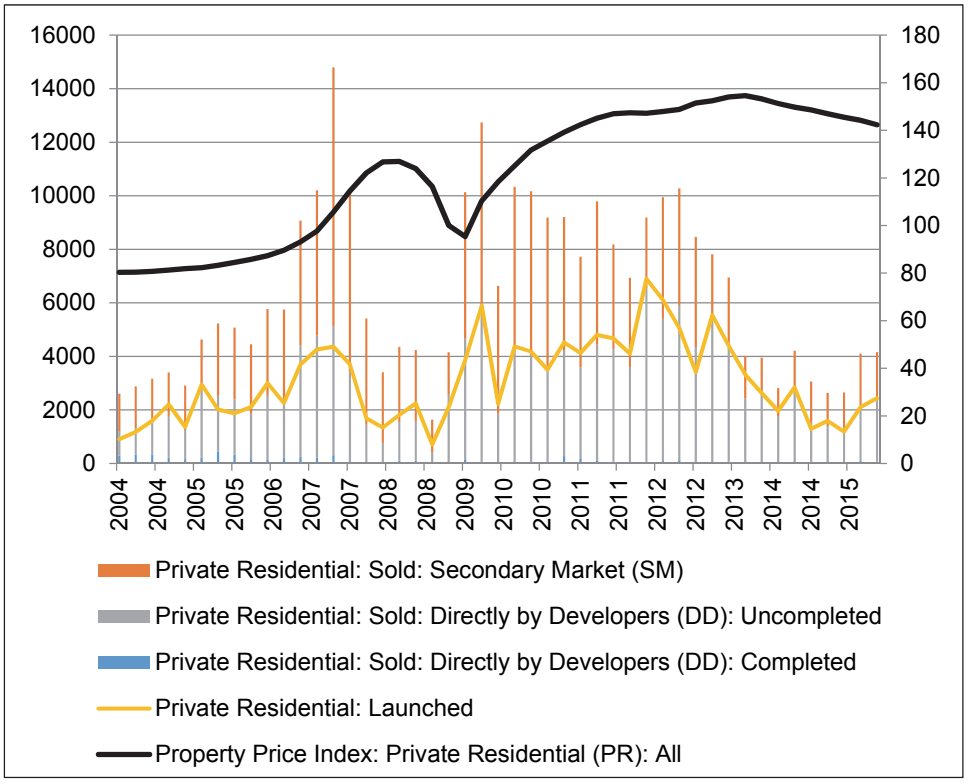


Source: "The impact of Land Supply and Public Housing Provision on the Private Housing Market in Singapore" (Lum, 2011)

Successive rounds of macroprudential policy measures were introduced (see Appendix 2), but due to strong fundamental and liquidity drivers of house price and transaction activity, house prices continued to creep upward until 2013Q4, after which the total number of transactions in terms of number of private residential units launched and sold fell markedly, and the property price index showed a steady decline (Figure 4.36).

Particularly noteworthy was barring HDB flat owners from owning both private property and an HDB flat at the same time during the minimum occupancy period (MOP), which was extended from three to five years in 30 August 2010. This effectively banned private property owners from buying HDB resale flats for investment purposes (Lum, 2011). It is also notable that capital inflows (while positive in 2011, see above) may have played a role, where the growth in domestic credit post 2008 seems to have corresponded more closely to the property price increases.

FIGURE 4.36: PRIVATE RESIDENTIAL UNITS SOLD



GRANGER CAUSALITY OF RENT AND PRICES IN NON-LANDED PRIVATE RESIDENTIAL MARKETS

To further investigate the sources and effects of housing inflation, we conduct a series of tests on the relation between rents and prices, and nominal wages, in the private non-landed private residential sector, as the data on rentals and prices are readily available.

Cheung, Tsang and Mak cite several hypothesis regarding the relation between residential prices and residential rents (1995). First, demand in the two markets are substitutes because of the trade-off between purchasing and renting a home. Hence, a rise in property prices would drive a part of the demand to the rental markets, and landlords are in a position to ask for higher rentals leading to a co-movement in prices and rents. A second hypothesis states that sales and rental markets are not causally related due to market segmentation, with different preferences, risk attitudes and budget constraints among owner-occupiers and tenants. Hence, the observed co-movements in prices in the two markets are due to the effect of common third terms, such as rising income or rising population

density. A third hypothesis is given by a user cost of capital, or cap rate, used more broadly within a four-quadrant model (DiPasquale & Wheaton, 1995), which states that the prices adjust to rents according to a yield requirement that tracks the mortgage rate. Hence the increase in prices is caused either by high demand and rentals in rental markets that increase prices for a given cap rate, or a lowering in the cap rate caused by credit conditions that increases price for a given median rent level. A fourth hypothesis is that prices determine rents: as the price paid for the ownership of land increases, due to exogenous factors, the rent expectation of landlords increase, which lead to an upward shift in the reservation rent and a corresponding upward shift in the demand curve.

Following the methodology in Cheung et al. (1995), we estimate a bivariate VAR and conduct tests on the Granger causality[15] to test for plausible hypothesis. We also include exogenous variables to detect the significance of other variables on the relationship between prices and rents.

The form of the following VAR(p) that is estimated is as follows:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + A_3 Y_{t-3} + A_4 Y_{t-4} + B_0 x_t + u_t$$

where Y_t is the K × 1 vector of endogenous variables, A is a K × K matrix of coefficients, B_0 is a K × M matrix of coefficients , where M is the number of exogenous variables included in the VAR, and p is the number of lags. The two endogenous variables are on first differences on natural logs of rent and price (dlnrent and dlnprice). We use 4 lags due to the adjustment period of one year in contracts.

To test the following hypothesis, quarterly data from URA on median price and rents for private non-landed residential, including apartments and condominiums, are used, with data available from 1998Q4–2014Q4.[16] Based on Augmented Dickey-Fuller (ADF) tests, the data on the median price and median rents are found to be I(1).

One of the major problems encountered was the low number of observations (60) in the dataset, which severely restricted the number of variables and lags that could be modelled, as well as the time horizon of the dataset. Furthermore, as prices and rents are based on transactions

[15] According to Granger Causality, if a signal X1 "Granger-causes" (or "G-causes") a signal X2, then past values of X1 should contain information that helps predict X2 above and beyond the information contained in past values of X2 alone (Seth, 2007).

[16] An alternative would be to conduct a similar study on HDB resale flats. However, we were unable to obtain data on the rentals of the HDB markets.

rather than valuations, and further information on the dataset is not released, they may contain idiosyncratic features (heterogeneity) and errors, which may or may not cancel out in an aggregate dataset.

FIGURE 4.37: MEDIAN PRICE AND MEDIAN RENT (NON-LANDED)

Source: URA (n.d.)

We run a VAR model with exogenous variables, including first-differenced logs of average nominal monthly earnings, average housing loan rate for 15 years, second differenced log of population, as well as dummies for removal of estate duties (2008Q1), Introduction of Additional Buyer's Stamp Duty (2011Q4), MSR, LTV and ABSD[17] modifications (2013Q1), introduction of TDSR[18] framework (2013Q2). The variables on loans, loan rate, and macroprudential measures were found to be insignificant and removed. Lags of 1, 2, 4 and 8 were tested, although LR tests and AIC criteria indicated that 2 lags were optimal.

Rents Granger-Cause Prices

Results based on estimations on 1, 2 and 4 lags indicate that rents Granger-cause prices and prices do not Granger-cause rents. Tests on 2 lags and other lag structures indicate stronger rejections for prices on

[17] MSR: Mortgage Servicing Ratio, LTV: Loan to Value, ABSD: Additional Buyer's Stamp Duty
[18] TDSR: Total Debt Servicing Ratio

rents. However, Granger causality testing reveals that rentals lead price movements across 1, 2 and 4 lags, although a complex series of adjustments to rents, prices and exogenous conditions are taking place. Rents lead prices in 1 quarter, but 2-period effects are negative. Further regression using 4 lags, as well as 8 lags indicate that quarterly gains tend to be dampened out on a yearly basis. Due to the presence of Granger causality of rents on prices, and the absence of significant positive effects of prices on rents, hypotheses of 1 of segmented markets, as well as hypothesis 4, of changes in landlords' rental expectations due to rising prices are unlikely.

Hypothesis 3a: Rising occupancy rates led to rising rents, which increased prices at a given mortgage rate.

Testing for a bivariate VAR on first differences of natural logs of occupancy and rent on 4 lags (selected by LR test) found that occupancy rates Granger-caused rents (Table B). The results are a justification for the hypothesis that supply and demand conditions in the rental housing markets were drivers of rents, and that rents in turn drove price increases.

As the supply of property is inelastic to rental or price movements in the short run, it is likely that demand-driven supply shortages due to population growth led to a corresponding upward adjustment in prices. This is verified through the strong positive and significant effects of the variable of second-differenced log of population on housing prices (Table C). However, second-differenced lnpopulation did not display significant Granger-causality on rents or occupancy rates (Table D, Table E).

Over the period 2000–2014, population grew at a CAGR of 2.21%. From mid-2000 to 2006, the rate was 1.49%, and subsequently accelerated to 3.69% from 2006–2014, where a total resident population of 4.40 million in 2006 grew to 5.47 million in 2014.

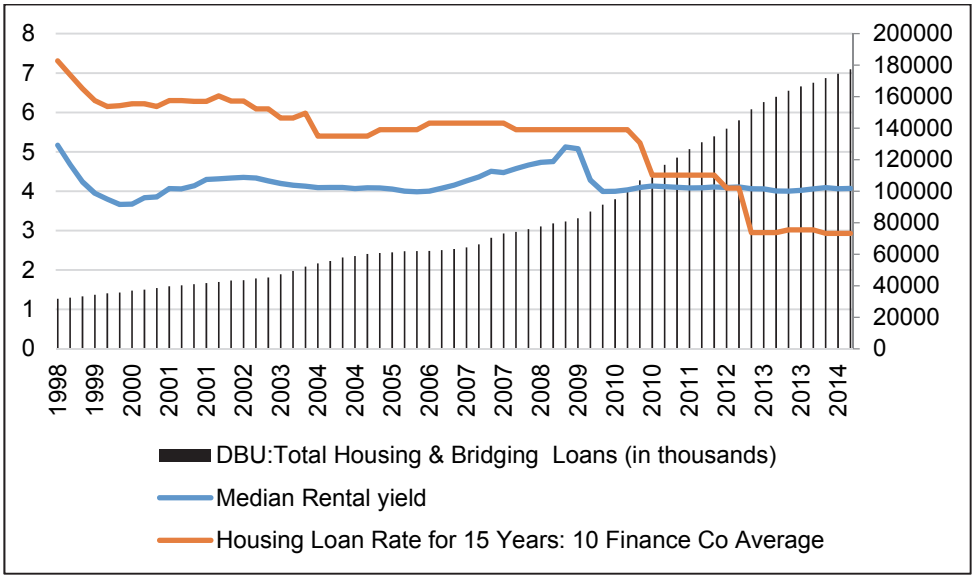
Hypothesis 3b: Falling mortgage rates led to rising prices, at a given absolute rent.

One of the potential transmission effects of lower mortgage rates on cap rates is through buy-to-let, as investors would be incentivised to borrow to let if the yield falls below the housing loan rate and a market risk premium.

Testing this hypothesis, we do an Engle-Granger test on the residuals of regression of mortgage rates and yield, which indicates I(0) residuals at the 5% significant level. Hence, there is possible co-integration of mortgage rates and rental yield, which indicates that there is a possible adjustment

mechanism of yield and mortgage rates through buy-to-let. However, this is not a strong result, as it would be rejected at the 1% significant level. Spreads have been increasing over the period, turning positive in June 2012 (Figure 4.38).

FIGURE 4.38: MEDIAN RENTAL YIELD AND HOUSING LOAN RATE



Source: URA (n.d.), Retrieved from https://webcdm.ceicdata.com, MAS (n.d.)

We proceed to test the first differences of logs on housing loan rates and housing prices, with rents, earnings, population and taxes as exogenous variables, with 1, 2 and 4 lags. The coefficients on all lags of housing loan rates on prices were significant. Granger causality testing indicates that falling housing loan rates was not a driver of prices at a given rent (Table F).

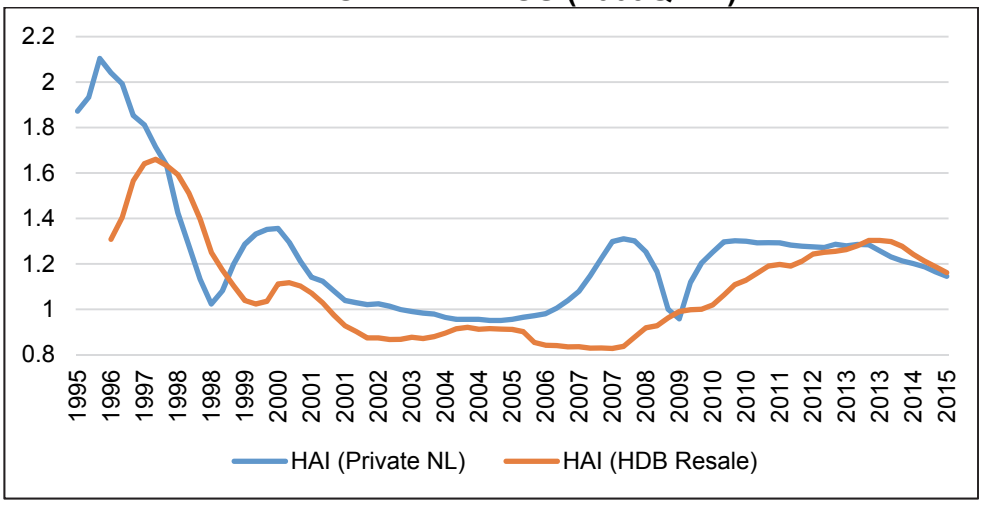
Rising House Prices Granger-Cause Growth in Housing Loans

Results based on Granger Causality testing on 4 lags indicate that housing prices are seen to display a significant Granger Causality on loans (Table E). This suggests that one of the main growth drivers of domestic housing loans are rising property prices. However, while dlnprices display significant positive effects on dlnloans in lags 1 and 3, significant negative effects of prices changes on loans were found in lag 2. This suggests that that rising prices generate bidirectional effects on loan growth. The effect of prices on loans may be positive for existing homeowners, but may also discourage further home purchases.

PROPERTY PRICES AND NOMINAL WAGES

The rise in property prices may have had a reinforcing effect on the rise in nominal wages. As home prices rose sharply, employees' desired salary levels rose, prompting a rightward shift in the labour supply curve, thus causing wages to rise. Taking the ratio of the private non-landed and the HDB resale price index (provided by URA and HDB) with a constructed index using data on a four-quarter moving Average Nominal Earnings (provided by MOM) with (2009Q1=100, ratio=1) for the three indexes, it is seen that the HDB resale rose from a low of 0.828 in March 2007 to a high of 1.303 in December 2012, while Private Non-Landed rose from a low of 0.951 in March 2005 to 1.302 in September 2010 (Figure 4.39).

FIGURE 4.39: RATIO OF HOUSING INDEX TO MONTHLY AVERAGE EARNINGS (2009Q1=1) [19]



Source: URA (n.d.), Department of Statistics (n.d.)

Stationarity tests on the time-series of the ratio indicate stationarity, indicating the presence of mean-reversion in the ratio. This points to a possibility of housing prices affecting nominal wages.

To further investigate if housing price increases Granger cause earnings increases, we conduct VAR Granger causality tests with 4 lags on first-differences in the housing price index and nominal wage index. Exogenous

[19] The housing index used are the non-private residential and HDB resale index, provided by URA and HDB (via CEIC). The monthly average nominal earnings index was calculated based on absolute data provided by MOM by taking a moving average of 1 year nominal earnings, and using 2009Q1 as the base rate (100) for the index, corresponding to the base year for the property indexes.

variables include first-differenced log occupancy rates, unemployment rates (including 1, 2 lags), consumer price index excluding accommodation (including 1, 2 lags), and GDP.

In the absence of exogenous variables, results indicate that private residential prices Granger-cause earnings, but HDB resale prices do not Granger-cause earnings. However, with exogenous variables included in the estimation, no VAR Granger causality was detected for both the Private non-landed and HDB resale indexes.

This suggests that while residential prices may have had an effect, they were marginal compared to the effects which labour market conditions had on wages.

CONCLUSION

The results from the HP filter demonstrate that the economy was in the overheating phase over the period 2006–2007 and 2009–2013, and that the accommodation sector (both public and private) is a strong factor in the linkages between GDP growth components and the overall CPI growth rate. In particular, the property development and construction sector showed a dramatic turnaround from 2005 onwards, growing at an accelerated pace, while the growth in exports, while still positive, fell over the period. This suggests that much of the CPI growth was driven by activities in the real estate sector and rising rental costs rather than export growth transmitting through higher real wage demands.

The lack of coordination in population and public housing construction in the public housing sector was a major factor in the supply-demand imbalance that led to the escalation of public housing prices over the period. In particular, population growth rates were a key significant factor in our VAR regressions on prices. The role of global capital liquidity inflows was another factor in the credit growth that led to rising prices. However, the effects did not operate independently of the supply demand imbalance, which was the fundamental driver of rising rents. Hence, macroprudential policies, while effective in reducing capital inflows, remained initially insufficient to counteract the upward pressure on rents driven by fundamental factors.

In the private housing sector, a clear link between escalating rents and rising prices was found. However, a significant impact between rising prices and real wages was not found, indicating that the effects of prices on wages did not operate independently of conditions in the labour markets.

A review of countercyclical fiscal and supply-side policy measures may be useful in view of increased inflation volatility. In particular, policies regarding the use of land may be reviewed to balance the long-term needs of urban development with the smoothing of market cycles. This objective may be consistent with a higher level of public investment, ownership and price anchoring in the residential, industrial and commercial sector. The Government Land Sales (GLS) scheme may also have to be modified to incorporate adjustments according to short-term cyclical conditions.

Chapter 5

Market Structure and Rising Costs

CHAPTER 5: MARKET STRUCTURE AND RISING COSTS

In this section, we provide brief case studies of two industries to investigate the hypothesis that product markets in Singapore are not sufficiently competitive, where oligopolistic pricing and other distortions cause prices to be higher in Singapore than in neighbouring countries for identical goods. The markets include the commercial rental markets with a focus on REITs and the retail furniture industry. These serve as introductory cases for further exploration in the respective industries.

RETAIL PROPERTY MARKETS IN SINGAPORE

Retail space can generally be classified as public or private space. According to a market study by Competition Commission of Singapore (CCS) on retail mall rental space in Singapore, public space includes HDB-owned retail space, HDB shop units and properties owned by government agencies, while private space consists of REIT-owned retail space, property-fund owned retail space, developer-owned retail space, and Strata-titled retail space (CCS, 2008). URA releases data on retail space, as well as shop space. Shop space does not include spaces that are used for food and beverage (F&B), entertainment, and health and fitness uses. According to URA, Shop space comprises about 60% of retail space as at 4Q2013.

The share of public shop space of the total space has fallen from 43.18% in 1992Q1 to 30.26% in 2015Q4. Total public sector shop space had fallen from 1,101,000 sqm in 1993Q4 to 1,091,000 sqm in 2015Q4, while private sector shop space rose from 1,743,000 sqm in 1993Q4 to 2,515,000 sqm in 2015Q4. This marks a shift away from the social model that emphasised state-sponsored cost subsidies to keep business and consumer costs low and ensure competitiveness towards one that emphasised greater efficiency in the use of space, which led to rising rental costs.

FIGURE 5.1: SHOP SPACE AVAILABLE ('000 SQM NETT)

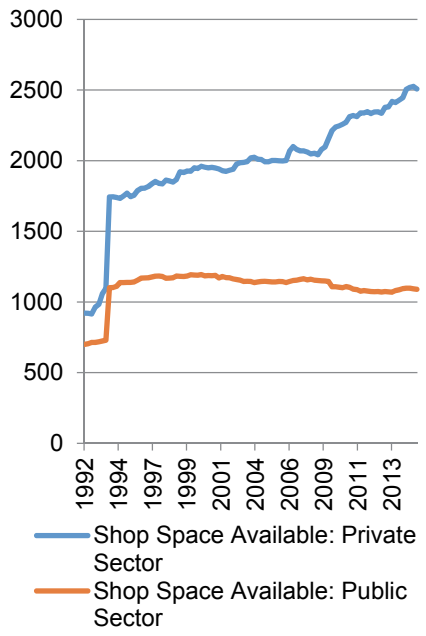
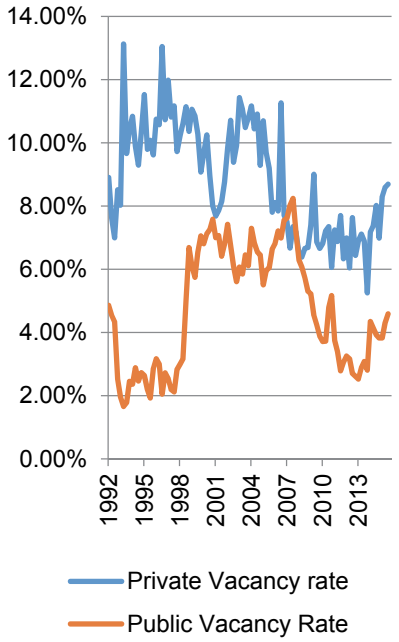


FIGURE 5.2: PROPERTY MARKET VACANCY RATES



Source: URA (n.d.), Retrieved from https://webcdm.ceicdata.com

Several macroeconomic factors have contributed to the rise in the rental prices and the fall in vacancy rates from the period of 2004–2011 as seen in Figure 5.2. Based on Figure 3.11, it is seen that six out of nine years were characterised by net change in occupied properties exceeding net change in available properties, indicating a situation of excess demand or undersupply during the period. Furthermore, strong correlations that exceeded 0.7 between population growth and shop rental index growth was found (Figure 5.3), while moderate correlations between growth in visitor arrivals and the shop rental index was seen (Table 5.1). This provides some support to the view that rising rents was one of the inflation transmission mechanisms of go-for-growth and excessive immigration policies that were pursued over the decade in a bid to raise Singapore out of the slump experienced in 2002-2003.

FIGURE 5.3: TOURIST, RETAIL SALES INDEX, PROPERTY RENTAL INDEX

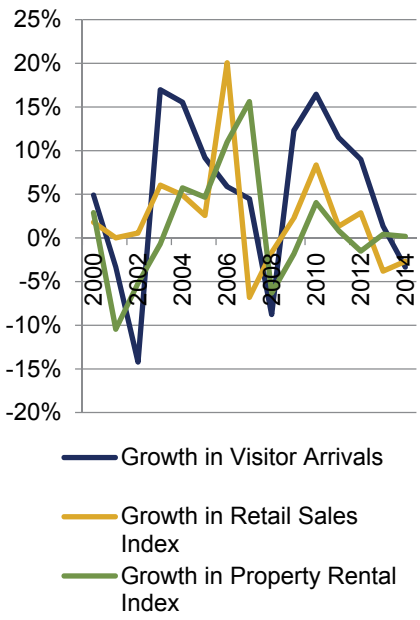
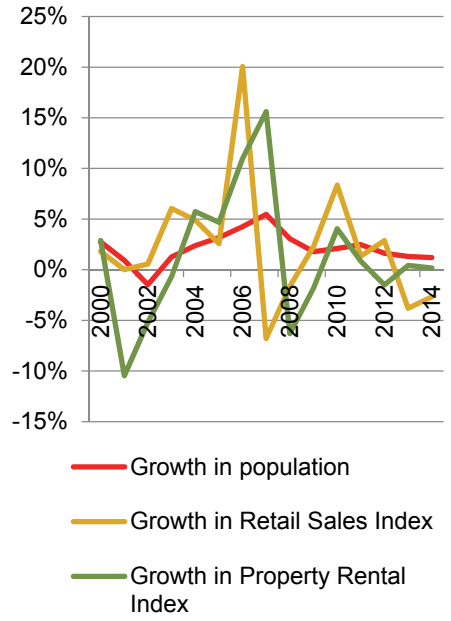


FIGURE 5.4: POPULATION, RETAIL SALES INDEX, PROPERTY RENTAL INDEX



Source: URA (n.d.), Department of Statistics[20] (n.d.). Retrieved from https://webcdm.ceicdata.com

TABLE 5.1: CORRELATION OF POPULATION GROWTH, VISITOR ARRIVALS, AND RETAIL SALES

	Population Growth	Visitor Arrivals Growth	Retail Sales Index Growth
Population Growth		-	0.136764
Visitor Arrivals Growth	-		0.403916
Retail Sales Index Growth	-	-	
Shop Rental Index Growth	0.756755	0.433774	0.246414[21]
Shop Rent Central Growth	0.717035	0.438268	0.271073
Shop Rent Fringe Growth	0.816371	0.454959	0.145347

[20] Data was annualised using cumulative visitor arrivals, and based on year-on-year changes in the respective indexes.

[21] The growth in the shop rental index correlates with 1-lag growth in the retail sales index at 0.711, as seen in Figure 5.3/5.4.

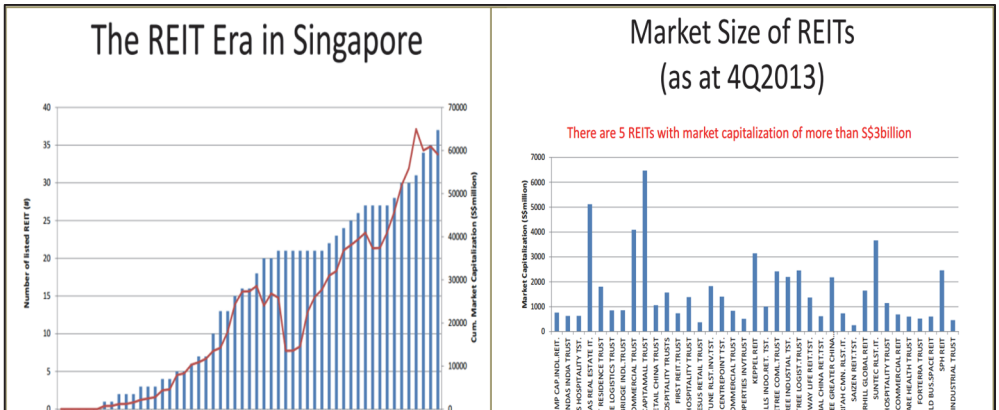
Source: URA (n.d.), Department of Statistics[22] (n.d.). Retrieved from https://webcdm.ceicdata.com

THE RETAIL REIT INDUSTRY IN SINGAPORE

The MAS issued the first set of regulations governing REITs in Singapore in 1999. The regulatory framework has undergone several revisions, aimed at promoting Singapore as a regional REITs (Real Estate Investment Trusts) centre, while protecting the interests of unit holders (Koh et al., 2014). Regulation on REITs cover distributable income, performance fee methodologies, development limits, leverage limits, disclosure requirements, and restrictions on investments, etc. Regulatory requirements include: distribution of at least 90% of taxable income; maximum gearing ratio of 35% or 60% subject to credit ratings; full valuation of real estate annually; and competency requirements and duty guidelines for REIT managers.

Since the first CapitaMall listing in 2002, REITs in Singapore have grown to include more than 33 REITs representing a total market capitalisation exceeding S$61 billion at the end of September 2014, with asset holdings in retail, office blocks, serviced apartments, hospitality, healthcare, industrial and warehousing in Singapore and abroad (MAS, 2014; see Figure 5.5). Singapore is currently the second largest REIT market in Asia after Japan and the 7th largest REIT market globally. This is on the back of favourable liquidity conditions, which aided the expansion of REITs.

FIGURE 5.5: OVERVIEW OF REITS IN SINGAPORE



[22] Data was annualised using cumulative visitor arrivals, and based on year-on-year changes in the respective indexes.

Source: IPS Closed Door Discussion on “The Costs and Benefits of Landlord Institutionalisation” (Institute of Policy Studies, 2014)

However, anecdotal evidence indicates that businesses have witnessed steep rent increases due to institutional ownership and management of retail space, most notably by REITs (Yahya et al., 2016). During this period, tenanted business owners have expressed concerns about the lease structures and practices of REITs, citing issues of asymmetric information and unequal bargaining power between small business tenants and institutional landlords. In reply, landlords have cited the substantial value-added services they provide as a justification for cost increases.

Several impacts of the development of REITs have been cited in the literature. On the positive side, REITs structures provide investors with liquidity, diversification and an inflation hedge (Atchison & Yeung, 2014). It professionalises the real estate value chain, diffusing best practices, increasing transparency and standards of disclosure, initiating real estate innovation, reducing agency conflicts, and attenuating property cycles (Jones Lang Lasalle, 2012; Bauer et al., 2010). It encourages investment in the real estate sector by lowering liquidity and risk premiums as well as expanding market access, hence reducing the cost of capital. Other benefits of REITs include: allowing developers to free up capital for infrastructure development; contributing to the breadth and depth of capital markets; providing economies of scale in active property management and value-adding activities; and contributing to GDP and job creation directly and through the employment of ancillary services (Atchison & Yeung, 2014). In addition, as REITs become major stakeholders in the communities in which they invest, they are invested in the continuing economic vitality of suburban areas (Dinsmore, 1998).

Centralised mall management adds value to tenants and shoppers in important ways. This relates to the function of a shopping mall, which lies in its ability to capture agglomeration effects to provide a retail destination to shoppers for both single-purpose and multi-purpose trips (Arentz et al., 2005), thereby enabling tenants to capture the added footfall that each shop provides to a concentration of shops. This leads to inter-store externalities (Miceli & Sirmans, 1995) where the sales of each store depend in part on how many customers the other stores attract. The economic success of the shopping centre therefore depends on the extent to which stores can maximise the opportunities provided by these spatial externalities. In particular, it was found that the legal capacity to evict underperforming or undesirable tenants was a key factor for added revenue generation by central mall management (Miceli & Sirmans, 1995).

In Singapore's context, REITs create added value to the malls by overcoming collective-action problems associated with strata-titled malls. Centrally managed malls pool resources to engage in asset enhancement initiatives, hire professional managers, and generate economies of scale in property management and tenant services — ensuring optimal tenant mix, providing advertising and promotions, and extending retail space to tenants with outstanding sales performance at other malls. This is reflected in the corresponding market segmentation of strata-titled and single-owner malls in the eyes of tenants, and the corresponding premiums, which are paid for REIT-owned malls (CCS, 2008).

However, research has also shown the adverse impacts of REITs on tenants. The REIT manager fee structure includes a base fee that is calculated based on a fixed percentage of the value of the properties in the REIT as well as a performance fee pegged to certain metrics such as gross revenue, net property income or the dividends paid out to investors. This creates an incentive for REITs manager to pursue expansion aggressively. In the US, the evidence on the scale efficiency of REITs has been mixed.[23] Evidence of diseconomies of scale in REITs have been found, suggesting that external factors rather than operational efficiencies contribute to the scaling up of REITs (McIntosh et al., 1991; Ambrose et al., 2000). Other studies show that the best sources of scale economies reside in general and administrative expenses and management fees, both of which are smaller components of total REIT costs (Capozza & Seguin, 1998; Bers & Springer, 1998). Bers and Springer (1998) concluded that REITs experience scale efficiencies differently according to their organisational characteristics such as management structure, capital structure, diversification levels and investment portfolio.

Dinsmore (1998) noted that new forms of financial intermediation through REITs have changed the dynamics of metropolitan growth and urban development in ways that are still poorly understood. The changing structure of ownership of real estate away from smaller private entities to large institutional public and private funds affects the markets for real estate acquisitions and development. Private and public constituents who are not primarily involved in real estate development or finance continue to seek and pursue strategies that improve the economic, social, and environmental welfare of their communities, and these strategies may or may not conflict, complement, or otherwise connect with the strategies being pursued by the emerging property owners and credit intermediaries (Dinsmore, 1998). Furthermore, added financing considerations, such as

[23] See Anderson et al. (2000) and Corgel et al. (1995) for a review.

desired risk-return profiles of REITs, interact with operational and leasing decisions to affect the markets for retail space (Wheaton, 2000).

In Singapore, the introduction of the REIT business model improved corporate governance and transparency, creating avenues for capital-raising from institutional investors at lower costs, hence allowing for the aggressive expansion of malls in key retail centres. As single-owner malls were established as local monopolies in key retail centres, the effects of an overheating economy, an increase in population density, and the demand for inflation-hedging Distribution per Unit (DPU) growth from investors led to the full exercise of market pricing power and acceleration of rent growth, which has increased the cost of rentals to businesses and consumers. The introduction of suburban prime REITs led the expansion of international high street brands beyond the central districts, and guided the development of major local franchises within the suburban retail space, which resulted in further segmentation of market dynamics between strata-titled and professionally managed space.

In addition, studies have found that the market concentration of REITS in Singapore has expanded over time, increasing the barriers to entry for potential competitors. Moving forward, the trend towards market consolidation is likely to lead to greater bargaining power among retail REITs.

In the following sections, the pain points that have triggered the concerns of tenants in the retail sector in Singapore are reviewed.

RENTAL GROWTH

Results of studies of the impact of REITs on rents have been mixed. Sing (2014) has shown that the increase in rental costs in the industrial and commercial sectors correlate with the institutionalisation of landlords in Singapore after controlling for macroeconomic effects, particularly after 2003 as professionally managed REITs experienced rapid growth to become major players in the commercial and industrial real estate markets. However, it was found that lagged REIT returns do not significantly Granger-cause rents to increase in retail markets, while lagged rental in real estate markets explain changes in both REIT returns and contemporary rents in all real estate sectors.

However, an MTI study in the REIT sector published in the *Economic Survey of Singapore* report for the first quarter of 2014 showed that the higher levels and growth rates of rents observed in REIT-owned malls appears to be largely driven by the better physical characteristics of the

REIT-owned malls. After controlling for observable mall characteristics like AEIs and distance to the nearest MRT station, the level of rents in REIT-owned malls is not statistically different from that in single-owner malls.

Based on data gathered by IPS from the annual reports of the various REITs, it is clear that the rentals of REIT-owned malls exceeded the URA shop rental index by a considerable margin. However, mall management and characteristics played an important factor. Using the growth in gross revenue per square foot of net lettable area (NLA) as an indicator to estimate rental increases in REIT-owned properties, it is seen that rentals in three malls in CapitaLand Mall Trust's early portfolio — Junction 8, Tampines Mall and Funan Digitalife Mall — have grown by 82.23%, 64.98% and 46.93%, respectively over the period 2003–2013, outpacing growth in the shop rental index at 36.02% (Figure 5.6).

CapitaLand Mall Trust's overall portfolio gross rental income per NLA increased 112.67% as compared to the shop rental index at 34.83% over the period 2003-2013 (Figure 5.7). The gross revenue per NLA of VivoCity, owned by Mapletree Commercial Trust, rose by 57.56% from 2010/2011 to 2014/2015 (Figure 5.8).

FIGURE 5.6: GROWTH IN GROSS REVENUE PER SQUARE FOOT OF NLA (2003–2013)

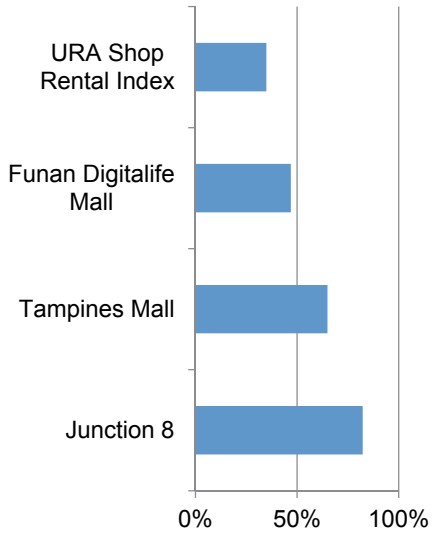
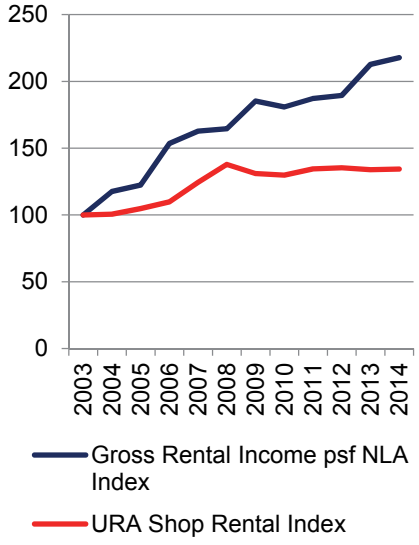
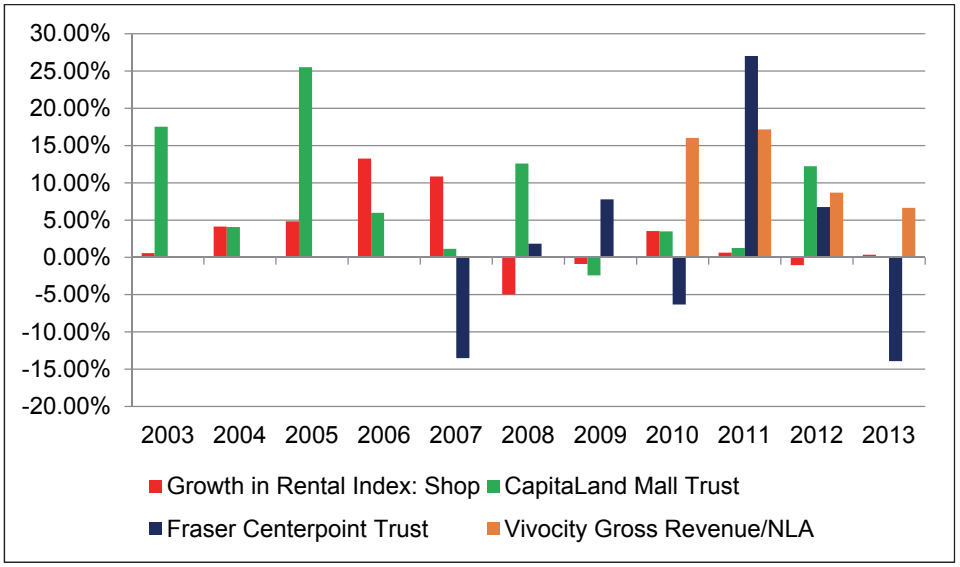


FIGURE 5.7: CAPITALAND MALL TRUST RENTAL INCOME PSF OF NLA



Source: Urban Redevelopment Authority (n.d.) and Capitaland Mall Trust (n.d.)

FIGURE 5.8: GROWTH IN GROSS RENTS PSF NLA VS SHOP RENTAL INDEX



Source: Urban Redevelopment Authority (n.d.); Capitaland Mall Trust (n.d.); Mapletree Commercial Trust (n.d.); and Frasers Centrepoint Trust(n.d.)

Based on a MTI 2013 report on REITs, it was found that the cumulative increase in rents upon renewals in 2013 is highly skewed, with median rent increases at 5.5%, while that at the 99th, 90th and 75th percentiles to be 136%, 45% and 14%, respectively. In every year from 2000 to 2013, up to 25% of retailers would either experience no increase or a decline in rent price upon lease renewal. For most of the renewals, annual effective increases in rent per annum amounted to 3.3% and 2.9% for one-year and two-year lease renewal terms, respectively, similar to the rate of inflation of 3.5% per annum. Higher lease renewals rates were generally for leases that were renewed after more than five years, with the median annual rental price increases working out to be 3.6% on an annualised basis, which is in line with the inflation from 2007 to 2013.

LEASING STRUCTURES

Retailers have also voiced concerns about the leasing structure of retail REITs, most of which include a base rent and an additional rate pegged to gross turnover that kicks in as turnover exceeds a certain threshold. Studies conducted by Wheaton (2000) suggest that in situations where tenants make specific sunk costs with imperfect long-term contracts, and where there are inter-store externalities and an uncertain tenant mix, the

percentage gross turnover structures align the incentives of the landlords with tenants (by aligning mall revenue maximisation with store sale maximisation), ensuring that landlords do not act opportunistically or against the interest of existing tenants when attracting new tenants. Percentage rents have also been explained through risk-sharing among risk-adverse parties (Miceli & Sirmans, 1995), although this may induce risk aversion among landlords (Australia Productivity Commission, 2008), resulting in a reduced diversity in the retail sector.

MARKET CONCENTRATION

Based on data taken from Urbis via Capitamall's Annual Report 2014, Capitamall Trust is the largest single owner, with 14% of market share (Figure 5.9). Tenants have claimed that retail REITs in Singapore operate within an oligopolistic structure, and that high market concentration handled unfair pricing power to REITs landlord, resulting in rapid rental price increases.

FIGURE 5.9: SHARE OF MAJOR SHOPPING CENTRE FLOOR SPACE

Share of Major Shopping Centre Floor Space					
Owner	**2010**	**2011**	**2012**	**2013**	**2014**
Others	40.7%	43.7%	43.7%	38.9%	46.3%
CapitaMall Trust*	16.2%	16.6%	17.3%	16.6%	14.3%
Pramerica	7.1%	6.9%	6.8%	5.9%	5.6%
Frasers Centrepoint Trust*	5.8%	6.6%	6.5%	5.7%	5.3%
Mapletree Comm Trust*	5.7%	5.6%	5.5%	4.8%	4.5%
Suntec REIT*	4.5%	4.4%	4.3%	4.5%	3.0%
Lend Lease	5.0%	4.0%	4.0%	5.7%	5.4%
Far East Organisation	3.8%	3.7%	3.7%	3.2%	3.0%
Marina Centre Holdings	3.2%	3.1%	3.1%	2.7%	2.5%
City Developments Ltd	3.6%		2.7%	2.3%	2.2%
Singapore Press Holdings	2.8%	2.7%	2.7%	2.3%	2.1%
Las Vegas Sands		2.7%	2.7%	2.4%	2.2%
Allgreen			2.3%	2.0%	
CapitaMalls Asia	1.5%	1.5%	2.2%	2.8%	
CapitaLand					2.0%

Source: Urbis, cited in CapitaLand Mall Trust Annual Reports (2010–2014)

However, based on calculations made by IPS, market concentration in the retail real estate market remains relatively low, with a modified HHI[24] of about 0.05, and aggregated market shares of the four and eight largest companies standing at 30.6% and 43.6%, respectively in 2014. However, of note is the ratio of the largest company (CapitaLand Mall Trust) to the second largest company, which is in the range of 2.5, while the largest company takes up 46.7% (in 2014) of the market share of the four largest firms. This may indicate the potential for some degree of pricing power of the largest firm over the next largest firms. It is also important to note that market concentration alone does not account for other factors that influence pricing power, such as local monopoly effects, market segmentation and substitutability of retail space.

TABLE 5.2: MARKET CONCENTRATION MEASURES

	2010	2011	2012	2013	2014
M-HHI	0.053301	0.053913	0.060396	0.057327	0.044429
CR4	34.8%	35.7%	36.1%	33.9%	30.6%
CR8	51.7%	50.9%	51.2%	49.2%	43.6%
S1:S2	2.28	2.41	2.54	2.81	2.55
S1:T4	46.6%	46.5%	47.9%	49.0%	46.7%

Source: IPS calculations

Notes: CR4: Market share held by the largest 4 firms in the industry. CR8: Market share held by the largest 8 firms in the industry. S1:S2: Ratio of market share of largest firm to second-largest firm in the industry. S1:T4: Ratio of market share of largest firm to the total market share of the 4 largest firms.

Nevertheless, the low vacancy rates in CapitaLand Mall Trust as well as the strong property demand suggest that the effects of market structure on price-setting at present among the REITs is minimal as rent prices have not been set at above-market-clearing prices. Vacancy rates have been less than 1% for the majority of CapitaLand Mall Trust malls over the period from 2006 to 2014. A 2008 study by the Competition Commission of Singapore using regulatory market share thresholds also concluded that there was no significant evidence of uncompetitive behaviour in the Singapore retail market. However, the trend towards market consolidation could lead to greater bargaining power for retail REITs.

[24] Unlike the conventional HHI (Herfindahl-Hirschman Index), the modified HHI corrects for potential upwards bias by assuming that the market share of firms in the others group is no larger than the smallest share of the documented companies. See Appendix 5 for a derivation.

RELATIVE BARGAINING POWER

Several factors create stronger bargaining power for retail REITs, including relatively high entry barriers into the industry, the presence of high switching costs for the tenant (if he has invested heavily in a fit-out and stocked shop for the term of the lease as well as building up a customer base at its retail location), a lack of market information and research for the tenant, and an imbalance in negotiating skills between landlord and tenant (Australia Productivity Commission, 2008). Farrell and Klemperer (2007) noted that switching costs might create lock-in effects that incentivise market-distorting behaviours, such as low rent bargains followed by steep rent increases, and retrofits billed to the tenant that exacerbates tenant lock-ins. In addition, tenants who put themselves in a bad position to walk away from lease renewals (e.g., by taking business loans or signing franchise agreements beyond the terms of the lease) weakened their own bargaining power during lease renewal negotiations (Australia Productivity Commission, 2008).

Furthermore, there have been reports of exclusivity clauses in rental contracts that require tenants to pay a higher base rent should they commence a business or trade which is the same or similar to an existing one that has been opened in the vicinity (CCS, 2008). According to the report, the landlord's rationale for this is that an additional store in close proximity would result in trade cannibalism, which would affect sales turnover and hence the variable component of retail rents (CCS, 2008). However, this creates artificial penalties which further prevent businesses from operating several stores within the vicinity, thereby increasing the bargaining power of landlords during the re-negotiation of leases.

Furthermore, the role of natural downstream local monopolies on landlord bidding actions and rental pricing have been noted (Leong & Tan, 2015). Landlords who own all retail space that serves a given population catchment area may be able to charge higher rents due to the low substitutability of prime retail space. This creates distortions during the GLS bid process, where the highest bidder has a high valuation for the item due to the prospect of acquiring local monopoly in the downstream market (Leong & Tan, 2015). An example cited was the case of Frasers Centrepoint, which owns Northpoint Shopping Centre, which made a bid in the GLS auction for a mixed commercial and residential site adjacent to Northpoint. Their bid was 47.4% higher than the next highest bid, which may reflect a monopoly premium, the costs of which will be borne by future tenants and consumers. Analysts note that this reflects the synergies of the two malls and "the determination to protect its market position in the Yishun area" (*Today*, 2013).

In response to the unequal bargaining power between landlords and tenants, the SBF announced in January 2015 details of the Fair Tenancy Framework developed by its SME Committee (SMEC) Rental Practices Working Group. The Framework aims to establish a reference leasing practice and a useful mediating platform for the industry, and helps tenants and landlords of business premises understand the key terms and conditions of a lease agreement, their respective roles and responsibilities, as well as the implications of prevalent industry lease clauses. It consists of three prongs: Rental Data Transparency; Education and Awareness (Develop a Business Leasing Guide and a Basic Reference Lease Agreement); and acting as a Preferred Dispute Resolution Channel. It aims to address some of the existing issues in an equitable manner to all stakeholders.

The overheating of the economy, high population density growth, and the insufficient, or inefficient use of land area allocated to malls in key retail centres has led to the uneven growth in rental prices. Hence this signals the result of unintended effects of government policy to maximise urban density in locations close to MRT stations, and failures in the coordination of population and economic growth management and time lags in infrastructure development in these areas. The solutions to the underlying supply constraints may rest in the development of alternative retail platforms. The potential of e-commerce and omni-channel retailing remains large as market remains immature and penetration of online retailing in Singapore is relatively low. However, a full report on the development of retail space in Singapore to address cost concerns, is beyond the scope of this report.

MARKET STRUCTURE IN THE HOME FURNISHINGS RETAIL INDUSTRY

We shift our focus from input goods to consumption goods and focus first on the analysis of market structure effects on product prices in the home furnishings retail industry. The home furnishings industry is defined as the retail of first-hand furniture and other moveable articles in a home that are necessary or useful for comfort and convenience, excluding kitchen electrical appliances. IKEA is the largest furniture retailer in the world with a large presence in numerous markets in various geographical regions. The largely uniform product ranges across these markets also make it an ideal vehicle for cross-country comparisons.

A wide range of factors determine the prices that retailers set in the markets. These include taxes and tariffs, production and distribution costs, market structure, consumer preferences, market segments and product substitution, competitors' products and prices, strategic behaviour of competitors, entry and exit costs, and business positioning. The objective in this section is not to provide a detailed analysis, but to discuss the role of market structure in price setting.

RETAIL HOME FURNISHING MARKETS IN SINGAPORE

The retail home furnishing market in Singapore is largely fragmented, with a high percentage of sales accruing to niche and specialised manufacturers, and catering to a wide variety of client groups and preferences. It is a relatively small market of US$1.652 billion, with growth projected by to come in at about 1.07% annually over five years (Euromonitor International, n.d.). Due to its small size and high overhead costs, the mass-market retail furnishing segment is comprised of a few players like Inter Ikea Systems BV, Courts Asia Ltd, and TT International. IKEA's market shares in Singapore are considerably larger than those of its competitors.

TABLE 5.3: MARKET SHARE BY REVENUE OF HOME FURNISHING COMPANIES (SINGAPORE)

Company Name	2010	2011	2012	2013	2014
Inter Ikea Systems BV	10.70	11.80	11.60	11.50	11.50
Courts Asia Ltd	-	-	2.60	2.70	2.80
Koninklijke Philips NV	-	-	-	1.70	1.70
TT International Ltd	2.30	2.10	1.80	1.60	1.50
Comfort Solutions Co	1.30	1.30	1.20	1.20	1.20
Osram Licht AG	-	-	-	0.70	0.90
Pacific Brands Ltd	0.40	0.50	0.50	0.50	0.50
Everson Electrical (S) Pte Ltd	0.20	0.20	0.20	0.20	0.20
Aussino Group Ltd	0.80	0.70	0.70	0.70	0.10
Koninklijke Philips Electronics NV	1.80	1.70	1.70	-	-
Siemens AG	0.40	0.50	0.60	-	-
Courts (Singapore) Pte Ltd	2.50	2.60	-	-	-
Others	79.50	78.60	79.00	79.00	79.50
Total	100.00	100.00	100.00	100.00	100.00

Source: Euromonitor International (n.d.)

Founded in Sweden in 1943, IKEA is currently the world's largest furniture retailer, and as of March 2016, it owns and operates 384 stores in 48 countries (IKEA, 2016). Due to its global reach, the price dispersion of similar IKEA products in different countries have been the subject of several price indexes and research into purchasing power parity (PPP), both by practitioners (O'Brien & Siedenburg, 2015; Idealo, 2015) and academics (Haskel & Wolf, 2001; Baxter & Landry, 2012). In a study of 220 transactions across 25 countries, Haskel and Wolf (2001) find typical deviations of 20% to 50% in IKEA prices, and that cross-country cost differences alone cannot explain differences in product pricing (due to price differences for similar products), leaving strategic pricing or other factors which account for varying markups.

IKEA differentiates itself from its competitors in Singapore in several ways due to its unique business positioning, by producing stylish and minimalist designs aimed at young homeowners. Its furniture, emphasising value over durability, is well suited for Singaporean couples that tend to move towards progressively higher-value residential units after a few years. Its unique competitive position is preserved by a relatively small market and well-established brand, which places high entry barriers to potential competitors.

IKEA's competitors do demonstrate differentiation from IKEA, and its direct product competitors, such as Novena Living, operate on a much smaller scale. Mass market retailers tend to source most products from multiple manufacturers that operate on a limited scale, although there is some in-house product design and manufacturing. The second largest home furnishings company in Singapore, Courts (with 2.80% market share), differentiates itself relative to IKEA with a focus on complete home solutions including appliances, as well as a hire purchase sales model. The core business remains in IT and electronics, which constitutes 76.1% of its FY2015 revenue, while furniture comprises a fairly low share of revenues at 19.2% (Courts Asia Ltd, 2015). IKEA's next largest direct competitor, TT International (with 1.50% market share), adopts a highly diversified approach, owning multiple brands across the furniture and consumer electronics range, each targeting different groups of consumers, including niche and mass market segments, of which Novena comprises the largest market share at 1.10% in 2014. Novena sells integrated dining, living and bedroom solutions, but lacks the resources and scope of IKEA.

The table below illustrates some of the key selling points that constitute its unique value proposition that drove IKEA's global growth.

TABLE 5.4: IKEA'S KEY SELLING POINTS

Key Selling Points	Unique Product Positioning Strategies
1) Low Cost	- Cost-reduction-focused design process - Cost efficiency through close collaboration with suppliers and internal competition in sourcing and design - Bulk sourcing, production and product standardisation - Self-service: self-collection, self-delivery, self-assembly to reduce costs - Flat-pack system to reduce wastage, transport and warehousing costs - Unique integrated warehouse-retail DIY concept reduces storage costs
2) Convenience	- Economies of scope (diversity of products)

	- Immediate self-service delivery - Integrated one-stop furniture and retail destination - Show house display to assist in visualising product complementarities - Store location chosen for convenience - Extended opening hours
3) Quality	- Coherent, stylish, trendy, minimalist design - Integrated global procurement - Show house retail concept with strong emphasis on customer experience, while showcasing affordable and quality interior design solutions - Emphasis on functionality and value over durability
4) Well-Defined Company Vision	- Product mix well-calibrated to target audience of young middle-class couples - Clear brand image and positioning - Coherent and mutually reinforcing vision, design and operational philosophy - Company culture aimed at developing service staff - Developing product and process innovation in line with company's Blue Ocean business positioning

Source: Caglar et al. (2012); Harapiak (2013); Hultman et al. (2009); Li (2010); and Lu (2014).

IKEA PRODUCT PRICES

IKEA generally prices its products in line with a low cost, high quality business model, although there are heterogeneities. In developed markets, IKEA is positioned as a low-priced mass-market brand, but in emerging markets where low prices are the norm, it targets a growing middle class that aspires to international lifestyle products (Ringstrom, 2013). The IKEA head office does not suggest prices, and the general pricing strategy aims

to create a consumer expectation that IKEA prices will be substantially below those of local competitors for virtually all products, and attempts to raise margins focus on lowering sourcing costs (Haskel & Wolf, 2001).

Singapore has one of the highest IKEA product prices. Based on Idealo's 2012 ranking, which ranked 40 IKEA products across 33 different countries, Singapore was ranked fifth most expensive in the world. Several factors may be accountable for this, including high rental and distribution costs, high labour costs, low economies of scale, and market structure. However, in the absence of time series data across the IKEA catalogue, it would be difficult to conduct statistical analysis of these factors over time, or to conduct a comparative analysis of the relative importance of various factors across several countries, such as consumer wealth, input and distribution cost, and market concentration, which remain an area for further research.

However, a cursory examination of some cross-sectional data shows the difficulty of establishing a determining factor, or a set of determining factors, in the strategic price setting of IKEA products. For example, while the very strong market position of IKEA in Singapore with a S1:S2 of 410.71% might be seen as generating pricing power, a higher S1:S2 in Germany is associated with a lower price. While high rental costs and limited economies of scale may account for higher prices, it does not explain the price discrepancy of Singapore and Hong Kong, which share similar revenue bases of US$1.65 billion and US$1.52 billion, respectively, while Hong Kong has higher rents and higher median household income, as seen in Hanna (2012).

In contrast to Singapore, the market in Hong Kong is dominated by major manufacturer-retailers specialising in the bedding and mattress industry. Of the four largest brands, three are manufacturer-retailers with core businesses in bedding solutions. The largest, Seven Seas Chemicals, has diversified into furniture production and retail.

The four largest furniture retailers each command a market share of between 9.60–15.60%. This means that the largest firm in the Hong Kong market, Seven Seas Chemicals, is only 1.3 times the size of its closest competitor. Performing the same comparison between the largest and fourth largest firm, we see that this ratio is 1.63 in Hong Kong and 9.58 in Singapore. These observations suggest that the distribution of market share and power is vastly different in these two markets.

The overall market concentration is larger in Hong Kong because the majority of the share of retail revenues is captured by the four largest

retailers. However, between these major players, market shares are relatively evenly distributed, suggesting that no single firm has a distinct strategic advantage over the other. In contrast, much of the share of retail revenues in Singapore is concentrated in IKEA, with the next closest competitors lagging far behind in size.

From a stylised perspective, the Home Furnishings retail market in Hong Kong most closely resembles a competitive oligopoly, where competition (or the threat of competition), puts a ceiling on the price mark-ups and hence profit margins that each firm can sustain. In addition, close connections to the Chinese mainland mean the threat of new entrants is present, and prices have to remain competitive. On the other hand, the Singaporean market for home furnishings with its single large player is more conducive for the extraction of larger profit margins. In addition, high overheads create high entry barriers for potential entrants, and no threat seems to emanate from across the border in Malaysia to the entrenched position of a mass-market branded retailer in Singapore.

TABLE 5.5: MARKET CONCENTRATION AND PRICE RANKING

Country (IKEA brand ranking)	M-HHI	CR8	CR4	S1:S2	S1:T4	Idealo Price Rank (2012)	GDP per capita (IMF 2015)	Median Household Income (2013 Gallup Survey)
China (1)	0.16%	6.10%	3.90%	150.0%	38.46%	18	13,206	-
HK (3)	7.19%	64.50%	48.70%	132.20%	32.03%	-	55,084	35,443
Japan (3)	2.24%	22.60%	18.00%	14.80%	58.33%	3	36,619	34,822
Malaysia (1)	0.52%	11.20%	10.10%	321.05%	60.40%	-	25,639	-
Singapore (1)	1.55%	19.90%	18.30%	410.71%	62.84%	5	82,763	32,360
Australia (2)	1.63%	28.80%	21.50%	171.70%	42.33%	1	45,926	46,555
Taiwan (2)	0.75%	16.50%	12.30%	128.57%	43.90%	-	43,600	32,762
USA (2)	1.33%	15.90%	11.40%	220.83%	46.49%	31	54,630	43,585
Germany (1)	7.79%	15.50%	13.50%	673.33%	74.81%	29	46,401	33,333
Sweden (1)	11.26%	54.60%	49.00%	345.05%	64.08%	8	45,297	50,514

Source: Euromonitor International (n.d.), IMF (n.d.), Idealo (2015), Gallup (2013)

TABLE 5.6: MARKET SHARE BY REVENUE OF HOME FURNISHING COMPANIES (HK)

Brand	Company name	2010	2011	2012	2013	2014
Sea horse	Seven Sea Chemicals (Holdings) Ltd	15.00	15.20	15.40	15.40	15.60
Airland	Airland Holdings Co Ltd	11.00	11.30	11.50	11.60	11.80
IKEA	Inter Ikea Systems BV	10.60	11.80	11.50	11.60	11.70
Simmons	Serta Simmons Holdings LLC	10.10	10.00	9.80	9.70	9.60
Sealy	Tempur Sealy International Inc	5.90	6.10	6.00	5.90	5.90
Giormani	Arredamenti Co Ltd	4.80	4.80	4.80	4.80	4.80
A-Fontane	A-Fontane Group Ltd	3.20	3.30	3.40	3.40	3.40
Philips	Koninklijke Philips NV	1.60	1.70	1.80	1.70	1.70
Megaman	Megaman Ltd	0.90	1.00	1.00	1.00	1.00
Green Home	Green Home LLC	1.10	1.10	1.10	1.00	1.00
Osram	Osram Licht AG	1.00	0.90	0.90	0.90	1.00
Others	Others	34.60	32.90	32.80	32.70	32.30
Total	Total	100.00	100.00	100.00	100.00	100.00

Source: Euromonitor International (n.d.)

Chapter 6

Building Towards a Cost Function Analysis

CHAPTER 6: BUILDING TOWARDS A COST FUNCTION ANALYSIS

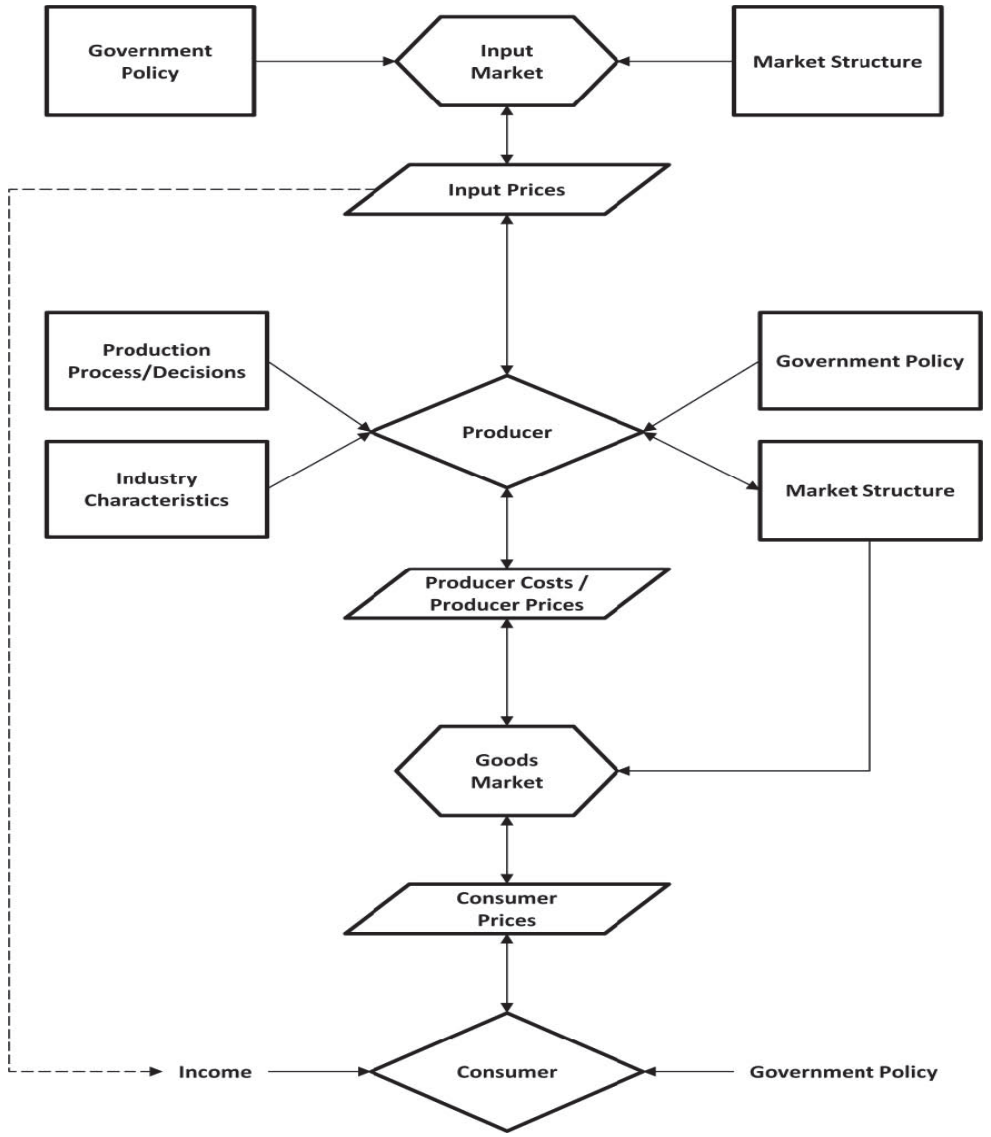
METHODOLOGY

The overarching theme of the analysis that is proposed is that the costs facing businesses and consumers are the result of interactions between numerous factors. This is the crucial first step. While analysis of different factors will require varying methods, the overall framework of a complete study on the structure of costs is summarised in Figure 6.1.

A complete study on business costs will cover trends in input prices, producer prices and consumer prices, as well as the institutions, factors and decision processes that result in these observed changes. It will focus on the structure, which intermediates between these prices. In the input markets, it will examine the roles of market structure and government policy on price changes. The focus of the analysis of businesses/producers will be on production processes and decisions as well as industry-specific characteristics, both of which will be covered by the proposed analytical framework: cost function analysis.

Government policy and the structure of each input market are important factors that interact with standard market forces to result in the input price movements described in the previous section. A key area where government policy has tremendous influence is in the labour market, more specifically, the supply of foreign labour to businesses, which remains an area for further research.

FIGURE 6.1: FRAMEWORK FOR STUDY OF COSTS



Previous work on businesses' costs has typically focused on identifying the share of each component of costs and inferring the impact of input price changes on overall costs. For example, the National Business Survey conducted annually by the SBF contains a section on cost competitiveness, which reports changes in total operating expenses and the breakdown of total costs by cost components. The perceived impact of

each cost component on profitability is also reported. Similarly, a 2008 study by the Ministry of Trade and Industry looked at the share of key cost components in various industries in the manufacturing and services sector. Based on these cost shares, the authors next attempted to infer the impact of growth in monthly earnings and rental rates on business costs.

The type of analysis carried out in the above studies is useful for providing us with a snapshot of the state of business costs in each industry at a particular point in time. However, this static perspective cannot account for the fact that businesses can and indeed, should, substitute between inputs in response to price changes. To illustrate, suppose overall wages increase by 10%: how will the total business costs of a manufacturer, whose labour-share of total costs is 70%, respond? Analysis based on the cost-share approach would take the 70% labour share as an indication that the business is labour-intensive; and hence infer that costs will increase in the face of a wage increase. However, suppose the manufacturer responds to the wage rise by increasing mechanisation in the production process and reducing its number of employees. In such an instance, business costs are unlikely to increase in the same way as suggested by the cost-share analysis. If substitution towards machinery is strong enough, the firm's labour-share will fall and its average cost of production might even decrease in response to a wage increase. Under this outcome, policy analysis based on inference from cost shares will result in incorrect predictions and might lead to misdirected policy intervention.

The example above is highly simplified but serves to highlight the inadequacies of a static perspective on businesses' costs. Firms do respond to changes in input prices and oftentimes, these shifts in production patterns are also actively encouraged by policy. An analytical approach to understanding business costs that does not account for these dynamic effects is thus at odds with the prevailing economic and policy environment and requires revision.

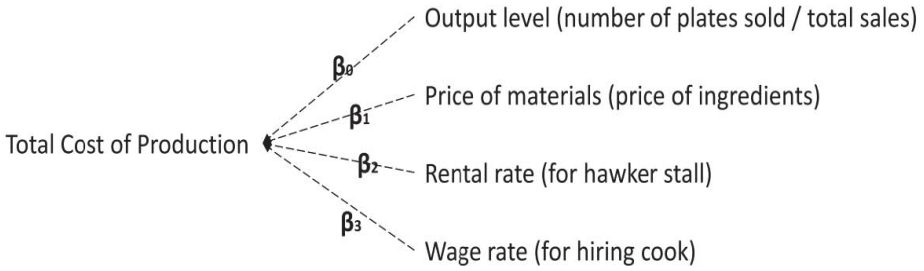
THE COST FUNCTION

In response to the shortcomings of the existing analytical approach, we propose using the cost function as a tool for understanding the structure of costs facing businesses.

Conceptually, a cost function is the quantitative relationship that links a business' total or average cost of production to its output level and relevant input prices. Figure 6.2 below shows a simplified example for the case of a hawker whose only inputs are raw ingredients, shop space and labour. The symbols, β, represent the magnitude of the relationship between each

factor and the total cost of production. Hence, a large value of β2, say, implies that the hawker's total costs are very sensitive to changes in shop rental rates.

FIGURE 6.2: COMPONENTS TO PRODUCTION COST



Notice that the description above has moved away from shares of total costs to focus on the *relationship* between input prices and costs. This relationship is arguably of primary interest to policy. Thus, the immediate advantage of looking at business costs with this approach is the ability to avoid having to make inferences about the impact of input price changes based on the limited information provided by cost-shares. At a deeper level, the cost function approach also addresses the issue of substitution between inputs since the relationship is derived (Appendix 4) from the fact that firms adjust their use of inputs in order to minimise costs.

In addition to the relationship between input prices and costs, the cost function also allows us to identify the important relationship between a business's average cost of production and output level. Economies of scale, or the lack thereof, are often cited as the reason for higher costs of production in Singapore compared to equivalent overseas businesses. However, there has not been much work on identifying the presence of such scale economies using data on Singapore businesses. Since a firm is defined as experiencing economies of scale if its average cost of production decreases as its output level increases, the cost function approach provides us with a rigorous means of identifying economies of scale in Singapore's industries. Empirical estimation of cost functions has been the predominant method used in the literature for identifying economies of scale in a large variety of industries.[25]

Translating the theoretical concept of a cost function as described above to a tool for analysis requires the estimation of an empirical cost function.

[25] See Christensen and Greene (1976) and Evans and Heckman (1984) for extensions of cost function analysis. See Rezvanian and Mehdian (2002) for an application of cost function analysis on commercial banks in Singapore.

Cost function estimation is essentially a “curve-fitting exercise”, where the “curve” is the cost function itself and the data consists of the relevant input prices, output level and cost information (Appendix 5). Depending on the nature of data available, different econometric techniques can be applied.

A major obstacle facing the implementation of the analysis is the lack of accessible data. Data of sufficient quantity and quality are essential requirements of any statistical analysis and our attempt to estimate industry cost functions empirically was held back by these requirements. Nevertheless, intermediate analysis using average costs and cost shares computed from industry-level data for the manufacturing sector provided evidence in support of the proposition that a dynamic perspective of costs is needed.

From looking at the evolution of cost shares in Singapore over time, these measures do not stay fixed, even in the relatively short observation period of six years. The cost of materials tend to be the most variable component of total costs, due largely to the volatility in the prices of raw material imports and the responsiveness of the demand for materials to output changes. Cost shares also show changes when we consider only labour and operating costs. These support the claim that inferring the impact of input price changes on total costs by looking at cost shares is problematic because the cost share movement implies that this inference based on information and assumptions, which may not hold across time.

This illustrates the importance of a dynamic perspective of costs and also the need for fine-grained data, at the industry level and below, for analysis. Unless constraints are present, firms should typically respond to changes in input and output markets. Technological improvements can also enhance production processes leading to adjustments in the demand for inputs such as labour and machinery. In light of these movements in underlying factors, analysis of the costs faced by businesses should also take a dynamic perspective by accounting for these within-firm/industry responses to external changes.

INPUT PRICE ELASTICITY OF COSTS, INPUT SUBSTITUTABILITY AND POLICY INTERVENTION

Although a fully-fledged cost function analysis could not be carried out, the usefulness of such an analytical approach to policy analysis can be illustrated by using a hypothetical scenario. Through this illustration, we also highlight input price elasticity of costs and input substitutability as key factors that policymakers should consider in their analysis of costs.

Consider a scenario where policymakers anticipate a sharp rise in wages across industries and are concerned about the impact of this increase on overall costs in a specific industry, say, electronics manufacturing. As a first step to analysing the situation, an empirical cost function for the industry can be estimated. For the sake of illustration, suppose that the electronics industry only uses labour, materials and floor space as inputs and that the cost function estimation procedure tells us that a 1% increase in wages, materials prices and property rentals is estimated to increase total costs by 0.6%, 0.2% and 0.2%, respectively. In other words, costs are highly responsive to wages, or in more precise language: total cost is relatively elastic with respect to wages.

Such cost behaviour can arise from two underlying structural cases: a) the manufacturing process is highly labour intensive by nature, or b) the manufacturing process need not be labour-intensive, but local producers are not substituting labour in favour of mechanisation. Here, input substitutability is the concept of interest. The first case corresponds to a situation where costs respond strongly to wages due to low input substitutability, while the second case is a situation where substitutability is not low, but producers, for whatever reason, are not making the necessary adjustments to their production processes.

To identify the different cases, and as a means of comparison, cost function analysis can be applied again by carrying out the analysis on firms in the electronics manufacturing industry in a different country. Ideally, this comparative study should be carried out at a more granular level (by sub-industry or product type) in order to exclude composition effects.

Suppose the cost function analysis for the comparison country gives the same elasticity estimates of 0.6, 0.2 and 0.2 for wages, materials prices and property rentals, respectively. This means that costs in the foreign country are equally responsive to wage changes, and we have reason to believe that the electronics industry under study is indeed labour-intensive by nature. In contrast, if the cost function estimation yields estimates of, say 0.33, 0.33, 0.33, for wages, materials costs and property rentals, respectively, then we have evidence that the industry is not actually labour-intensive and that local manufacturers are over-reliant on labour.

These different analysis outcomes imply very different policy responses. In the first case, where costs are highly responsive to wages due to intrinsically low input substitutability, intervention in the labour market or to wage rates may be warranted if policy deems the industry as important and

seeks to protect firms from exiting due to rising costs. On the other hand, measures to dampen wage increases in the second case would be detrimental as they help to perpetuate inefficient production processes. This over-reliance on labour as an input can impact other industries as well, by disrupting the balance in the supply of labour available to other industries. This, in turn, also has implications on wages received by workers in all affected industries. Under the circumstances described in the second case, a more appropriate policy response would be to incentivise firms to carry out the input substitution/mechanisation, which should have been done in response to wage changes. Under a more extreme policy stance, such inefficiently labour-dependent firms could even be allowed to exit the market.

Although this example was not based on results obtained from using actual data, it outlined an approach to applying the cost function analytical framework to a relevant policy question. Through the use of this approach, the issues of the responsiveness of costs to input price changes, and the responsiveness of firms' input usage to price changes are also addressed and highlighted as critical in determining appropriate policy responses.

DEMAND-SIDE CHANNELS

The analysis in this section has thus far addressed costs from a largely "supply-side" perspective. Referring back to Figure 6.1, the earlier subsections have essentially covered the effects represented by the arrows by looking at the effects of: input market conditions on input prices; input prices and other factors on producer costs; and producer costs and other factors on consumer prices. However, changes to the pool of consumers and their demand for goods and services can also impact costs. These effects are represented by the upward-pointing arrows, which similarly link the key components of the cost structure, but in the opposite direction. While there are numerous factors that could affect consumer demand, we will discuss the demand-side channel of the cost structure in the context of our earlier analysis on the effects of government foreign labour policy.

Recall that there was a net increase in the size of the foreign workforce between 2008 and 2012, as documented in our earlier analysis. Such an increase not only increases the supply of labour, resulting in the effects discussed above, but also increases demand for goods and services. For our analysis, we classify these goods and services into two broad categories: public infrastructure, and regular consumption of goods and services.

Public infrastructure includes transport infrastructure such as roads and public transport services. Characteristics common to these goods and services are their large scale and importance in the day-to-day functioning of households and businesses. Relative to regular goods and services, the supply of infrastructure goods and services is also sticky. For example, when the demand for MRT train services exceeds its currently available capacity, this capacity cannot be increased quickly or easily. There is often a significant lag-time — the time it takes for new trains to be commissioned or new lines to be constructed — and during this period, excess demand is persistent and can have significant implications for costs, especially to consumers. This is to the extent that transport providers have leeway in pricing their transport services, where the excess demand is likely to contribute to rising transport prices. Even if transport prices are inflexible or kept low through regulation, consumers still bear higher costs due to excess demand.

The effect of increased demand for regular goods and services through rapid population growth is slightly more ambiguous. In an economy with minimal frictions, businesses should be able to adjust their output and corresponding input use in order to meet the excess demand. Superficially, such increases in demand could in fact be welcomed by businesses, since they imply revenue growth and provide a conducive economic environment for business expansion. However, applying the analytical framework that we have constructed up to this point, we know that this need not be the case.

From our analysis of the effects of industry characteristics on producers' costs, we know that not all firms benefit from an increase in scale. Some businesses, especially those in niche segments, are fundamentally configured to produce a limited quantity of output. Such firms' potential lies in creating more value per unit of output, not more units of output. In such cases, imposing an expansion in output could even be counterproductive, resulting in "diseconomies of scale". On the other hand, our application of cost function analysis also informs us about businesses' ability to adjust their production processes to meet changes in demand. When businesses do not reconfigure themselves adequately, increases in demand could in effect result in net increases in costs.

Moving up the structure of costs, even if businesses are willing and able to increase their production scale, our study of the market structure of and policy effects on input markets tells us that firms may be constrained in their ability to obtain inputs in amounts and prices which would enable them to benefit from increased demand. For example, if businesses in the restaurant services industry face increased demand but are constrained in

their ability to hire more workers — perhaps through new government foreign worker policies and the lack of resident workers — then there will be excess demand for labour, resulting in upward pressure on labour costs.

Similarly, increased demand for, say, a retail service, might push a retailer to increase its number of outlets. However, given the trends in retail rentals and the structure of the retail property market documented earlier, such a move might result in an increased overall burden of rental, even after accounting for increased profits. Depending again on individual market characteristics, the increased costs faced by businesses outlined above could either be passed over to consumers in the form of high consumer prices, or be retained as higher producer costs, which in turn would reduce businesses profit margins.

Of course, the effects mentioned above need not necessarily be true, but neither will increased demand through a larger pool of workers-consumers necessarily benefit businesses. The key point of the discussion above is that just as various components and drivers of costs from the “supply-side” are linked and interact through a larger structure, so too are “demand-side” factors and shifts. Therefore, the changes in costs faced by various economic agents are results of interactions from all of these factors.

Chapter 7

Recommendations and Areas for Further Study

CHAPTER 7: RECOMMENDATIONS AND AREAS FOR FURTHER STUDY

RECOMMENDATIONS

In this report, it is seen that a perfect storm of several factors arose to generate inflation in Singapore. The primary cause of high rates of population growth led to shortfalls in housing supply. The supply-demand imbalance led to accelerating home prices and construction activity. This led to overheating in the construction sector, which spilled over to the real economy given the strong output multipliers and backward linkages in the sector.

In addition, global liquidity inflows, as well as the liberalisation or privatisation of HDB resale, retail and industrial markets contributed to the acceleration of asset prices and rents. This in turn led to high growth in private household credit and property prices, and an unstable feedback loop of credit and prices was averted through successive macroprudential policies and cooling measures.

The high cost economy marks a shift towards a higher value-added economy; but this has created a distribution of wealth towards landowners. High inflation in the context of stagnating productivity and wages, driven in part by high rates of immigration of low-skilled workers from 2006–2012, has led to major distributional impacts, which have not yet been fully explored in a detailed study.

In sum, inflation over the period was driven mainly by accelerating population growth, which overburdened existing infrastructure, and rising land-use costs caused by global liquidity, supply-demand imbalances and institutional shifts in ownership and management of key resources. Other contributory factors included rising commodity prices, and in particular energy prices, which increased the costs of doing businesses.

Based on our studies, several areas of concern, at the practical and methodological levels, for further discussion and research have been raised.

Resource Management of Land and Labour

The use of the managed floating exchange rate policy, operating through import price deflation and export tightening, remains the most effective tool to target inflation. Currently, Singapore is facing a medium-term

deflationary outlook. However, over the longer term, domestic sources of inflation will increase in relative importance, due to inherent land and labour scarcity and increasing population density. Hence, the trade-off between domestic and external tightening will become more severe. Nevertheless, the use of blunt monetary tools will be ineffective and insufficient, while imposing negative externalities on the real economy. Addressing cost issues effectively will require a hands-on, coordinated regime of resource management, which incorporates both long-term planning needs and counter-cyclical adjustment mechanisms.

In particular, economic and fiscal policy coordination is required to lean against the unintended effects of monetary policy. Fiscal injections into the construction sector will have to be calibrated to the demands of urban development as well as fiscal rebalancing. Construction activity leads to front loading of inflationary pressures but also requires coordination with urban use projections.

Moving forward, greater coordination, information-sharing, and collective decision-making among monetary, fiscal and supply-side policy agencies is probably necessary. In particular, discretionary government spending at about 10% of total GDP can be used to offset the impacts of monetary policy. Planning of discretionary fiscal tools aimed at a countercyclical function while minimising disruptiveness to markets can enhance the effects of monetary and fiscal policy working in tandem.

The Role of Dispute Resolution in Landlord-Tenant Relations

Acknowledging the influence that landlords and REIT owners have over the profit outcomes of their retail tenants, the Rental Practices Working Group (RPWG) of the Singapore Business Federation-led SME Committee (SMEC) developed a Fair Tenancy Framework for Business Premises, launched in 2015. This is a set of leasing guidelines and negotiation principles for small businesses looking to rent premises for commercial, industrial, retail and food and beverage activities. It aims to help landlords and tenants better understand their roles and responsibilities, and provide a framework for resolving disputes that may arise between both parties.

The following are some suggestions to extend the existing framework:

- Effective rents should be made publicly available for potential-buyers/leasers to check and make more prudent decisions. This information can be managed by a third-party independent of the landlords and tenants for greater visibility. Tenants are encouraged

to check the rents via this information bank before signing any tenancy agreements.

- Introducing a set of rules for landlords and tenants, including cost-sharing for retrofits, longer notice periods for tenants when they no longer have the option for renewal, and restricting the use of certain clauses such as the exclusivity and non-compete clause for tenants within a nearby location.
- Setting up a tenant protection agency to assist tenants in the process of reviewing contracts, as well as to facilitate collective bargaining by smaller tenants when negotiating with major landlords.
- The prevention of local monopoly effects by the blocking of entry in Government Land Sales (GLSs) by the incumbent that owns adjacent plots of land parcels, and dividing land parcels in GLS within a given catchment area so that incumbents are not permitted to obtain all the lots, have been suggested (Leong & Tan, 2015).

AREAS FOR FURTHER STUDY

The Role of Public Ownership of Rental Space

Public management of space for key economic activities remains a crucial function of Singapore's policymaking. The JTC continues to closely monitor cyclical and structural market developments to pro-actively plan and develop infrastructure and industrial space to strengthen competitiveness and catalyse the transformation of industries and enterprises. Total industrial space directly leased by JTC has fallen to 8.0% in 2013Q3 due to the privatisation of industrial plots (Tham, 2014); and privatisation has led to a reversion of prices to market clearing levels. While JTC retains the ability to determine prices over the longer term through the release of supply of industrial land and its extensive project development capabilities, the question of optimal levels of public ownership remains to be explored.

The government seems to have adopted a cluster- and productivity-based approach in determining the optimal trade-off between efficiency and diversity. Public industrial spaces are increasingly reserved for targeted synergistic functions within dedicated innovation districts, such as One-North, Seletar Aerospace Park and Jurong Innovation District. Conditions for the renewal of leases are also in alignment with the government's productivity drive (MTI, 2012). Price increases in the industrial sector over the longer run will remain calibrated within the framework of government's current restructuring efforts.

The retail sector lacks a similarly dedicated agency to assess industry and population needs and develop and manage land use in the retail sector. In the domestically oriented retail sector, the trade-off between efficiency on the one hand and equity and diversity on the other is less clear-cut than in the industrial sector. Subsidised retail spaces remain an important factor in ensuring that living expenses for the lower income groups in Singapore remains affordable. In addition, a policy that works purely on efficiency grounds is unsustainable in light of changing demands and concerns of the citizenry for outcomes oriented towards equity and diversity.

One of the ways to address these concerns would be to define the role of publicly-owned and managed retail spaces in terms of achieving equity objectives, and to expand the current stock of publicly owned and managed retail spaces such as wet markets, hawker centres, grocery and provision shops, and basic services and to regulate the tenants of these spaces, to provide insulation from rising costs for the lower income groups. The HDB should continue to function as both developer and landlord in these spaces. The number of shops managed by HDB has fallen in recent years, from 30,473 in 1990 to 28,477 in 2014. The percentage of public retail space has fallen from 43.6% to 30.5% over the same period. The division of roles of private and public ownership will be an effective means to pursue the contrasting social objectives of efficiency and equity.

The distributional impacts of ownership of key land assets, from an economic and a political economy perspective, remains an area of further research interest. In particular, addressing the inequalities stemming from current land ownership structures may be examined by various governmental and non-governmental stakeholders.

Market Structure Considerations and Impacts on Mark-Ups

Presently, policy discussion on market structure and competition takes place predominantly within the context of anti-trust analysis. However, our analysis has indicated that market structure factors can influence business costs even if regulatory thresholds are not crossed. This is not surprising as prices in various input and consumer markets arise from the interaction between “traditional” market forces as well as characteristics of the individual market structures. As such, analysis of market concentration should be carried out not only by competition regulators but also should be incorporated into studies on business costs. In particular, closer and more rigorous case studies on market structure and mark-ups across industries are warranted.

Building a Cost Function Analysis

A contribution of the work presented is the motivating evidence for a shift towards a more dynamic perspective on costs, and an analytical framework, based on the cost function, with which such an approach to costs can be implemented. Clearly, there is much room for further study in this area. For one, a fully-fledged cost function could not be estimated at the time of this report due to severe data limitations. If the required data were available, cost function estimates could prove very valuable for industry and policy alike. Such figures could be used to study the presence of economies of scale for various industries, thus finally providing supporting evidence to the longstanding claim of that the lack of scale is a factor constraining Singapore's businesses. More importantly, estimation and comparison of cost functions as part of case studies can help to inform policymakers on the appropriateness of certain interventions. These have non-trivial implications for policy.

Responsiveness to Input Prices

The analysis in Chapter 6 highlighted some serious shortcomings in the current methods used in discussions on business costs. Specifically, current analysis focuses heavily on static measurements of cost shares without sufficient attention paid to businesses' responses (or the lack thereof) in the face of input price changes. In light of the evidence presented in, discussions in policy and business circles should work to incorporate this more dynamic perspective. For example, more attention could be paid to how business costs are anticipated to change in response to conditions in input and goods markets.

Differences in Input Substitutability

Building on the previous point, the illustrative cost function analysis also highlighted the issue of input substitutability. Policy should recognise that the degree and ease with which inputs can be substituted differ between industries due to differences in intrinsic industry characteristics. However, even within industries, firms can differ in their input substitutability. In such cases, adjustments in input demand may be lagging not because of the characteristics of the production process, but due to firms' (sub-optimal) allocation decisions. Identifying between the two channels has important implications for policy.

Where low substitutability is due to intrinsic factors, policy intervention in input markets *may* be justified in order to prevent mass attrition of firms in the industry due to rising costs. However, if low substitutability is

attributable to firm's refusal to readjust their production processes, then intervention in input markets may be inefficient and lead to a net social loss. In such cases, more targeted policies that incentivise internal restructuring would be more appropriate.

In summary, empirical identification of the specific industry conditions and targeted policy responses are crucial. Across-the-board promotion of internal restructuring is not very meaningful, since some industries are, by nature, constrained in their ability to restructure. On the other hand, broad interventions in input markets may help to keep costs low, but may also incentivise inefficient firms to avoid restructuring their production processes.

Estimation of Time-Varying NAIRU

The relation between real wages, productivity and movement of the natural rate of unemployment, and the corresponding pass-through into CPI inflation through the Phillips curve, remains an area for further research. As the recent post-2014 deflationary episode has shown, estimation of the Time-Varying NAIRU has to be conducted taking into account demand-side, external, and policy factors.

A closer analysis of the natural rate of unemployment, as well as the process of corporate adjustment at the micro-level in response to rising cost inputs, produced through cost-function analysis, would aid in policymakers' understanding of the structure of the economy and the dynamics of economic adjustment.

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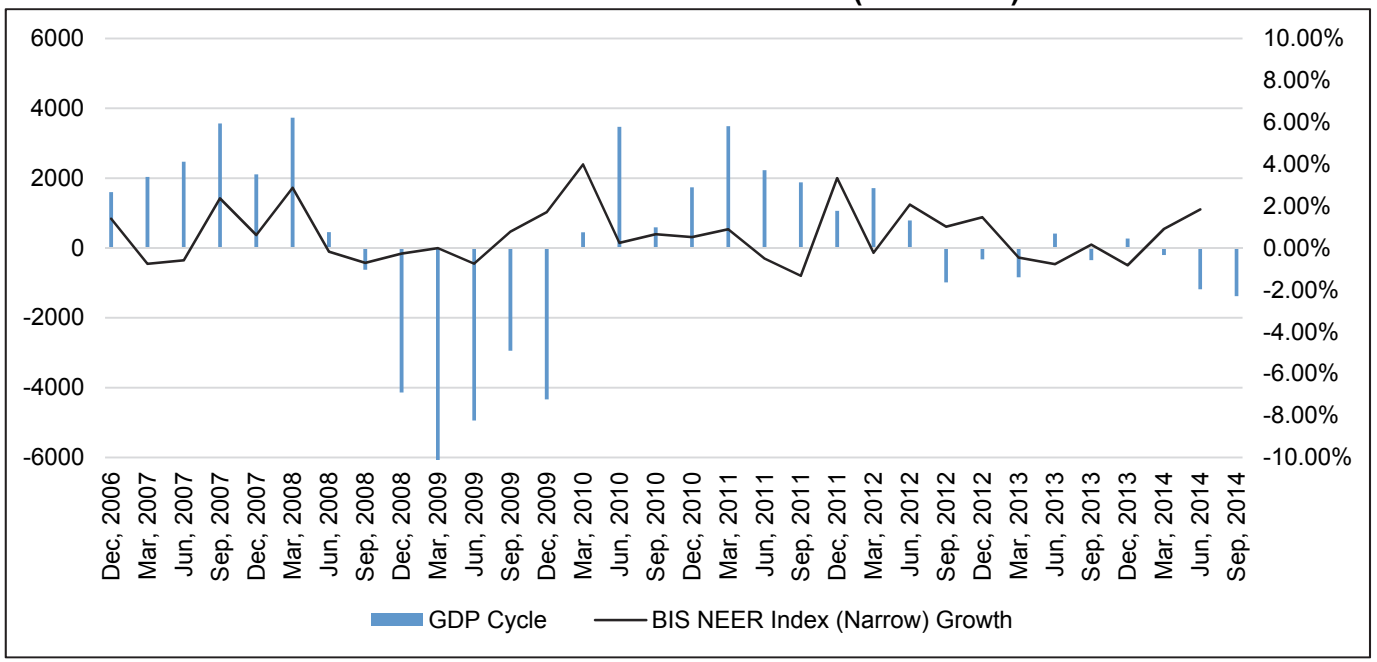
APPENDICES

Appendix 1

FIGURE A: OUTPUT GAP AND BIS NEER[26] (NARROW) GROWTH



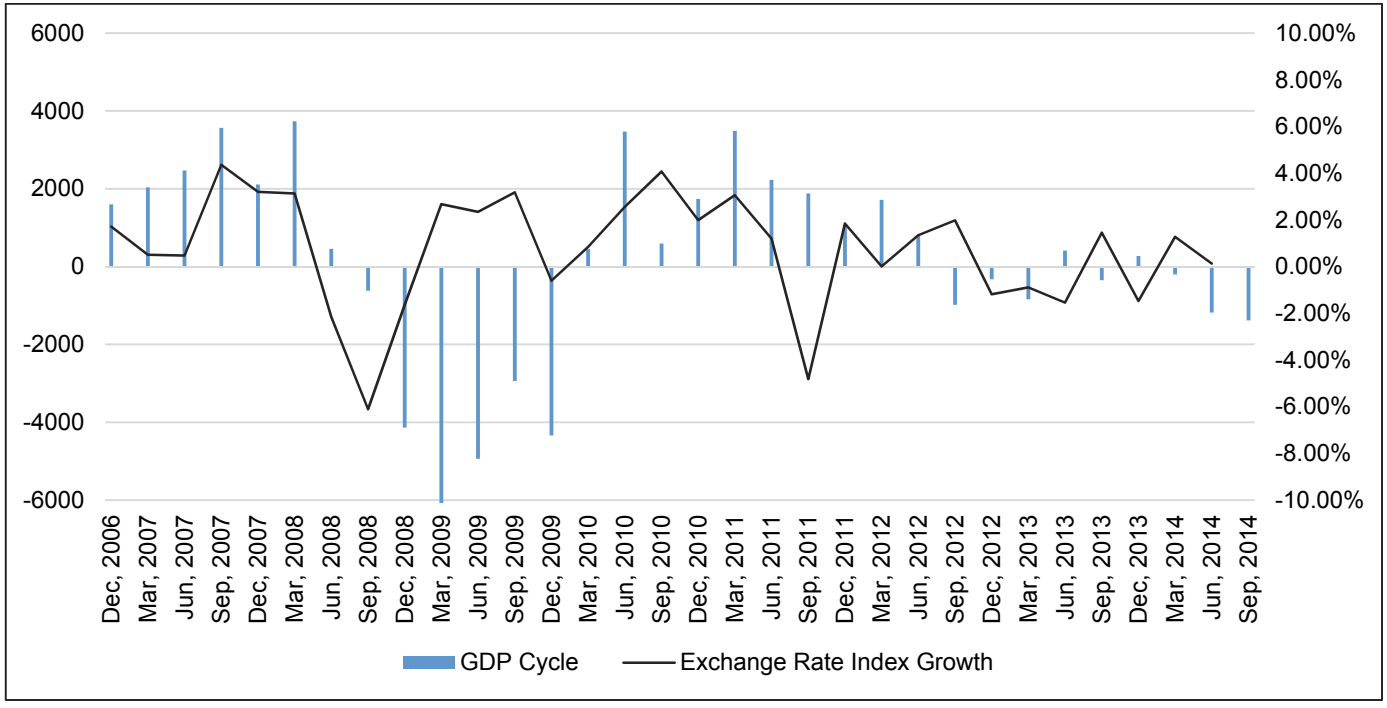
[26] Nominal EERs are calculated as geometric weighted averages of bilateral exchange rates. The weighting pattern is time-varying, and the most recent weights are based on trade in the 2008–2010 period. An increase in the index indicates appreciation.

2007-2014	GDP Cycle	CPI Growth	Consumption Expenditure Cycle	Net Investment Cycle	Change in Inventories Cycle	Exports Cycle	Imports Cycle
NEER Growth	0.139	0.156	0.104	-0.060	0.204	0.076	0.076
L1 (1 quarter)	0.264	0.208	0.189	0.521	0.117	0.236	0.297
L2	0.314	0.220	0.156	0.144	-0.091	0.376	0.341
L3	0.123	0.116	0.284	-0.174	-0.055	0.153	0.097
L4	0.194	0.028	-0.004	-0.292	-0.078	0.174	0.016
L5	0.156	0.129	0.060	0.187	0.065	0.059	0.042
L6	0.193	0.297	0.200	0.114	-0.338	0.164	0.060
L7	-0.027	0.192	0.246	0.228	-0.057	0.079	0.141
L8	-0.004	-0.199	0.312	0.194	0.347	0.119	0.312

Source: Singapore Department of Statistics (n.d.), IMF (n.d.), Exchange Rate Index[27], Retrieved from https://webcdm.ceicdata.com

[27] The index is calculated by the IMF based on the Fund estimated period average exchange rate expressed in terms of US dollars per unit of each of the national currencies, for ease of comparison between the nominal effective exchange rate index and the real exchange rate index. It is thus an average exchange rate expressed in an index form. An increase in the index indicates appreciation.

FIGURE B: OUTPUT GAP AND IMF EXCHANGE RATE INDEX GROWTH



2007–2014	GDP Cycle	CPI Growth	Consumption Expenditure Cycle	Net Investment Cycle	Change in Inventories Cycle	Exports Cycle	Imports Cycle
EER Growth	0.136	0.270	-0.241	-0.077	-0.174	-0.074	-0.241
L1 (1 quarter)	0.283	0.531	0.148	0.409	-0.345	0.264	0.111
L2	0.451	0.342	0.479	0.084	0.132	0.443	0.430
L3	0.367	0.162	0.442	-0.074	0.319	0.442	0.489
L4	0.277	0.101	0.126	0.217	0.143	0.365	0.413
L5	0.149	0.080	-0.026	0.109	-0.236	0.117	0.041
L6	-0.037	0.144	-0.060	-0.029	-0.354	-0.021	-0.156
L7	-0.234	-0.081	0.043	0.057	-0.075	-0.219	-0.213
L8	-0.165	-0.167	0.137	0.120	0.291	-0.247	-0.126

Appendix 2

Macroprudential Policy

Box 2. Singapore—Macroprudential Measures, 2009–13	
September 2009	Removal of the Interest Absorption Scheme and Interest-Only Housing Loans.
February 2010	The LTV cap was lowered from 90 percent to 80 percent for housing loans granted by financial institutions.
	A seller stamp duty (SSD) (including on executive condominium units and Housing and Urban Development Company apartments bought from the resale market) was introduced on all private properties sold within one year of purchase at the rate of one percent for the first S$180,000, two percent for the next S$180,000 and three percent for the remaining balance.
August 2010	The LTV cap was lowered from 80 percent to 70 percent for housing loans granted by financial institutions to borrowers with one or more outstanding housing loans; the minimum cash down payment was increased from five percent to ten percent.
	The SSD was extended to sales within three years of purchase, with the full SSD rate pro-rated depending on the length of the holding period.
January 2011	The LTV cap was lowered to 60 percent for housing loans granted by financial institutions to individuals with one or more outstanding loans and to 50 percent for non-individuals.
	The SSD was extended to sales within four years and rates raised to 16 percent for sales within a year, decreasing gradually thereafter to a minimum of four percent in the fourth year.
December 2011	An Additional Buyer's Stamp Duty (ABSD) was imposed at a rate of ten percent on foreigners and corporate entities buying any residential property, and three percent on permanent residents buying second or subsequent residential property and Singapore citizens buying their third and subsequent residential property.
October 2012	A limit of 35 years was introduced for all new housing loans granted by financial institutions; if the loan tenor exceeded 30 years, or the sum of the loan tenor and the age of the borrower exceeded 65 years, the LTV cap was reduced to 40 percent from 60 percent for borrowers with one or more outstanding housing loans, and to 60 percent from 80 percent for borrowers with no outstanding housing loans; the LTV cap was reduced to 40 percent from 50 percent for new housing loans to entities such as corporations.
January 2013	For individuals obtaining a second mortgage from financial institutions, the LTV cap was lowered from 60 percent to 50 percent (30 percent if the loan exceeded 30 years or would mature after the borrower's retirement age of 65); for individuals obtaining the third or subsequent mortgages, the LTV cap was lowered to 40 percent (20 percent if the loan exceeded 30 years or would mature after the borrower's retirement age of 65); and for non-individual borrowers, the LTV cap was lowered to 20 percent from 40 percent; the minimum cash down payment was increased from 10 percent to 25 percent for borrowers with one or more outstanding housing loan.
	The mortgage servicing ratio (MSR) was capped at 30 percent of a borrower's gross monthly income for housing loans granted by financial institutions for the purchase of HDB apartments, and lowered from 40 percent to 35 percent for loans granted by HDB for the purchase of its apartments.
	The ABSD rates were raised from 10 percent to 15 percent on foreigners and corporate entities; from three percent to ten percent on permanent residents purchasing the second or more residential properties and on Singapore citizens purchasing the third or more residential properties; a new ABSD of five percent was imposed on permanent residents purchasing their first residential property, and of seven percent on Singapore citizens purchasing the second residential property.
February 2013	LTV ceilings were introduced for motor vehicle loans (excluding commercial vehicles and motorcycles). A maximum LTV of 50 percent was set for cars with open market value of greater than S$20,000 and 60 percent for lesser valued cars. The maximum tenor of a motor vehicle loan was capped at five years.
	The 2013 budget contained tax measures targeting the non-owner-occupied residential properties (let-out residential properties were taxed at progressive rates between 10–20 percent compared to the flat ten percent) with the revised rates phased in over two years; the property tax refund was removed for vacant properties from January 2014; and the progressivity of the property tax system was increased for owner-occupied residential properties.

Box 2. Singapore—Macroprudential Measures, 2009–13 (Concluded)	
June 2013	MAS introduced a Total Debt Servicing Ratio (TDSR) framework for all property loans granted to individuals, limiting total debt service payments to 60 percent of a borrower's income. Under this framework, debt service on the housing loan is calculated based on the higher of the prevailing market interest rate or a medium-term interest rate of 3.5 percent, while debt service on non-residential property loans is computed based on the higher of the actual market rate or a medium-term interest rate of 4.5 percent.
	As a refinement of previous measures, borrowers named on a property loan were required to be mortgagors of the residential property for which the loan was taken. Guarantors would need to be brought in as co-borrowers if the borrower did not meet the TDSR threshold of 60 percent. In case of joint borrowers, the income-weighted average age of the borrowers would be used in applying rules on loan tenor.[1]
August 2013	The maximum tenor was reduced from 30 years to 25 years, and MSR lowered from 35 percent to 30 percent, for public housing loans granted by HDB; for housing loans granted by financial institutions for the purchase of public housing, the maximum tenor was reduced from 35 years to 30 years and loans with tenors exceeding 25 years and up to 30 years were subject to tighter LTV limits.
September 2013	Announced measures to be progressively implemented between December 2013 and June 2015 include prohibiting financial institutions from granting further unsecured credit to individuals whose amount outstanding on any credit card or unsecured credit facility is 60 days or more past due or with total outstanding interest-bearing unsecured debt aggregated across all financial institutions exceeding their annual incomes for three consecutive months or more.
	Financial institutions were required to review a borrower's total debt and credit limits aggregated across all financial institutions before granting a new credit card, unsecured credit, or credit limit increases, to disclose to borrowers the potential cost of rolling over credit card debts and revolving credit and how the debt would accumulate, and to obtain a borrower's express consent for the amount of each credit limit increase.
December 2013	Introduction of MSR of 30 percent for housing loans granted by financial institutions for executive condominium units bought directly from property developers.

[1]In February 2014, MAS refined the TDSR framework with broader exemptions. Borrowers refinancing owner-occupied housing loans borrowed before the TDSR's June 2013 introduction would be exempt from the 60 percent limits, and those refinancing public housing loans from limits on the mortgage servicing ratio. Similarly, borrowers were allowed to maintain the remaining loan tenors when refinancing owner-occupied housing loans taken before the loan tenor limits were introduced.

Source: "Experiences with Macroprudential Policy" (Darbar & Wu, 2015, pp. 27—28)

Appendix 3

Table A: Dlnrent and Dlnprice

Vector autoregression

Sample: 1999q3 - 2014q4 — No. of obs = 62
Log likelihood = 320.5668 — AIC = -9.76022
FPE = 1.99e-07 — HQIC = -9.517752
Det(Sigma_ml) = 1.11e-07 — SBIC = -9.142665

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dlnrent	9	.016552	0.7848	226.0486	0.0000
dlnprice	9	.027729	0.6301	105.628	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dlnrent						
dlnrent						
L1.	1.008315	.1430728	7.05	0.000	.7278977	1.288733
L2.	-.2786386	.120876	-2.31	0.021	-.5155511	-.041726
dlnprice						
L1.	.1023159	.0727393	1.41	0.160	-.0402505	.2448823
L2.	-.0097627	.067433	-0.14	0.885	-.141929	.1224035
dlnearnings	-.0445585	.0178857	-2.49	0.013	-.0796138	-.0095032
dlnr	.0079922	.0408909	0.20	0.845	-.0721525	.0881369
ddlnpop	.4037467	1.162844	0.35	0.728	-1.875385	2.682878
noestatetax	-.0029544	.0042429	-0.70	0.486	-.0112703	.0053615
_cons	.0027588	.0027564	1.00	0.317	-.0026436	.0081612
dlnprice						
dlnrent						
L1.	1.230985	.2396814	5.14	0.000	.7612179	1.700752
L2.	-.9195588	.2024964	-4.54	0.000	-1.316444	-.5226731
dlnprice						
L1.	.429186	.1218558	3.52	0.000	.190353	.6680191
L2.	-.2429489	.1129665	-2.15	0.032	-.4643591	-.0215386
dlnearnings	-.0374583	.0299628	-1.25	0.211	-.0961843	.0212678
dlnr	-.0316342	.0685021	-0.46	0.644	-.1658958	.1026275
ddlnpop	-1.624196	1.948043	-0.83	0.404	-5.44229	2.193899
noestatetax	.0038292	.0071079	0.54	0.590	-.0101019	.0177604
_cons	.0019994	.0046176	0.43	0.665	-.0070509	.0110497

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
dlnrent	dlnprice	2.2499	2	0.325
dlnrent	ALL	2.2499	2	0.325
dlnprice	dlnrent	26.965	2	0.000
dlnprice	ALL	26.965	2	0.000

Source: Data from URA (n,d,)

Table B: Dlnrent and Dlnoccupancy

Vector autoregression

Sample: 2000q1 - 2014q4		No. of obs	= 60
Log likelihood = 386.7097		AIC	= -12.29032
FPE = 1.58e-08		HQIC	= -12.04456
Det(Sigma_ml) = 8.65e-09		SBIC	= -11.66202

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dlnrent	9	.014763	0.8352	304.0099	0.0000
dlnoccupancy	9	.007412	0.0797	5.19962	0.7360

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dlnrent						
dlnrent						
L1.	.9789213	.1199146	8.16	0.000	.743893	1.21395
L2.	-.1455538	.1696446	-0.86	0.391	-.478051	.1869435
L3.	-.1214111	.1552787	-0.78	0.434	-.4257518	.1829296
L4.	-.0664849	.1019882	-0.65	0.514	-.2663782	.1334083
dlnoccupancy						
L1.	.7561147	.2542592	2.97	0.003	.2577758	1.254454
L2.	.5828719	.2556817	2.28	0.023	.0817449	1.083999
L3.	.0716149	.2648186	0.27	0.787	-.44742	.5906498
L4.	.6818163	.2672959	2.55	0.011	.1579259	1.205707
_cons	.0020259	.0018464	1.10	0.273	-.001593	.0056448
dlnoccupancy						
dlnrent						
L1.	-.0164186	.0602045	-0.27	0.785	-.1344173	.1015801
L2.	.100497	.085172	1.18	0.238	-.0664372	.2674311
L3.	-.1428703	.0779595	-1.83	0.067	-.2956681	.0099275
L4.	.0422047	.0512044	0.82	0.410	-.058154	.1425635
dlnoccupancy						
L1.	.0391256	.1276538	0.31	0.759	-.2110713	.2893225
L2.	.0710598	.128368	0.55	0.580	-.1805368	.3226565
L3.	-.1296008	.1329553	-0.97	0.330	-.3901884	.1309867
L4.	.0501443	.134199	0.37	0.709	-.212881	.3131696
_cons	.0002638	.000927	0.28	0.776	-.0015531	.0020807

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
dlnrent	dlnoccupancy	18.144	4	0.001
dlnrent	ALL	18.144	4	0.001
dlnoccupancy	dlnrent	3.998	4	0.406
dlnoccupancy	ALL	3.998	4	0.406

Source: Data from URA (n,d,)

Table C: Dlnprice and Ddlnpop

Vector autoregression

Sample: 2000q2 - 2014q4			No. of obs	= 59
Log likelihood = 419.6169			AIC	= -13.61413
FPE = 4.21e-09			HQIC	= -13.36671
Det(Sigma_ml) = 2.28e-09			SBIC	= -12.98031

Equation	Parms	RMSE	R-sq	chi2	P>chi2
ddlnpop	9	.001914	0.0559	3.494926	0.8996
dlnprice	9	.029466	0.5741	79.53709	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ddlnpop						
ddlnpop						
L1.	-.0386679	.1296084	-0.30	0.765	-.2926956	.2153599
L2.	-.0293914	.1359651	-0.22	0.829	-.2958781	.2370953
L3.	-.0580752	.1357633	-0.43	0.669	-.3241664	.208016
L4.	.0494441	.1323883	0.37	0.709	-.2100322	.3089204
dlnprice						
L1.	.0019464	.007563	0.26	0.797	-.0128768	.0167696
L2.	.007921	.0096593	0.82	0.412	-.0110109	.026853
L3.	-.0005612	.0095791	-0.06	0.953	-.0193359	.0182134
L4.	.0035354	.0071883	0.49	0.623	-.0105534	.0176243
_cons	-.0001926	.0002442	-0.79	0.430	-.0006712	.000286
dlnprice						
ddlnpop						
L1.	4.188433	1.995312	2.10	0.036	.2776937	8.099172
L2.	3.331789	2.093173	1.59	0.111	-.7707544	7.434333
L3.	1.000066	2.090067	0.48	0.632	-3.096389	5.096522
L4.	-3.903824	2.038108	-1.92	0.055	-7.898443	.0907948
dlnprice						
L1.	.8275556	.1164319	7.11	0.000	.5993532	1.055758
L2.	-.5472307	.1487046	-3.68	0.000	-.8386863	-.255775
L3.	.3935867	.147469	2.67	0.008	.1045527	.6826207
L4.	-.3603749	.1106637	-3.26	0.001	-.5772717	-.1434781
_cons	.005799	.0037592	1.54	0.123	-.0015688	.0131668

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
ddlnpop	dlnprice	2.8438	4	0.584
ddlnpop	ALL	2.8438	4	0.584
dlnprice	ddlnpop	10.979	4	0.027
dlnprice	ALL	10.979	4	0.027

Source: Data from URA (n,d,)

Table D: Dlnrent and Ddlnpop

Vector autoregression

Sample: 2000q2 - 2014q4		No. of obs	= 59
Log likelihood = 458.151		AIC	= -14.92037
FPE = 1.14e-09		HQIC	= -14.67295
Det(Sigma_ml) = 6.17e-10		SBIC	= -14.28655

Equation	Parms	RMSE	R-sq	chi2	P>chi2
ddlnpop	9	.001805	0.1600	11.23509	0.1887
dlnrent	9	.01628	0.8034	241.1615	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ddlnpop						
ddlnpop						
L1.	.0342663	.124471	0.28	0.783	-.2096924	.278225
L2.	-.0457793	.1257572	-0.36	0.716	-.2922589	.2007002
L3.	-.03233	.1261402	-0.26	0.798	-.2795602	.2149001
L4.	.1348593	.1259306	1.07	0.284	-.1119601	.3816786
dlnrent						
L1.	.0181221	.0140471	1.29	0.197	-.0094097	.0456539
L2.	-.0414686	.0203938	-2.03	0.042	-.0814398	-.0014974
L3.	.0566437	.020642	2.74	0.006	.0161862	.0971013
L4.	-.03524	.0140209	-2.51	0.012	-.0627205	-.0077596
_cons	-.0000442	.0002314	-0.19	0.848	-.0004977	.0004093
dlnrent						
ddlnpop						
L1.	1.053965	1.12234	0.94	0.348	-1.14578	3.253711
L2.	1.811048	1.133937	1.60	0.110	-.4114276	4.033523
L3.	.160399	1.13739	0.14	0.888	-2.068845	2.389643
L4.	.3373025	1.1355	0.30	0.766	-1.888237	2.562842
dlnrent						
L1.	1.026775	.1266608	8.11	0.000	.7785245	1.275026
L2.	-.2130989	.1838887	-1.16	0.247	-.5735142	.1473164
L3.	.0520921	.1861264	0.28	0.780	-.312709	.4168932
L4.	-.2492209	.1264246	-1.97	0.049	-.4970086	-.0014333
_cons	.0034192	.0020864	1.64	0.101	-.0006701	.0075084

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
ddlnpop	dlnrent	10.503	4	0.033
ddlnpop	ALL	10.503	4	0.033
dlnrent	ddlnpop	3.3712	4	0.498
dlnrent	ALL	3.3712	4	0.498

Source: Data from URA (n,d,)

Table E: DInoccupancy and DdInpop

Vector autoregression

Sample: 2000q2 - 2014q4		No. of obs	= 59
Log likelihood = 501.9146		AIC	= -16.40389
FPE = 2.59e-10		HQIC	= -16.15647
Det(Sigma_ml) = 1.40e-10		SBIC	= -15.77006

Equation	Parms	RMSE	R-sq	chi2	P>chi2
ddlnpop	9	.001908	0.0618	3.887577	0.8671
dlnoccupancy	9	.007324	0.1190	7.96669	0.4367

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ddlnpop						
ddlnpop						
L1.	-.0346212	.1291711	-0.27	0.789	-.2877919	.2185495
L2.	-.0358647	.1330494	-0.27	0.787	-.2966368	.2249073
L3.	.0070603	.1328596	0.05	0.958	-.2533398	.2674603
L4.	.1121374	.1324955	0.85	0.397	-.1475489	.3718238
dlnoccupancy						
L1.	.039692	.0340219	1.17	0.243	-.0269897	.1063737
L2.	.0376108	.0334625	1.12	0.261	-.0279745	.1031961
L3.	.0145033	.0322762	0.45	0.653	-.0487569	.0777635
L4.	.0163935	.0323563	0.51	0.612	-.0470236	.0798106
_cons	-.0001056	.0002304	-0.46	0.647	-.0005572	.0003459
dlnoccupancy						
ddlnpop						
L1.	.7131448	.4958353	1.44	0.150	-.2586746	1.684964
L2.	-.884651	.5107225	-1.73	0.083	-1.885649	.1163467
L3.	.4173347	.509994	0.82	0.413	-.5822351	1.416905
L4.	.4423624	.5085962	0.87	0.384	-.5544679	1.439193
dlnoccupancy						
L1.	.0772091	.1305963	0.59	0.554	-.178755	.3331731
L2.	.0543974	.128449	0.42	0.672	-.1973579	.3061528
L3.	-.1068939	.1238952	-0.86	0.388	-.349724	.1359363
L4.	.054889	.1242026	0.44	0.659	-.1885436	.2983215
_cons	.0000772	.0008844	0.09	0.930	-.0016562	.0018105

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
ddlnpop	dlnoccupancy	3.2323	4	0.520
ddlnpop	ALL	3.2323	4	0.520
dlnoccupancy	ddlnpop	6.7103	4	0.152
dlnoccupancy	ALL	6.7103	4	0.152

Table F: Dlnprice and Dlnr

Vector autoregression

Sample: 2000q1 - 2014q4 — No. of obs = 60
Log likelihood = 243.3225 — AIC = -7.244083
FPE = 2.48e-06 — HQIC = -6.889091
Det(Sigma_ml) = 1.03e-06 — SBIC = -6.336534

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dlnprice	13	.024812	0.7192	153.6621	0.0000
dlnr	13	.052339	0.1643	11.79187	0.4625

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dlnprice						
dlnprice						
L1.	.4248019	.1158049	3.67	0.000	.1978284	.6517754
L2.	-.6396766	.1195748	-5.35	0.000	-.874039	-.4053143
L3.	.2424597	.1212474	2.00	0.046	.0048191	.4801003
L4.	-.2359113	.0886713	-2.66	0.008	-.4097039	-.0621187
dlnr						
L1.	.0047574	.0581247	0.08	0.935	-.109165	.1186798
L2.	-.0816513	.0594387	-1.37	0.170	-.1981489	.0348464
L3.	-.0252646	.0577466	-0.44	0.662	-.1384458	.0879167
L4.	.0052826	.0591455	0.09	0.929	-.1106405	.1212057
dlnrent	.9002274	.1358996	6.62	0.000	.6338691	1.166586
dlnearnings	.010939	.0282852	0.39	0.699	-.0444989	.0663769
ddlnpop	-.571327	1.678761	-0.34	0.734	-3.861638	2.718984
noestatetax	.0075159	.0063902	1.18	0.240	-.0050087	.0200404
_cons	-.0024877	.0042047	-0.59	0.554	-.0107287	.0057534
dlnr						
dlnprice						
L1.	.1139426	.2442794	0.47	0.641	-.3648362	.5927213
L2.	-.0435618	.2522316	-0.17	0.863	-.5379267	.4508031
L3.	.0427925	.2557598	0.17	0.867	-.4584874	.5440724
L4.	-.1401039	.1870436	-0.75	0.454	-.5067026	.2264948
dlnr						
L1.	-.0691737	.1226085	-0.56	0.573	-.309482	.1711346
L2.	.1183472	.1253802	0.94	0.345	-.1273934	.3640878
L3.	-.1230825	.1218109	-1.01	0.312	-.3618274	.1156625
L4.	-.1780534	.1247618	-1.43	0.154	-.4225819	.0664752
dlnrent	-.1405514	.2866671	-0.49	0.624	-.7024085	.4213057
dlnearnings	-.1259135	.0596648	-2.11	0.035	-.2428544	-.0089727
ddlnpop	-1.623564	3.541184	-0.46	0.647	-8.564157	5.31703
noestatetax	-.0275982	.0134795	-2.05	0.041	-.0540175	-.0011789
_cons	-.000415	.0088694	-0.05	0.963	-.0177987	.0169687

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
dlnprice	dlnr	2.0311	4	0.730
dlnprice	ALL	2.0311	4	0.730
dlnr	dlnprice	1.0373	4	0.904
dlnr	ALL	1.0373	4	0.904

Table G: Dlnloans and Dlnprice

Vector autoregression

Sample: 2000q1 – 2014q4		No. of obs	= 60
Log likelihood = 319.6747		AIC	= -10.05582
FPE = 1.48e-07		HQIC	= -9.81006
Det(Sigma_ml) = 8.08e-08		SBIC	= -9.42752

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dlnprice	9	.031297	0.5152	63.76089	0.0000
dlnloans	9	.010856	0.5445	71.72512	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dlnprice						
dlnprice						
L1.	.8576643	.1240578	6.91	0.000	.6145154	1.100813
L2.	-.642385	.1578246	-4.07	0.000	-.9517156	-.3330544
L3.	.5113632	.1620877	3.15	0.002	.1936772	.8290492
L4.	-.3567861	.1242909	-2.87	0.004	-.6003919	-.1131804
dlnloans						
L1.	.3790239	.3730528	1.02	0.310	-.3521462	1.110194
L2.	-.0480345	.424886	-0.11	0.910	-.8807958	.7847268
L3.	-.4265529	.4144684	-1.03	0.303	-1.238896	.3857903
L4.	.1103711	.3651591	0.30	0.762	-.6053276	.8260698
_cons	.0045033	.0095537	0.47	0.637	-.0142215	.0232282
dlnloans						
dlnprice						
L1.	.0974147	.0430312	2.26	0.024	.0130751	.1817543
L2.	-.1859424	.0547437	-3.40	0.001	-.2932381	-.0786467
L3.	.1550191	.0562224	2.76	0.006	.0448252	.2652129
L4.	-.0727803	.0431121	-1.69	0.091	-.1572784	.0117178
dlnloans						
L1.	.65349	.1293986	5.05	0.000	.3998734	.9071067
L2.	.1133204	.1473777	0.77	0.442	-.1755346	.4021754
L3.	-.0327937	.1437642	-0.23	0.820	-.3145664	.248979
L4.	-.0251475	.1266606	-0.20	0.843	-.2733977	.2231026
_cons	.0078608	.0033138	2.37	0.018	.0013658	.0143558

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
dlnprice	dlnloans	3.4409	4	0.487
dlnprice	ALL	3.4409	4	0.487
dlnloans	dlnprice	14.497	4	0.006
dlnloans	ALL	14.497	4	0.006

Table H: Dnlprice[28] and Dearnings

Vector autoregression

Sample: 1997q1 - 2015q2 — No. of obs = 74
Log likelihood = -223.0623 — AIC = 6.94763
FPE = 3.627607 — HQIC = 7.369928
Det(Sigma_ml) = 1.42327 — SBIC = 8.006254

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dnlprice	17	3.15501	0.6656	147.2842	0.0000
dearnings	17	.491344	0.6228	122.1687	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dnlprice						
dnlprice						
L1.	.721532	.1192411	6.05	0.000	.4878238	.9552402
L2.	-.2806146	.1261164	-2.23	0.026	-.5277982	-.0334309
L3.	-.1427177	.1152986	-1.24	0.216	-.3686987	.0832634
L4.	.0539355	.0983689	0.55	0.583	-.138864	.246735
dearnings						
L1.	.2686597	.6396276	0.42	0.674	-.9849874	1.522307
L2.	-.2401239	.6353081	-0.38	0.705	-1.485305	1.005057
L3.	.034437	.6502041	0.05	0.958	-1.23994	1.308814
L4.	.0564431	.6145289	0.09	0.927	-1.148011	1.260898
dnloccupancy	-.0721528	.5093738	-0.14	0.887	-1.070507	.9262014
dunemploym~t	-.3591493	.9631437	-0.37	0.709	-2.246876	1.528578
ldunemploy~t	-1.238305	.9348308	-1.32	0.185	-3.07054	.5939297
lldunemplo~t	-.0053585	.9433143	-0.01	0.995	-1.854221	1.843504
dlngdp	88.35023	19.97356	4.42	0.000	49.20276	127.4977
dcpiexa	.9585946	.5823572	1.65	0.100	-.1828044	2.099994
ldcpiexa	-.2608846	.5788459	-0.45	0.652	-1.395402	.8736325
lldcpiexa	.3015842	.5794391	0.52	0.603	-.8340955	1.437264
_cons	-1.396723	.826059	-1.69	0.091	-3.015769	.2223231
dearnings						
dnlprice						
L1.	.0016791	.01857	0.09	0.928	-.0347174	.0380755
L2.	.0046912	.0196407	0.24	0.811	-.0338038	.0431863
L3.	.0247033	.017956	1.38	0.169	-.0104898	.0598964
L4.	-.0222333	.0153194	-1.45	0.147	-.0522588	.0077923
dearnings						
L1.	.415746	.0996121	4.17	0.000	.2205098	.6109822
L2.	.1574626	.0989394	1.59	0.111	-.0364551	.3513804
L3.	.3699634	.1012593	3.65	0.000	.1714989	.5684279
L4.	-.5218567	.0957034	-5.45	0.000	-.709432	-.3342815
dnloccupancy	.0291336	.0793271	0.37	0.713	-.1263447	.1846119
dunemploym~t	-.2556285	.1499948	-1.70	0.088	-.5496129	.0383559
ldunemploy~t	-.2283036	.1455855	-1.57	0.117	-.5136459	.0570388
lldunemplo~t	-.0398063	.1469067	-0.27	0.786	-.3277381	.2481254
dlngdp	1.732277	3.110575	0.56	0.578	-4.364338	7.828891
dcpiexa	-.1046687	.0906932	-1.15	0.248	-.282424	.0730866
ldcpiexa	.1530344	.0901463	1.70	0.090	-.0236491	.329718
lldcpiexa	.0514113	.0902387	0.57	0.569	-.1254533	.2282759
_cons	.4335354	.128646	3.37	0.001	.1813939	.6856768

Source: Data from URA (n,d,)

[28] Dnlprice refers to the first difference on non-landed private residential prices.

Table I: Dresaleprice and Dearnings

Vector autoregression

Sample: 1997q1 - 2015q2				No. of obs	= 74
Log likelihood = -170.9621				AIC	= 5.485462
FPE = .8382627				HQIC	= 5.882919
Det(Sigma_ml) = .3481378				SBIC	= 6.481814

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dresaleprice	16	1.57297	0.7040	176.0355	0.0000
dearnings	16	.489997	0.6183	119.8479	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dresaleprice						
dresaleprice						
L1.	.8791196	.1279511	6.87	0.000	.62834	1.129899
L2.	-.2281733	.1653249	-1.38	0.168	-.5522042	.0958576
L3.	.108879	.1435909	0.76	0.448	-.1725539	.3903119
L4.	-.1313066	.1043212	-1.26	0.208	-.3357723	.0731591
dearnings						
L1.	-.2119659	.3095425	-0.68	0.493	-.818658	.3947261
L2.	-.1023075	.309264	-0.33	0.741	-.7084539	.5038389
L3.	.0994228	.3248422	0.31	0.760	-.5372562	.7361019
L4.	-.0013039	.2982339	-0.00	0.997	-.5858317	.5832239
dlngdp	5.999433	9.759407	0.61	0.539	-13.12865	25.12752
dcpiexa	.5278158	.2919943	1.81	0.071	-.0444825	1.100114
ldcpiexa	.1172649	.2898481	0.40	0.686	-.4508269	.6853567
lldcpiexa	.0758002	.2940519	0.26	0.797	-.500531	.6521314
dunemploym~t	.1155559	.4649324	0.25	0.804	-.7956949	1.026807
ldunemploy~t	-.3812732	.4643573	-0.82	0.412	-1.291397	.5288503
lldunemplo~t	.1052951	.4598259	0.23	0.819	-.795947	1.006537
_cons	.0229253	.3969333	0.06	0.954	-.7550495	.8009002
dearnings						
dresaleprice						
L1.	-.0209007	.0398581	-0.52	0.600	-.0990211	.0572198
L2.	-.0080594	.0515004	-0.16	0.876	-.1089984	.0928796
L3.	-.0132719	.04473	-0.30	0.767	-.1009412	.0743973
L4.	-.0071439	.0324971	-0.22	0.826	-.0708371	.0565492
dearnings						
L1.	.4165318	.0964257	4.32	0.000	.227541	.6055227
L2.	.1383729	.096339	1.44	0.151	-.050448	.3271938
L3.	.3318912	.1011917	3.28	0.001	.1335591	.5302233
L4.	-.5341751	.092903	-5.75	0.000	-.7162615	-.3520886
dlngdp	4.173028	3.040156	1.37	0.170	-1.785569	10.13163
dcpiexa	-.0603777	.0909592	-0.66	0.507	-.2386546	.1178991
ldcpiexa	.2191062	.0902907	2.43	0.015	.0421397	.3960726
lldcpiexa	.1582231	.0916002	1.73	0.084	-.02131	.3377562
dunemploym~t	-.2299997	.1448313	-1.59	0.112	-.5138638	.0538643
ldunemploy~t	-.2278672	.1446521	-1.58	0.115	-.5113801	.0556457
lldunemplo~t	-.0967628	.1432405	-0.68	0.499	-.377509	.1839835
_cons	.4086015	.1236488	3.30	0.001	.1662543	.6509487

Source: Data from URA (n,d,)

Appendix 4

BOX 1: DERIVATION OF THE MODIFIED HERFINDAHL-HIRSCHMAN INDEX (M-HHI)

The standard Herfindahl-Hirschman Index (HHI) is the sum of squares of the market share of each firm, i, in the market. Suppose firms are numbered in decreasing order of share size so that: $s_1 \geq s_2 \geq \ldots \geq s_N$.

The standard HHI is given by:

$$H = s_1^2 + s_2^2 + s_3^2 + \ldots + s_N^2 = \sum_{i=1}^{N} s_i^2$$

The problem with most market share data is that it contains an "Others" category, which is the accumulated share of all small firms for which individual company shares are not available. Computation of the HHI using the above formula necessarily produces inflated values for the HHI.

Proof: Suppose only $s_1, s_2, \ldots, s_K$ are observed, and the rest of the companies' market shares are accumulated under s_O, the share of "Others". i.e.

$s_O = s_{K+1} + s_{K+2} + \ldots + s_N = \sum_{i=K+1}^{N} s_i$, then computing the 'naive' HHI using the formula above gives:

$$H' = \sum_{i=1}^{O} s_i^2 = s_1^2 + s_2^2 + s_3^2 + \ldots + s_K^2 + s_O^2 = s_1^2 + \ldots + s_K^2 + \left(s_{K+1} + s_{K+2} + \ldots + s_N\right)^2 \geq \sum_{i=1}^{N} s_i^2$$

To correct for this problem, we make the assumption that each omitted firm's share is no larger than the smallest reported firm's share reported. I.e. we assume:

$$s_j \leq s_K \qquad \forall j \in \{K+1, K+2, \ldots, N\}$$

For our modified HHI, we let each excluded company's share be equal to the smallest included company share[25], i.e. $\bar{s} = s_K$, and we define R to be the virtual number of firms, each with market share $\bar{s}$, such that the sum of market shares equals 1. i.e.

$$s_1 + s_2 + \ldots + s_K + s_O = s_1 + s_2 + \ldots + s_K + R \times s_K = 1$$

which gives, $R = \dfrac{1 - (s_1 + s_2 + \ldots + s_K)}{s_K} = \dfrac{s_O}{s_K}$

Thus, the modified HHI is:

$$\hat{H} = s_1^2 + s_2^2 + s_3^2 + \ldots + s_K^2 + \left[s_K^2 + s_K^2 + \ldots + s_K^2\right]$$

$$= \sum_{i=1}^{K} s_i^2 + R s_K^2 = HHI_K + \frac{s_O}{s_K} \times s_K^2$$

$$= HHI_K + s_O s_K \qquad \text{where } HHI_K \text{ is the HHI for all included market shares except "Others"}$$

Appendix 5

BOX 2: DERIVATION OF THE COST FUNCTION

To illustrate how the relationship between costs and input prices arise from minimal assumptions, we derive the most basic cost function based on a Cobb-Douglas production form with labour, L, and capital, K, as the only inputs.

We begin with a standard cost minimisation problem for the firm,

$$\min_{K,L} \quad rK + wL \qquad s.t. \qquad y \geq K^{\alpha} L^{\beta}$$

$$\frac{r}{w} = \frac{\alpha}{\beta}\frac{L}{K} \qquad (1), \qquad y = K^{\alpha} L^{\beta} \qquad (2)$$

After some algebra, we obtain the input demand functions,

$$L = L(r,w,y) = y^{\frac{1}{\alpha+\beta}} \left(\frac{\beta}{\alpha}\right)^{\frac{\alpha}{\alpha+\beta}} \left(\frac{r}{w}\right)^{\frac{\alpha}{\alpha+\beta}}$$

$$K = K(r,w,y) = y^{\frac{1}{\alpha+\beta}} \left(\frac{\alpha}{\beta}\right)^{\frac{\beta}{\alpha+\beta}} \left(\frac{w}{r}\right)^{\frac{\beta}{\alpha+\beta}}$$

The input demand functions relate the firm's demand for each input, to the prices of both inputs and the output level. In fact, the mechanics of these functions underlie a key point in our overall argument: that firms adjust their input demands, and consequently costs, in response to changes in prices and output level.

Substituting these into the definition of total cost gives

$$TotalCost = rK + wL$$

$$C(r,w,y) = rK(r,w,y) + wL(r,w,y)$$

$$= r \times y^{\frac{1}{\alpha+\beta}} \left(\frac{\alpha}{\beta}\right)^{\frac{\beta}{\alpha+\beta}} \left(\frac{w}{r}\right)^{\frac{\beta}{\alpha+\beta}} + w \times y^{\frac{1}{\alpha+\beta}} \left(\frac{\alpha}{\beta}\right)^{\frac{\beta}{\alpha+\beta}} \left(\frac{r}{w}\right)^{\frac{\alpha}{\alpha+\beta}}$$

$$= A y^{\frac{1}{\alpha+\beta}} r^{\frac{\alpha}{\alpha+\beta}} w^{\frac{\beta}{\alpha+\beta}}, \qquad \text{where } A \equiv \left(\frac{\alpha}{\beta}\right)^{\frac{1}{\alpha+\beta}} \left[\left(\frac{\alpha}{\beta}\right)^{\beta} + \left(\frac{\beta}{\alpha}\right)^{\alpha}\right]$$

Econometric estimation of the cost function

Continuing with our simplified example, taking logs of both sides gives,

$$\ln C = \ln A + \frac{1}{\alpha+\beta}\ln y + \frac{\alpha}{\alpha+\beta}\ln r + \frac{\beta}{\alpha+\beta}\ln w$$

Which can be empirically estimated using the equation:

$$\ln C_i = \alpha_0 + \beta_0 \ln y_i + \beta_1 \ln r_i + \beta_2 \ln w_i + u_i$$

Where the regularity conditions are:

$$\beta_0 > 0, \qquad \beta_1 \geq 0, \qquad \beta_2 \geq 0$$

Here we note that

β_0, is the elasticity of cost with respect to output. i.e., the percentage change in cost given a 1 percent increase in output

β_1, is the elasticity of cost with respect to wages. i.e., the percentage change in cost given a 1 percent increase in wage rate

β_{2i}, is the elasticity of cost with respect to rental rate. i.e., the percentage change in cost given a 1 percent increase in rental rate

In fact, we can do away with the assumption of a Cobb-Douglas production function by using a more general functional form. The most common form used in empirical cost function estimation is the transcendental-logarithmic (translog) cost function:

$$\begin{aligned}\ln C_i = {} & \alpha_0 + \beta_0 \ln y_i + \beta_1 \ln r_i + \beta_2 \ln w_i \\ & + \frac{1}{2}\delta_0 (\ln y_i)^2 + \frac{1}{2}\delta_{11}(\ln r_i)^2 + \frac{1}{2}\delta_{22}(\ln w_i)^2 \\ & + \frac{1}{2}\delta_{12}\ln r_i \ln w_i + \frac{1}{2}\delta_{10}\ln r_i \ln y_i + \frac{1}{2}\delta_{20}\ln w_i \ln y_i + u_i\end{aligned}$$

This form essentially extends the linear log-log form by including square and cross terms, thus accounting for the curvature of the cost function. The corresponding regularity conditions are:

$$\beta_0 + \delta_0 \ln y_i > 0, \qquad \beta_1 + \delta_{12}\ln w_i \geq 0, \qquad \beta_2 + \delta_{12}\ln r_i \geq 0$$

For the translog form with one output and two inputs, the interpretations are as follows:

$\beta_0 + \delta_0 \ln y_i$, is the elasticity of cost with respect to output.

$\beta_1 + \delta_{12} \ln w_i$, is the elasticity of cost with respect to wages.

$\beta_2 + \delta_{12} \ln r_i$, is the elasticity of cost with respect to rental rate.

Whichever functional form we decide on, the objective of our econometric analysis is to obtain estimates for the coefficients, which tell us about the responsiveness of costs to changes in output and input prices.

To test for the presence of economies of scale, we simply estimate the average cost function, by replacing the Total Cost with Average Cost on the left side of the equation. For example, returning to the simple linear model, the average cost equation is:

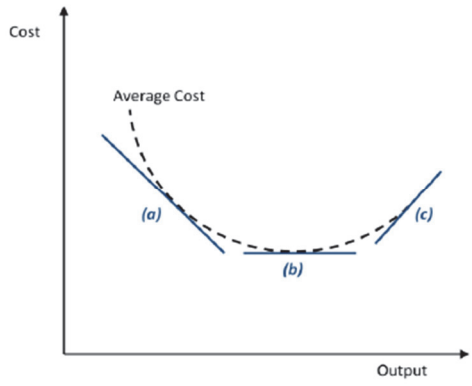
$$\ln\left(\frac{C}{y}\right)_i = \alpha_0 + \beta_0 \ln y_i + \beta_1 \ln r_i + \beta_2 \ln w_i + u_i$$

Hence, for the purpose of testing for scale economies, the corresponding interpretations for the coefficients are:

$\beta_0 < 0$: Average cost decreases in output (Case a.). i.e., there are economies of scale

$\beta_0 = 0$: Average cost is unresponsive to output (Case b.). i.e., there are no scale economies

$\beta_0 > 0$: Average cost increases in output (Case a.). i.e., there are diseconomies of scale



The estimation method to be used will differ depending on the nature of data available. Ideally, a panel of firm level-data across a number of years should be used. With such data, a fixed-effects estimation method should be used to account for unobserved heterogeneity amongst firms.

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