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Singapore: Selected Issues

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SINGAPORE

Selected Issues

Prepared by R. Cardarelli, J. Gobat, and J. Lee

Approved by the Asia and Pacific Deparment

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I. Overview

1. Singapore has had a remarkable growth record over the last three decades, propelling the city state into the league of countries with the highest per capita income. Backed by credible and proactive policy management, Singapore's strong fundamentals have allowed the economy to weather the impact of the Asian crisis more successfully than most countries in the region. With the recovery now fully underway and the short-term economic outlook bright, the focus of this year's Article IV consultation is on the medium-term structural challenges facing Singapore's economy.

2. Singapore's economy faces considerable challenges to its future growth, in part because of the impact of rapid globalization and "digitalization" and in part because of demographic pressures arising from an aging population and high government involvement in the economy. The government is keenly aware of these challenges and over the past few years has begun progressively addressing them with the aim to facilitate the transition to an increasingly private sector-led, knowledge based economy. A core theme of the reforms is to enhance private sector initiatives and innovation.

3. Chapter II "**Singapore: Productivity Growth and Competition**" discusses the government's reforms to deregulate the economy and enhance competitiveness with the aim of developing Singapore into a knowledge based economy within the next decade. The author reviews factors that have contributed to Singapore's historical strong growth performance while spotlighting microeconomic weaknesses that are acting as drag on Singapore's growth potential. The paper notes that several studies suggest past growth has been due more to factor accumulation and less to productivity growth. The author notes that, going forward, economic growth in Singapore must come from sustained productivity growth, since there is limited scope for capital accumulation as capital ratios are already at levels in advanced economies and labor force growth is expected to stabilize due to demographic trends. The study concludes that while the government-led strategy has been very successful to date, productivity growth in the future will have to come from a more dynamic and entrepreneurial private sector.

4. Chapter III "**Singapore—Financial Sector Development: A Strategy of Controlled Deregulation**" reviews the authorities' reforms aimed at promoting Singapore into a full service international financial center. Like other financial centers, Singapore faces a difficult transition to a "digital age" of global markets. The paper provides a brief background to the development of the financial sector and the government's central role in promoting and regulating the financial industry. What sets Singapore apart from other countries in the region is that the development of the financial sector has been carefully controlled, and guided by conservative prudential practices. The author notes that, although this approach has helped to create a solid and sound financial system, it has not been without costs in that the tight controls may have limited financial sector development. The paper then reviews major trends that are sweeping through the global financial industry and their impact on Singapore's financial center and concludes by discussing outstanding constraints that still need to be addressed to improve the depth and efficient functioning of Singapore's capital markets.

5. Chapter IV "**Singapore's Central Provident Fund: Options for a Comprehensive Reform**" describes the mandatory Central Provident Fund (CPF) and highlights how the CPF has been a useful tool in mobilizing household savings and helping to finance Singapore's growth. However, over time, the author notes that several problems have emerged as the scheme has been used for wider policy uses. A central problem is that at retirement most CPF members are "asset rich but cash poor" largely because almost all of their savings has been used to finance housing and because of low returns on their cash balances. The paper discusses the government's reforms to the CPF and concludes by highlighting several proposals that could be considered to refocus the CPF as a core retirement scheme with the aim of providing a satisfactory replacement rate at retirement.

6. The last chapter "**Generational Accounting for Singapore**" reviews the sustainability of Singapore's fiscal policy management within a long-term context. Prudent fiscal policies have been the cornerstone of Singapore's financial management, with the government budget recording overall surpluses in every year but two since 1970. At end-March 2000, the government's net assets were estimated to amount to roughly 125 percent of GDP. Various studies have raised the question of whether Singapore's fiscal surpluses are excessively large in an intertemporal framework, especially when taking into account the impact of population aging on revenues and expenditures. The author addresses the same question by applying the "generational accounting" method. The paper concludes that taking into account population aging, uncertainty about future revenues and expenditures, and a relatively high degree of risk aversion, a good case can be made for a reduction in taxes and/or an increase in expenditures leaving an overall fiscal position that would be both sustainable and equitable across generations.

II. SINGAPORE: PRODUCTIVITY GROWTH AND COMPETITION[1]

The tidal wave of competition is already upon us. We must move decisively now to ride the wave, and not try in vain to hold it back. This applies both to regulators and players. In this situation, the adage "If it ain't broke, don't fix it" does not apply. Our policies have not failed; they have succeeded, so far. But they will not continue to succeed in future. By the time our policies no longer work, it will be too late. We must fix them before they are broken.[2]

A. Introduction

1. Singapore has had remarkable economic growth during the last three decades, averaging 8 percent per annum. Its real per capita GDP increased eight-fold, putting Singapore in the league of countries with the highest per capita GDP. In tandem, Singapore has carved out distinct niches in the global economy. It is the world's largest in disk-drive production, the third largest in oil refining, and the fourth largest global foreign exchange center after London, New York, and Tokyo (see Chapter III).

2. The strength of its economic fundamentals and policy management has also borne the test of time, especially during the Asian crisis. The 1997 crisis hit Singapore with much less severity than other East Asian countries and after a slowdown in growth in 1998 a strong recovery has been underway since early 1999. The recovery, initially fueled by the strong external demand, has become increasingly broad-based and leading indicators point to prospects for continued strength in the period ahead.

3. The remarkable success to date notwithstanding, a closer look reveals areas in which some signs of weakening have emerged. Some studies suggest that the bulk of past growth has not been so much due to productivity growth as due to factor accumulation, but such a pattern of growth cannot be expected to continue. Various indicators of competitiveness—including the microeconomic competitiveness indicator of the World Economic Forum—confirm Singapore's macroeconomic strengths, but have also revealed a relative weakness in the microeconomic environment viewed critical for innovation and productivity growth. Singapore's market shares for some goods have declined against regional neighbors in its major export markets.

4. The Singapore authorities have acted pragmatically by implementing changes and formulating plans to help maintain a strong economy in the region. From a longer-term

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[1] Prepared by Roberto Cardarelli (x38059) and Jaewoo Lee (x37331), who are available to answer questions.

[2] Address by Deputy Prime Minister Lee Hsien Loong at the official launch of Info-Communications Development Authority of Singapore, December 3, 1999.

perspective, the authorities have stressed the importance of a strategic repositioning away from low skill, labor-intensive production and toward higher value-added and knowledge-intensive activities. This vision was followed up by a number of measures to strengthen the innovative capacity and efficiency of the economy.

5. The rest of this chapter discusses these developments in more detail. The importance of productivity growth is discussed in Section B, and followed by the discussion of signs of competitive weaknesses in Section C. Section D discusses the measures undertaken by the authorities in response to signs of weakness. Section E contains concluding remarks.

B. The Need for Productivity Growth

6. The economic growth of a low-income country is typically driven by factor accumulation at early stages of development, but increasingly needs to rely on productivity growth. The low capital stock in low-income countries means that rapid capital accumulation will generate rapid economic growth, enabling the country to narrow the gap between itself and higher-income country. However, as a country's economy matures, decreasing returns to capital set in and sustained economic growth depends on a country's capacity to generate productivity growth.

7. Singapore's economic growth has been heavily dependent on factor accumulation during the past three decades. Attempts to gauge productivity growth in Singapore and other East Asian countries has led to the widely publicized debate on whether the East Asian "miracle" was driven by factor accumulation or productivity growth (Krugman 1994). In particular, some economists have argued that Singapore's economic growth has been driven almost entirely by factor accumulation with little contribution from productivity growth (see Box II.1). According to the most recent study by the authorities, Singapore's productivity growth was indeed very low until the 1980s, but has improved significantly to a level comparable to the OECD average in the 1990s. While the exact magnitude of Singapore's productivity growth is still debatable, it is clear that a larger part of Singapore's economic growth has been due to factor accumulation up to this point. Even in the 1990s, factor accumulation accounted for three-quarters of Singapore's economic growth of about 8 percent per annum.

8. Regardless of how the past is characterized, there can be little debate about the fact that future economic growth in Singapore has to come from sustained productivity growth. The capital-output ratio in Singapore has reached 2.7 in 1997, comparable to the ratio in the United States in the same year, suggesting that there is limited scope for capital accumulation alone to generate strong growth. Likewise, in the absence of large inflows of foreign labor, demographic trends suggest that growth in the labor force will stabilize around 1½ percent per annum. Thus, without robust productivity growth, the scope for economic growth will be much more limited in the future. The areas in which the authorities need to focus their attention with a view to enhancing productivity growth can be assessed by reviewing a broad spectrum of indicators of Singapore's competitiveness.

Box II.1. Singapore—The Debate on Total Factor Productivity

The debate was initiated by Young (1995), who argued that economic growth in Singapore was driven by massive capital accumulation that was not accompanied by reasonable productivity growth (Table II.1). Out of the average growth rate of 8 percent per annum, growth in total factor productivity accounted for less than ½ percent from the mid-1960s to 1990, with the remainder of growth attributable to the accumulation of capital and labor. Productivity growth in other Asian tigers (Korea, Hong Kong, and Taiwan) was higher than in Singapore, but still contributed a relatively small fraction (¼–⅓) of their overall economic growth, implying that the substantial part of their rapid economic growth was due to factor accumulation.

In contrast, Sarel (1997) and Hsieh (1999) find that significant contributions were made by productivity growth. Sarel provides evidence in favor of strong productivity growth in Singapore, using capital shares that were constructed from sectoral data. Sarel's capital share is about ⅓, much less than Young's ½, and the difference in the capital shares accounts for 70 percent of the difference between the two estimates of total factor productivity. Hsieh presents evidence to show that the behavior of the return to capital is not consistent with the claim that Singapore's economic growth was driven by capital accumulation without productivity growth. He then derives TFP measures based on factor prices and shows that Singapore has experienced a stronger productivity growth than Young has estimated. He attributes this difference to possible shortcomings in national accounts data in Singapore.

Clearly, measurement problems are at the heart of the debate. The usual difficulties in measuring the capital stock are particularly daunting in Singapore, which has gone through rapid changes in its economic structure at the same time as having frequent changes in investment incentives in the context of its capital intensive development strategy. Using more detailed information on the capital stock, Statistics Singapore recently conducted two studies of productivity growth in Singapore. A preliminary study in 1997 found evidence of substantial productivity growth in the late 1980s and 1990s. A more recent study—quoted in a recent speech by DPM Lee and soon to be published—finds that productivity growth in Singapore averaged nearly 2 percent in the 1990–97 period, while the productivity growth averaged ¾ percent in the 1973–90 period—only slightly higher than Young's estimate for the period prior to 1990.

C. Competitiveness and Competition

9. In 1999, Singapore continued to be ranked first in the competitiveness ranking by the World Economic Forum (WEF), on the force of its strong macroeconomic factors. Despite the recent economic downturn during the Asian crisis, Singapore has preserved its traditional strengths: high levels of saving and investment; an efficient government with low marginal tax rates; sound government finance; strong financial sector; openness to trade; high-quality education; and flexible labor market. Also in the competitiveness ranking by the International Institute for Management Development (IMD), Singapore continues to be ranked as the second most competitive economy after the United States.

10. Nevertheless, Singapore was ranked twelfth in the microeconomic competitiveness index of the WEF, which is designed to measure the microeconomic foundations for productivity growth, and has lost some ground in the last two years (Table II.2). The WEF views the intensity of local competition as the most influential single variable in terms of the

Table II.1. Sources of Economic Growth

	Young			
Time Period	Output	Capital	Labor	TFP
66–70	13.0	13.4	3.3	4.6
70–80	8.8	14.0	5.8	-0.9
80–90	6.9	8.4	6.6	-0.5
66–90	8.7	11.5	5.7	0.2
	Sarel			
Time Period	Output per person	Capital per person	Labor per person	TFP
78–96	5.1	6.5	1.1	2.2
91–96	4.9	5.6	0.8	2.5
	Statistics Singapore 1/			
Time Period	Output	Capital	Labor	TFP
80–85	6.0	11.2	1.7	-0.6
85–90	8.1	5.6	3.0	3.8
90–98	7.5	8.1	4.4	1.2

1/ Statistics Singapore (October 1997).

contribution to economic growth. In the study that formed a basis for the microeconomic competitiveness index, Porter (1990) argues that domestic competition is the training ground for international competition. In particular, the quality and the dimension of the network of domestic suppliers and related industries are identified as one of the key factors of national competitive advantage, and these are viewed as the main weaknesses of the national business environment in Singapore. According to the survey on management by the WEF, Singapore ranks particularly low in areas such as the presence of domestically established brand names, first-class business schools, and the capacity of managers to attract high-quality staff (Table II.3).

Table II.2. WEF Competitiveness Rankings

	Micro Index		Overall		
	1999	1998	1999	1998	1997
United States	1	1	2	3	3
Netherlands	3	3	9	7	11
Switzerland	5	9	6	8	6
Canada	8	6	5	5	4
United Kingdom	10	5	8	4	7
Singapore	12	10	1	1	1
Japan	14	18	14	12	13
Hong Kong	21	12	3	2	2
Malaysia	27	27	16	17	9
Korea	28	28	22	19	20

Source: World Competitiveness Report 1999.

11. One likely cause of the weakness in microeconomic environment is the very high degree of government involvement in Singapore economy. Following political independence in the mid-1960s, Singapore pursued the growth strategy based on export-oriented industrialization. With the viability of the economy in doubt due to small size of the domestic market, the government played a pioneering role in areas where the initial capital requirement exceeded the capacity of the private sector or where the project was viewed too experimental in nature (Krause 1990), as well as trying to attract foreign companies. As a result, the business landscape in Singapore is characterized by heavy government presence, through the Statutory Boards and a large number of Government Linked Corporations (GLCs). The government maintains significant equity positions in GLCs through Temasek Holdings which is the government holding company (Table II.4).

12. Indeed, several studies find that the overall government influence is stronger in Singapore than in other Asian countries (Table II.5). La Porta, Lopez de Silanes and Shleifer (1998) have looked at the ownership structure of the twenty largest publicly traded firms in each of the 27 richest economies in the world. Associating control with the ownership of 20 percent of stocks, they find Singapore to have the second-highest proportion of state-controlled firms (45 percent, second only to Austria), and higher than Korea and Japan. Claessens, Djankov and Lang (1999) reach similar conclusions using a sample of 2,980 publicly traded corporations in nine East Asian countries. For cutoff levels of 10, 20 and

Table II.3. Survey on Management

Ranking	Score 1/	Question
10	5.44	Overall, the quality of management in your country is truly world-class.
12	5.09	Product design capability is heavily emphasized.
9	5.85	Production processes generally employ the most efficient technology.
8	5.42	Total quality management is strictly applied in your country.
11	5.19	Firms in your country are very strong at marketing.
8	5.54	Firms in your country generally pay close attention to customer satisfaction.
42	4.57	Domestically established brand names are fairly common in your country.
18	4.96	Managers in your country know how to attract, retain and motivate high-quality staff.
7	5.54	Staff training is heavily emphasized.
15	4.85	Willingness to delegate authority to subordinate is generally high.
3	5.40	Compensation policies link pay closely with job performance.
11	5.56	Most companies in your country have highly competent financial officers.
13	5.23	Domestic companies are very effective at cutting costs.
16	4.79	It is more common for owners to appoint outside professional managers.
11	4.83	Corporate boards are highly effective in monitoring management performance and representing shareholder interests.
22	4.81	Your country has first-class business schools to train managers.
14	5.60	Managers in your country generally speak some foreign language and have good international exposure.
1	6.31	Managers in your country generally use computers and information technology extensively.

Source: World Competitiveness Report 1999.

1/ Scores are 1 for "strongly disagree" and 7 for "strongly agree."

30 percent of the voting rights, Singapore has the largest proportion of state-controlled firms (24, 23½ and 11¼ percent of the 221 firms, respectively for the three cut-off levels). Although the GLCs have been expected to operate on a competitive basis in both domestic and international markets (and indeed most of them have remained profitable, generating large operating surpluses), their overwhelming market power is likely to have crowded out local private enterprises and thus prevented the development of a large and dynamic network of local corporations, contributing to the widely perceived lack of corporate dynamism in Singapore.

Table II.4. Temasek Equity Position 1/

Listed Companies	Percent	Unlisted Companies	Percent
Singapore Telecommunications	79.7	PSA Corporation	100.0
Semb Corporation Industries	58.8	Singapore Technologies	100.0
Singapore Airlines	53.8	Media Corporation of Singapore	100.0
SNP Corporation	49.0	Singapore MRT	100.0
Neptune Orient Lines	32.7	Singapore Power	100.0
Keppel Corporation	32.3	Tuas Power	100.0
DBS Group Holdings	18.4	Indeco	96.4
		ECICS Holdings	100.0
		PWD Corporation	100.0
		ENV Corporation	100.0
		UMC	100.0

Source: Singapore authorities.

1/ First tier Temasek companies in which Temasek owns equity of around 20 percent or more.

Table II.5. Share of Companies Controlled by the State

(In percent of total)

	La Porta et al 1/	Claessens et al 2/		
	Above 20 percent	Above 10 percent	Above 20 percent	Above 30 percent
Singapore	45.0	23.6	23.5	11.3
Hong Kong	5.0	3.7	1.4	0.9
Japan	5.0	1.1	0.8	0.4
Korea	15.0	5.1	1.6	1.2
Malaysia	...	17.8	13.4	8.2
Taiwan	...	3.0	2.8	2.8
Philippines	...	3.6	2.1	2.1

1/ La Porta, Lopez de Silanes and Shelifer (1998). Percent of companies in which government holds voting rights of more than 20 percent.

2/ Claessens, Djankov and Lang (1999). Percent of companies in which government holds voting rights of more than 10, 20, and 30 percent.

13. Weaknesses in the microeconomic environment are also suggested by other indicators. First, local-controlled companies of Singapore are found to be less efficient than foreign-controlled companies. The Singapore authorities (1997) examined the efficiency of Singapore's corporate sector over the early 1990s, by comparing the return on total assets

(ROA) (see Table II.6). The ROA of local-controlled firms—6.1 on average in 1990–95—is much lower than that of foreign controlled firms—9.4 on average in the same period—in the nonfinancial sector. Especially in the manufacturing sector, the ROAs of foreign-controlled firms were about twice as high as those of local-controlled firms (14.4 relative to 7.2). A major cause for the low efficiency of local-controlled firms was their small size: the average asset size of foreign-controlled firms was six times as large as that of local-controlled firms. The prevalence of small and low-efficiency firms in the domestic market is consistent with the assessment that domestic competition is weak in Singapore.

14. Second, the estimate of price-average cost margin is also consistent with the view that Singapore's industries are likely to have been less competitive than in Hong Kong or in OECD countries. Table II.7 shows that the estimated price-average cost margin in Singapore is much higher than those in Hong Kong, the OECD, or the United States.[3] The high level of price-average cost margin can be due to technological factors or pricing factors.[4] Subject to the assumption that technological factors are similar across countries, which is likely to hold over a ten-year period, the high price-average cost margin reflects higher mark-up of price over marginal cost in the domestic economy, and is suggestive of the relative lack of domestic competition in Singapore.

15. Finally, there is some evidence that Singapore's international competitiveness may be weakening. Over the last three years Singapore has lost market shares in the United States, the European Union and Japan—accounting for around 52 percent of its total exports in 1998—against many of its neighbors (Figure II.1). Focusing only on machinery and transport equipment of which 80 percent is made up of electronics and which represented 67 percent of total exports in 1998, Singapore has lost market shares in the United States against other regional economies, with the only exception of Hong Kong.

D. Measures to Enhance Microeconomic Competitiveness

16. The need to strengthen the microeconomic environment of Singapore economy is well recognized by the authorities. A good example is the following quote from a speech by Senior Minister Lee Kwan Yew in February 2000:

For 30 years we concentrated on those industrial and service sectors which were suitable for our small economy. In that phase, the risks were taken and the entrepreneurship was provided by the MNCs. We produced the engineers, managers, professionals and skilled workers to help MNCs and our own companies to grow. The MNCs provided much of the enterprise and innovation.

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[3] The results here are open to potential measurement problems given that the data for Singapore and other countries come from different sources.

[4] The relation between the price-average cost margin (P/AC) and the markup of price over marginal cost (P/MC) can be written as follows: P/AC = (CU/RTS)(P/MC), where CU refers to capacity utilization and RTS refers to the scale of economy measured as the ratio of marginal cost to the minimum average cost.

Table II.6. Rates of Return and Asset Sizes by Sector and Ownership

	Rates of Return on Total Assets (Percent; Average in 1990–95)		Average Size of Companies (Millions; 1995)	
	Local	Foreign	Local	Foreign
Total	5.0	3.4	11.7	75.0
Financial Sector	4.1	2.1	71.0	558.6
Non-financial Sector	6.1	9.4	6.3	18.2
Manufacturing	7.2	14.4	6.2	49.5
Construction	1.5	0.1	3.8	35.8
Commerce	5.1	7.9	2.9	13.2
Transport, Storage, and Communications	10.2	5.3	10.0	12.4
Insurance, Real Estate, and Business Services	5.0	4.5	11.8	12.6
Others	7.9	4.2	...	...

Source: Statistics Singapore (September 1997).

Table II.7. Price-Average Cost Margins

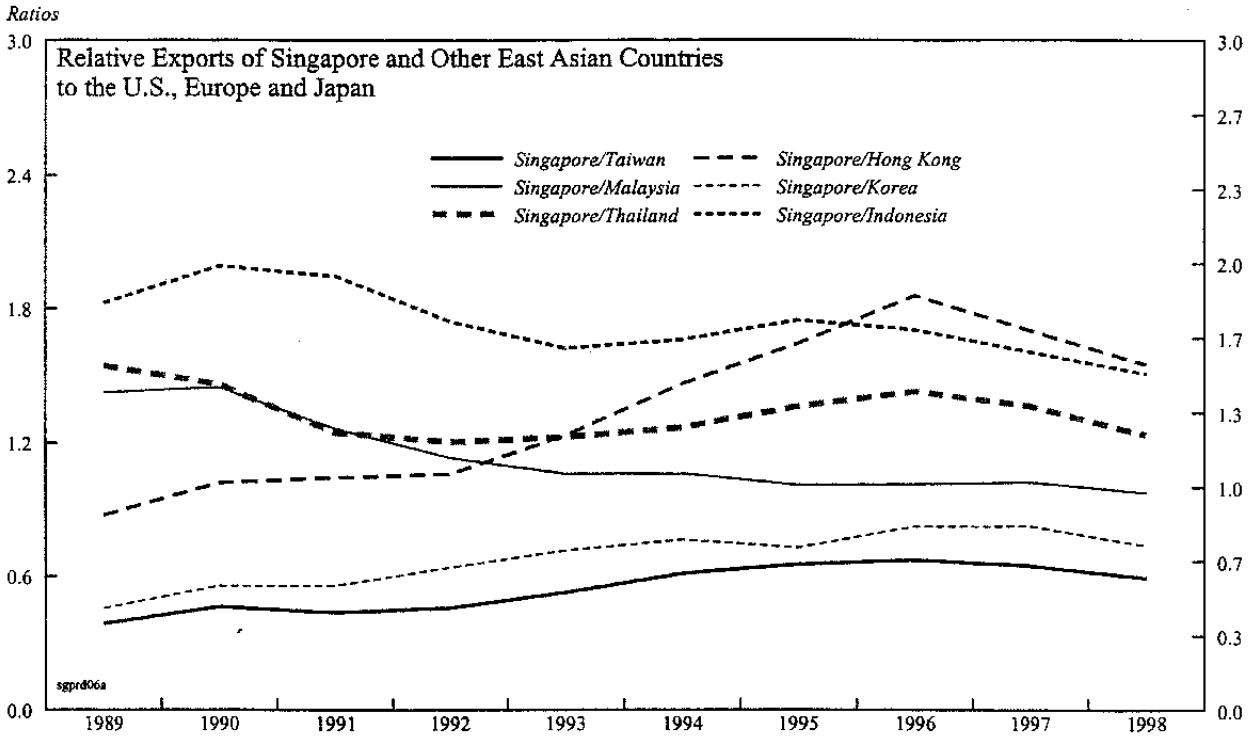
Industrial Code	Industry	Singapore 1/			Comparator Countries 2/		
		80–89	90–98	80–98	Hong Kong SAR	OECD	United States
15 and 16	Food and Beverages and Tobacco	21.0	27.4	24.0	20.6	11.7	13.4
15	Food and Beverages	20.0	*25.6* 3/	*22.1* 3/			
16	Tobacco Products	33.8	*38.7* 3/	*35.6* 3/			
17	Textiles	28.5	26.7	27.6			
18	Wearing Apparel	23.6	26.5	25.0	9.5	9.7	8.8
19	Leather Products and Footwear	19.8	18.4	19.2			
20	Wood and Wood Products	20.9	22.7	21.7	10.4	11.9	13.6
21	Paper Products	31.1	34.1	32.5			
22	Publishing and Printing	43.3	47.5	45.3	15.6	12.3	13.9
23	Refined Petroleum Products	13.2	16.8	14.9			
24	Chemicals and Chemical Products	40.0	40.8	40.4			
25	Rubber and Plastic Products	28.7	30.4	29.5	14.0	15.9	10.8
26	Non-metallic Mineral Products	30.5	31.7	31.0	13.6	8.4	9.5
27	Basic Metals	34.4	28.4	31.6	6.8	8.8	6.7
28	Fabricated Metal Products	28.5	30.0	29.2	12.3	15.1	12.5
29	Machinery and Equipment	33.7	30.8	32.3	15.0	10.1	10.0
30	Electrical Machinery and Apparatus	27.6	26.4	27.0			
31	Electronic Products and Components	23.3	24.1	23.7	19.3	11.0	17.4
32	Instrumentation and Scientific Equipment	35.7	35.8	35.8	10.3	14.5	6.3
33	Transport Equipment	51.7	50.2	51.0	16.3	6.4	5.1
34	Furniture and Other Manufacturing Industries	23.2	20.7	22.0	9.1	10.0	21.6
35	Recycling of Waste and Scrap	38.5	25.3	32.3	...	...	...
	Total Manufacturing	24.9	27.6	26.2	12.6	11.5	11.8
	Total Manufacturing Excluding Refined Petroleum Products	29.5	29.2	29.3	...	...	...

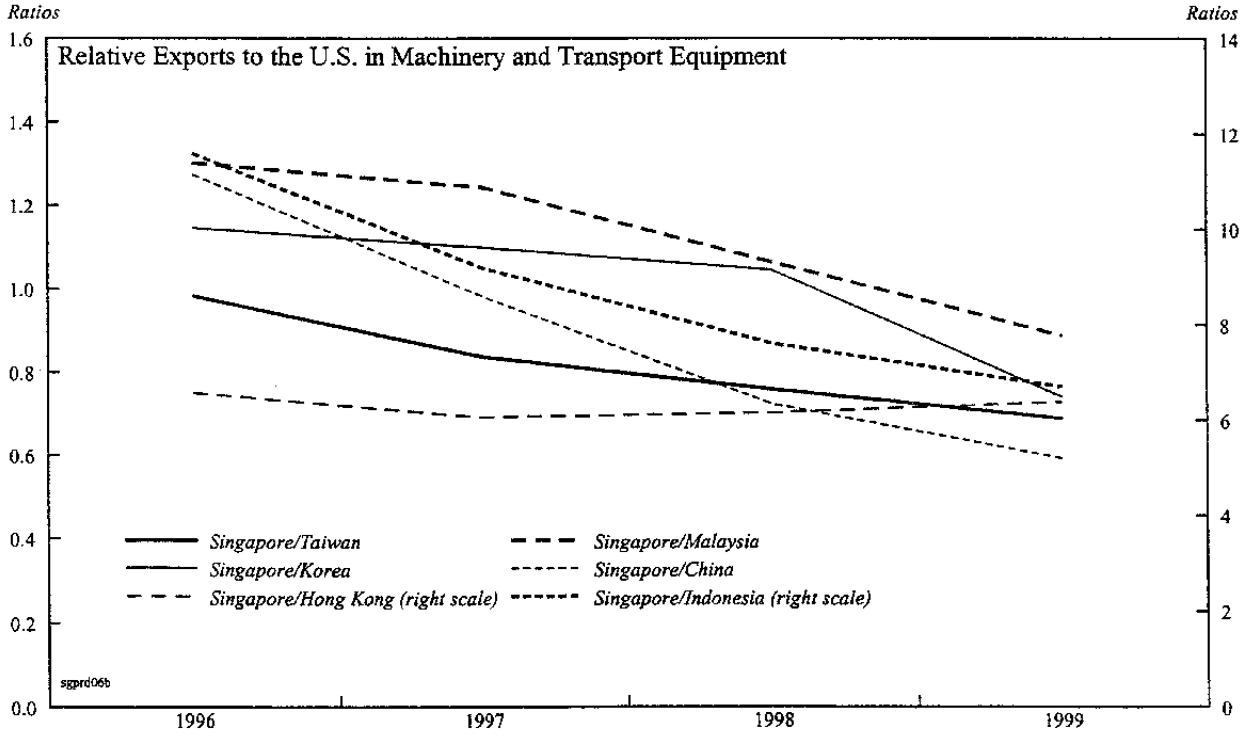
1/ Singapore authorities; staff estimates.

2/ From SM/00/26, Hong Kong SAR Selected Issues paper.

3/ Excluding 96–98.

Figure II.1. Singapore: Relative Exports in Major Export Markets





Sources: IMF, Direction of Trade Statistics; and U.S. Census Bureau.

For our next phase we need many of our own people to be more enterprising, innovative, and willing to strike out on their own, to create small and medium enterprises, and so create jobs and wealth.

17. Combining the perceived need for more lively entrepreneurial activity with the long-term strategies recommended by the Committee on Singapore's Competitiveness in November 1998, the authorities have set a goal of turning Singapore into an advanced and globally competitive knowledge-based economy within the next decade. The vision is for Singapore to shift from a capital-intensive economy to a knowledge-intensive economy, with manufacturing and services as its twin engines of growth. Considering the limited size of the domestic market, Singapore aims to position itself as a base from which MNCs and local companies manufacture high value-added products and provide related services to companies in the region (see Box II.2).

Box II.2. Industry 21

The vision is for Singapore to become a vibrant global hub of knowledge-driven industries with a strong emphasis on technology and innovation capabilities, including becoming a choice location for company headquarters with product and capability development charters.

The quantitative targets include:

- To develop knowledge-driven manufacturing and exportable services to constitute at least 40 percent of GDP and offering 20,000 exciting job opportunities each year;
- Manufacturing to contribute 25 percent of GDP;
- at least two out of three jobs in the manufacturing sector to be accounted for by knowledge-based and skilled workers; and
- at least three out of four jobs in the exportable services sector to be accounted for by knowledge-based and skilled workers.

In order to realize the vision and quantitative targets, the Economic Development Board will adopt the following strategies:

- Diversify among and within the key industry clusters. A balanced and robust mix of industries and markets will achieve sustainable growth and minimize vulnerability to fluctuations in specific sectors;
- Build up global capabilities. By upgrading capabilities, Singapore can compete effectively and remain attractive to investors;
- Promote innovation;
- Develop local talent and attract foreign talent; and
- Create a conducive business environment and world-class infrastructure necessary for knowledge-driven activities.

18. A comprehensive set of reform measures have been announced and implemented to facilitate the transition to a knowledge-based economy (see Annex for more details of measures discussed below).

- To develop Singapore into a premier service hub, its traditional strength in financial services is being reinforced through broad-ranging liberalization measures (see Chapter III), at the same time as high growth services including info-communications and media are being promoted. The development in information and communication sector is intended to provide a platform to boost the performance of all sectors in Singapore's knowledge based economy.

- To upgrade the regulatory framework and corporate governance, the government has set up committees to review corporate regulation and governance setting, in areas of regulatory framework, disclosure and accounting standards, and corporate governance. Private sector efforts for the same cause led to the creation of the Singapore Institute of Directors (SID) which is currently laying out a Code of Professional Conduct for its member directors, as well as a Code of Best Practices in Corporate Governance.

- To strengthen the competitiveness of the local corporate sector, support services will be provided to maintain the strong external orientation and improve the efficiency of the small and medium-sized enterprises that have grown as supporting industries for MNCs. To expand access to the global market by companies in Singapore, further trade liberalization will be pursued both on bilateral and multilateral basis. To help the small and medium local enterprises to compete effectively in the face of keener competition in the globalized economy, small and medium local enterprises are being encouraged to raise their technological capability and efficiency, including by pooling their resources to achieve synergy and economies of scale.

- To build up human and intellectual capital that will form Singapore's key competitive advantage, the authorities are intending to reinforce both domestic and foreign manpower in Singapore. To nurture domestic manpower, incentives are put in place for continuing education and retraining, including support through the Skills Development Fund. To overcome the constraints of a limited domestic talent pool and low population growth, measures are put in place to attract foreign talent to Singapore. One visible outcome of these efforts has been the opening of Singapore campuses by several foreign graduate schools including the University of Chicago, INSEAD, MIT, and the Wharton School.

- To foster growth of businesses with technology and innovation capabilities, the authorities are providing tax incentives and funds as well as improving the educational system. Favorable tax treatment is provided for gains from the relevant stock options and investment; funds are provided as seed money to catalyze the development of a vibrant venture capital industry; and programs are introduced to overcome the drawback of exam-dependent college education system.

- To infuse more market discipline and raise efficiency in the power sector, the electricity industry will be liberalized starting in 2001. Electricity generation and sales for businesses will be fully liberalized in April 2001. With further liberalization in electricity sales for households in 2002, the generation and distribution of electricity will be fully liberalized, while the transmission will remain under natural monopoly. The gas industry is under review for a similar restructuring plan.

19. Despite a broad array of measures announced thus far, there remain several areas where further deregulation would help to underpin Singapore's growth potential. First, a knowledge-based economy requires not only a vibrant telecommunications sector but also needs to be buttressed by dynamic high-technology infrastructure and media services industries, which have strong synergies with one another. At present, the media service sector is still relatively tightly controlled: Singapore has one major newspaper company, one TV network, one pay-TV operator and one radio network, and foreign shareholding in local media companies is limited to no more than 3 percent. The authorities are reviewing the structure of the media industry, including options to allow a second TV operator, as well as measures to provide further support for technology infrastructure.

20. Second, a number of recent incidents suggest the advantages of a faster reduction in the role of government. In recent months, attempts by GLCs to acquire large stakes in foreign companies—Air New Zealand and Cable & Wireless in Hong Kong SAR—were not successful. These incidents have brought to the fore the recognition that GLCs—though commercially managed, efficient, and profitable—tend to be conservative, averse to aggressive profit-seeking, and sometimes overly cautious in business decisions, which puts them at disadvantage in the fast-paced atmosphere of worldwide mergers and consolidations. The authorities are considering ways to further divest government holdings of GLCs, including by putting them under unit trusts for distribution to the public.

21. Third, greater freedom of choice by the private sector would improve the efficiency of saving and investment decisions. Currently, about 20 percent of individuals' wage income is tied up in the government-managed Central Provident Fund (see Chapter IV), the bulk of which is invested overseas by the Government Investment Corporation (GIC). This has contributed to the dearth of institutions that mediate the high savings of Singapore toward entrepreneurial private-sector investment opportunities, adding to the difficulty of implementing new business ideas in Singapore. While the GIC Special Investments is providing some funds (about half a billion Singapore dollars) to high-tech start-up companies to catalyze the development of the venture capital industry, care should be taken not to undermine the essence of the venture capital industry—which is to reward innovation and risk-taking—because of the involvement of the government.

E. Conclusion

22. Singapore has achieved remarkable economic development during the last three decades. The government-led growth strategy, defying conventional wisdom, has been successful up to this point. Going forward, however, Singapore faces a challenge to move on to the next stage of economic development, a knowledge-based economy with innovation and productivity growth. Confronted with this challenge, the authorities are pushing ahead with reform measures that are intended to facilitate Singapore's development into a knowledge based economy.

23. While the measures undertaken by the authorities are all in the right direction, concerns remain on how quickly they can succeed in arousing the very private sector initiatives and innovative activities that are the ultimate goal of the authorities themselves. Coming from an economy with very strong role of government in business and where there have been few apparent rewards to risk-taking, the public may be inclined to wait for the lead

by the government rather than to take risks in uncharted areas. Such a change in mindset would come around eventually, given the high capability of the public and the commitment of the government. However, too long a delay during the transition process could undermine the competitive edge that Singapore currently holds in the international market.

MEASURES TO STRENGTHEN COMPETITIVENESS

This annex provides a more detailed description of the various measures that the authorities have announced or implemented to strengthen the competitive base of Singapore in the transition to a knowledge-based and globalized economy.

1. Information and Communication Technology 21

To bring an integrated perspective to the promotion and development of the information and communication technology (ICT) sector, a number of relevant government entities were merged into the Info-Communications Development Authority of Singapore (IDA Singapore). Under its auspices, ICT 21 Masterplan is being pursued with the following three key objectives:

- Develop the ICT sector as the key sector of growth in Singapore's economy. Foreign and local companies will be encouraged to develop and produce new products for the regional and international markets, with a view to position Singapore as a leading innovator and exporter of ICT products and services in the global marketplace.

- Use ICT as a common platform to boost the performance of Singapore's knowledge-based economy. The government will strive to build new and better ICT capabilities in every major economic sector.

- Leverage on ICT to enhance Singaporean's standard of living in the information society of the future. Key initiatives include Singapore ONE, e-Citizen and e-Government aimed at delivering a whole range of online interactive services for public convenience.

2. Liberalization of Telecommunications Industry

- Starting with the corporatization of SingTel in 1992, market competition was introduced into the telecommunications sector in Singapore.

- In April 2000, full market competition was introduced in the telecommunications sector, with 58 new business licenses issued for new entrants to the market and new businesses by incumbents. The government also lifted the direct and indirect foreign equity ownership limits for all public telecommunication licenses.

- The broadband open access regulatory framework is under review to promote the interactive broadband multimedia industry. In addition, the government has pledged to continue to offset the costs of infrastructure and equipment needed to provide broadband access to residential and commercial buildings.

3. Enhancing Corporate Governance

The Ministry of Finance, together with the Monetary Authority of Singapore and the Attorney-General's Chambers, is sponsoring a comprehensive review of corporate regulation and governance in Singapore. Three private sector-led committees will be given up to a year

to come up with their recommendations on the major aspects of corporate regulation and governance in Singapore.

- The Committee on **Company Legislation and Regulatory Framework** will review Singapore's corporate law and regulatory framework, comparing Singapore's approach and legal structure with the standards and best practices in major business jurisdictions. The committee will also provide proposals to enhance efficiency and reduce red tape in the administration of corporate regulation.

- The Committee on **Disclosure and Accounting Standards** will review the process by which accounting standards are set, maintained and regulated in Singapore, in comparison with overseas jurisdictions. It will also review the development and promotion of best practices in disclosure requirements.

- The Committee on **Corporate Governance** will review the development and promotion of best practices in corporate governance, relative to international best practice benchmarks such as the OECD Principles of Corporate Governance. The committee will look at how to develop and promote best boardroom practices, and improve the training of company directors.

4. **Strengthening the Corporate Sector**

Trade 21 sets out the objectives for Singapore's trade development in the next five years, which are necessary to ensure a supportive external environment for the corporate sector.

- Merchandise trade to grow by 4–6 percent annually to S$500 billion;

- Offshore trade to grow by 3–5 percent a year to S$220 billion; and

- Services exports to grow by 5 percent a year to S$43 billion.

Under **Internationalizing Singapore Enterprises** program, the TDB will provide support to companies at the three stages of international market development.

- Preparation—international market evaluation and assessment, packaging and design development;

- Developing access—international contact development, establishment of commercial presence; and

- Positioning—international brand development, image enhancement.

The **Small and Medium Enterprises 21** (SME 21) program will be implemented over a ten-year period to create vibrant and resilient SMEs, through the following key initiatives:

- SME Mentoring Program allows SMEs to learn from the experiences of established company directors. A network of advisors will act as an external "board of directors" for SMEs to advise on strategic issues faced by the company.

- CEO Learning Circles provide CEOs of SMEs a platform to network, share and exchange experiences. A consultant will facilitate the discussion so that the sessions are conducted in a systematic and structured manner.

- Technology Network Program will facilitate connections between innovative SMEs, aspiring technopreneurs, researchers and venture capitalists. SMEs will be able to acquire new technologies more rapidly.

- At the sectoral level, SMEs will be encouraged to develop collaborative partnerships and alliances for greater synergy. In the retail sector in particular, SME owners will be encouraged to make use of business groupings and other tools and technologies like supply chain management to increase their operational efficiency.

- To upgrade the construction sector, support will be provided to promote training in core skills for the construction industry as well as encourage wider adoption of industry standards.

- Foreign SMEs will also be attracted to Singapore to set up operations or to link up with local SMEs in collaborative partnerships.

5. **Manpower 21**

Manpower 21 is intended to develop the Singapore workforce as a key source of competitive advantage that will support economic growth in the knowledge economy, based on lifelong learning and innovation.

- An enhanced Manpower Information System will be developed to provide relevant and timely information to policy makers, employers, training providers and individuals.

- A National Skills Recognition System will be established to develop definitive workplace skill standards and accord recognition to the training that meets these standards.

- To encourage more employer-based training, the ceiling of the Skills Development Fund levy was raised from $1000 to $1500, to be implemented from July 2000.

- The appeal of Singapore to foreign talents will be enhanced by strengthening the operations of Contact Singapore, a resource center that gives information and advice on education and career opportunities in Singapore.

- Guidelines will be issued to allocate foreign workers from low to high value-added sectors, to contribute to raising the skill profile of Singapore's workforce.

- Improvement in HR practices will be encouraged to attract and retain talents, both domestic and foreign.
- Efforts will be increased to encourage World-class institutions that carry out R&D in workforce training/organizational development and high value-added global manpower companies to set up operations in Singapore—examples include the United States-based National Training Laboratories and the Center for Creative Learning.

- Self-regulating manpower industry association will be formed to develop a vibrant manpower industry.

6. **Technopreneurship 21**

To build a conducive environment for the creation of knowledge-based, high growth companies in Singapore, initiatives are being undertaken in four areas: pro-enterprise environment, financing, facilities, and education.

Pro-Enterprise Environment

- Tax treatment of Employee Stock Options (ESOPs) was improved first by allowing the deferment of tax payment resulting from qualifying ESOPs, and the authorities are reviewing further steps to improve the tax treatment for ESOPs in high tech start-ups.

- Under Technopreneur Investment Incentive Scheme, qualifying investors and individuals will be allowed tax deductions on losses incurred from the sales of qualifying shares or from the liquidation of an approved technopreneurial start-up.

- Bankruptcies resulting from normal business risks are given appropriate differential treatment from bankruptcies due to misdeed or mismanagement.

- Technopreneurs will be allowed to use their residential premises as home offices.

- The government tendering procedures were modified to facilitate tender awards to the start-ups without conventional track records.

Financing

Technopreneurship Investment Fund (TIF) of US$1 billion will be used to co-invest with private sector to provide seed money for technopreneurial start-ups. The TIF fund managers will also work with private sector venture capital firms to stimulate the venture capital industry in Singapore.

Facilities

The Buona Vista area is earmarked as a focal point for the development of a science and research center. The area is intended for social and residential uses as well as industrial and commercial uses.

Education

The National University of Singapore and the Nanyang Technological University have announced a new university admission system from year 2003 that will include reasoning tests, project work and extra-curricular activities to supplement the current reliance on exam results.

7. Liberalization of Electricity Industry

The liberalization of the electricity industry in Singapore began with the corporatization of the electricity and gas department of the Public Utilities Board (PUB). As a result, the electricity industry currently has three generation companies, one grid company (PowerGrid: transmission), and one electricity supply company (PowerSupply: sales). The government has recently announced measures to further liberalize the industry, by allowing full competition in the contestable parts of the market—generation and retail sales in particular.

Generation

Temasek will divest all three generation companies with no limit on foreign ownership, to increase competition and raise the industry standards to international levels.

Retail competition

To bring about retail competition, the electricity retail business of PowerSupply will be divested from April 2001, and several customer service functions—including meter-reading and field services—will be taken out of PowerSupply to prevent these activities from becoming barriers to entry. These measures are anticipated to bring in full competition for large industrial and commercial customers from April 2001. Retail competition for smaller customers is anticipated to take place after 2002 following the completion of a detailed study of the effect of competition on households.

Regulation of PowerGrid

Since the transmission and distribution network is suitable for a natural monopoly, the grid industry will continue to be regulated through performance standards and incentives to improve efficiencies.

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III. SINGAPORE—FINANCIAL SECTOR DEVELOPMENT: A STRATEGY OF CONTROLLED DEREGULATION [1]

A. Introduction

1. For a city state with scant domestic resources, Singapore's development has been nothing less than remarkable. In the three decades since it gained independence, Singapore has built itself up from a small trade entrepot to a leading international financial center, ranking fourth in the world behind London, New York and Tokyo in foreign exchange trading, and fifth in derivatives trading. Singapore has played a pivotal role in channeling capital to Asia, largely through the Asian Dollar Market, the Asian counterpart to the Euromarket and is now one of the world's largest offshore financial markets. Conservative banking and regulatory practices, an open market and solid economic fundamentals have created a vibrant and healthy financial sector. Based on overall balance sheet soundness, Singapore banks were ranked seventh in the world and first in Asia by Moody's Investor Services in 1999.

2. Despite these strengths, Singapore's position as a leading financial center is being challenged by changes in global finance. Sophisticated financial innovations are reshaping financial markets worldwide, and institutional investors and capital markets are becoming the chief vehicles for raising money and channeling savings. Singapore's main advantage is as an international banking and foreign exchange center; its capital markets—fixed-income and equity markets and the fund management industry—are less developed and have played a smaller role in contributing to Singapore's financial growth. Furthermore, a broad worldwide trend toward financial deregulation that began in the OECD countries in the 1980s and has sharply accelerated in Asia since the 1997 financial crisis, is spurring competition and will likely result in consolidation of activity in fewer centers. Technological advances are also eroding Singapore's geographic advantages as a financial center—a favorable time zone and its location in one of the world's fastest growing regions. Indeed, all financial centers are facing a difficult transition to a "digital age" of global markets, in which national boundaries are being blurred and mobile capital means that traders can manage money from just about anywhere.

3. The Monetary Authority of Singapore (MAS) has long been aware of these challenges. In early 1997—before the full-fledged outbreak of the Asian crisis—the authorities undertook a fundamental regulatory review of the financial industry, and in early 1998 unveiled a comprehensive set of reforms to be phased in over five years targeted at lifting impediments to the development of Singapore's capital markets and to promote Singapore as a full service international financial center.

4. A key question—especially in light of evidence that size and "critical mass" matter for capital markets—is whether Singapore, with its small domestic economic base, can

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[1] Prepared by Jeanne Gobat (x34413), who is available to answer any questions on this paper.

develop the depth and liquidity in its capital market to attract issuers, intermediaries and investors beyond its borders. Singapore is also competing against other regional centers. Singapore's chief regional rival has been Hong Kong SAR, where the authorities are also undertaking efforts to deepen capital markets and attract foreign issuers and investors.

5. This paper addresses issues relevant to Singapore's continued development as a financial center. Section B provides brief background on the development of financial sector activities. Section C discusses major trends that have swept through the financial industry, including securities market developments and the increasing dominance of institutional investors, and highlights several weaknesses in Asian capital markets exposed by the financial crisis. Section D reviews the government's efforts to promote the capital market and other parts of the financial industry. Section E contains concluding remarks on Singapore's prospects as a global financial center.

B. Development of Singapore's Financial Center

6. The development of the financial sector was gradual and carefully controlled, guided by conservative prudential practices, and strict government guidelines regulating of financial activity. Beginning in the late 1960s, the government undertook a deliberate policy of shaping the financial industry to become a global force, employing a host of fiscal and regulatory measures combined with prudent macroeconomic policies to induce financial institutions to operate out of Singapore. These policies succeeded in putting Singapore on the map as one of the premier international offshore financial centers. Singapore's carefully controlled strategy helped win credibility and market integrity—vital to any financial center—but the approach has not been without costs. The government's heavy control has slowed capital market development and hampered financial innovation.

What makes a financial center?

7. A financial center consists of a high concentration of financial institutions and underlying markets that allow transactions to take place more efficiently than elsewhere.[2] Typically, the clustering of financial services and institutions at a particular site is fomented by a host of factors—affecting both demand and supply—such as market openness, low cost of funds, geographic location, a well-developed infrastructure, and an ample supply of skilled labor that can be tapped quickly when financial markets are in a cyclical expansion.[3] Financial activities also tend to be drawn to locations with high volumes of information flow from trade or other commercial activities. As such, larger cities provide a critical mass for information flows, including face-to-face contact that expedites exchange of news. Path dependence and scale economies have been identified as key determinants that allow financial centers with an early comparative advantage to sustain it over time and achieve

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[2] Jao (1997).

[3] Funding cost may be affected by factors such as domestic regulations, taxation and efficiency of payments and settlement systems. If these are more onerous in one center versus another, then the cost of funds will be higher as well.

critical mass.[4] These centers attract related services such as accountants, lawyers and computer specialists. The larger the market grows, the greater the efficiency, liquidity and information flow. This in turn attracts more market players and more liquidity.[5]

8. Singapore reached its current stature through a unique confluence of geographic, historical and economic factors. In the colonial period, its central location and its deep-sea port made it the trade and transportation center for commodity-rich Southeast Asia.[6] Growing trade and commerce attracted foreign bankers, trade finance and foreign exchange operations. Before World War II, Singapore bank branches acted as the regional headquarters for neighboring areas. Singapore's time zone allowed same-day trading with financial centers in United States, and centers in Asia and Europe, an advantage that later helped spur Singapore's foreign exchange market. Singapore also boasted a modern communications and transportation infrastructure, along with a skilled labor force. Like Hong Kong SAR, Singapore inherited from British colonialism stable political institutions and a legal system that attracted European and United States financial institutions familiar with British law (Box III.1). By the early 1960s, Singapore's bank centered financial system was already more advanced and open than most of its neighbors, putting it in an ideal position to take advantage of Southeast Asia's spectacular growth and the capital needs that would develop a decade later.[7]

9. Still, Singapore's future was not necessarily secured. Several political and economic events threatened its prospects. In 1965, Singapore separated from the Federation of Malaysia and became an independent nation state.[8] With this separation, Singapore lost a key

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[4] However, history also shows that centers can rise and fall in importance in part because of changes to the political systems or other factors. Until the mid 1960s, Beirut was a leading banking center for the region spanning from the Middle East to Asia. Further, Shanghai was thought to have the most developed financial center during the interwar period between 1910–39.

[5] Davis (1990) and Porteous (1995).

[6] For a detailed description of Singapore's development as a financial center, see Bryant (1985 and 1989).

[7] By the mid-1960s, roughly two-thirds of the 34 licensed banks operating in Singapore were foreign owned. Other financial institutions such as finance companies and insurance firms existed, although on a more modest scale. The Post Office Savings Bank, originally established in the 19th century to promote savings by low-income individuals, operated roughly 39 branches and counters by end-1965. The Central Provident Fund was formed in 1955 as a compulsory savings scheme to provide retirement benefits for workers

[8] Singapore gained full internal self-government in 1959 from the British government, although the British retained control over defense and foreign affairs. In 1963, Singapore joined together with Malaya, Sabah (North Borneo), and Sarawak to form the Federation of Malaysia.

Box III.1. Singapore and Hong Kong SAR as Financial Centers

Singapore's chief rival in the region for the large part of the past three decades has been Hong Kong SAR. Although Tokyo would have seemed the more natural regional center, onerous regulations and controls discouraged international capital and allowed Singapore and Hong Kong SAR to fill the vacuum. It was not until the 1980s, when the government slowly began deregulating the financial industry, that Tokyo developed into the global center it is today.

Singapore and Hong Kong SAR share several common characteristics: they are city states, although Hong Kong SAR's GDP and population is at least twice that of Singapore; their business and physical infrastructure (telecommunications, transportation, and clearing and settlement system etc.) are considered first class; they function as transportation (air and sea) and financial hub for the region; they operate in the same time-zone; they are English speaking and inherited British-based legal and political institutions; they lack a sufficiently large industrial base or "hinterland" to feed their own financial center, and instead have relied on attracting external funds and intermediating them via the center to regional users. China is considered Hong Kong SAR's extended hinterland and Southeast Asia Singapore's.

What sets them apart from other regional countries is their sound and open financial system, characterized by: high credit ratings and capital adequacy ratios (in excess of 18 percent), strong accounting practices, capable management, no deposit insurance, large presence of foreign institutions, and strong regulators.

Singapore vs. Hong Kong as Financial Centers, 1998

Indicators	Singapore	Hong Kong
Nominal GDP (In U.S. dollars)	82.8	163.6
Number of financial institutions	220	1669 (*)
Equity market		
Market capitalization (In percent of GDP)	209	205
Daily turnover (In billion of U.S. dollars)	0.2	0.9
Bond market		
Market capitalization (In percent of GDP)	14.6	17.4
Daily turnover in government bonds (In billion of U.S. dollars)	0.53	n/a
FX Market (In billion of U.S. dollars)		
Daily turnover	138.9	78.5
Futures market		
Daily turnover in financial contracts	108,961	18,407 (**)

Source: IFC, BIS, HKMA, and MAS.
For Hong Kong, (*) data for 1994 and (**) for 1995.

However, there are several areas where the two differ, reflecting in part the different political routes they followed starting in the 1960s. Following independence, the authorities in Singapore adopted a pro-active approach towards developing the economy, and introduced tight controls and conservative prudential standards. By contrast, Hong Kong SAR—under British protectorate—continued its laissez-faire approach, with minimal controls and government interference. Its tax rates are the lowest in the region. Unlike Singapore, onshore and offshore banking are fully integrated, with domestic and foreign currency activities and resident and nonresident activities being treated the same.

As for the regulatory approach, banks in Hong Kong SAR are not subject to reserve requirements. For years, Hong Kong SAR had no central bank and was reluctant to introduce prudential standards. However, banking sector problems in the 1980s, the stock market crash in 1987 and various financial scandals threatened Hong Kong SAR's reputation, leading to the gradual introduction of prudential regulations and the establishment of the Hong Kong SAR Monetary Authorities (HKMA). In contrast, Singapore began with high prudential standards and gradually relaxed them to establish a level playing field for local banks.

Under intense competitive pressures, HKMA like MAS is undertaking several efforts to improve the functioning of the local capital market. For instance, HKMA has listed Exchange Fund Notes on the Stock Exchange to enhance liquidity; established a Mandatory Provident Fund that will go into effect at the end of 2000 and will channel more long-term funds to the capital markets and enhance fund management industry; and launched an asset-backed securities market for mortgage loans.

trade market and income source. In addition, in 1967, Britain began withdrawing its military forces that had accounted for roughly 15 percent of Singapore's GDP. Both these events left Singapore with a markedly smaller economic base. Singapore also had limited natural resources. Most of its energy, raw materials and food had to be imported.[9] Political risks were looming as well, with large neighboring countries threatening open hostility.

Policies to promote Singapore's financial center

10. Recognizing these economic and political uncertainties, the government adopted an aggressive outward oriented development strategy. For the financial sector, this meant reaching well beyond Singapore's own borders to overcome comparative disadvantages relative to London, Tokyo or New York, all of which drew on industrial establishments that provided a vast pool of funds for financial intermediation. Singapore's practical response to its shortage of natural resources, limited size, and relatively large stock of educated workers was to develop a modern and sophisticated financial center that would serve needs well beyond its own economy and immediate region.[10] A strong domestic financial sector would also serve to finance the government's industrialization drive.

11. Over the next three decades, the authorities introduced an array of financial-sector reforms, launched new markets and used regulatory and fiscal incentives to attract financial institutions to Singapore. Well ahead of most Asian countries and in line with its export oriented development strategy, the government liberalized the capital account, deregulated a large part of domestic financial sector and completely lifted all exchange controls by late 1970s, helping Singapore's financial center stay ahead of other competitors in the region and progressively improve market efficiency.[11] Beginning in the 1980s, the government's efforts shifted to broadening the financial system and promoting the domestic capital markets.

12. Three core tenets characterized the government's strategy: (i) fiscal and regulatory incentives to lure financial activities to Singapore and jumpstart activities such as the Asian currency market; (ii) the creation of a separation fence to insulate domestic financial intermediation from international banking activities; (iii) strong emphasis on controlled and regulated development of the financial sector.

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[9] Agriculture, fishing and quarrying accounted for less than 4 percent of GDP. Singapore's land area is very small. Its total land has grown somewhat through the government's efforts to reclaim land. Yet, to put its size in perspective. Luxembourg has a land area four times that of Singapore but a population only one sixth as large. London is 2½ times larger than Singapore and its population three times as large (Bryant, 1985).

[10] The Monetary Authority of Singapore, 1980 and 1989.

[11] By the mid 1970s, a bank cartel system of exchange-rate quotations was abolished and the Singapore dollar was floated; credit guidelines were lifted and the interest rate setting cartel dismantled. (Bercuson, 1995).

The Asian Currency Market

13. The government's first move to promote its financial sector was to try to emulate the remarkable success of London's offshore center—the Eurocurrency market—by introducing its regional counterpart in 1968, the Asian currency market, commonly known as the Asian Dollar Market because most of the transactions are denominated in U.S. dollars.[12]

14. The Eurodollar market developed because of onerous banking regulations in developed countries and a large supply of U.S. dollars emanating from oil-producing as well as countries with noncovertible currencies who maintained dollar deposits in order to finance international trade. The Eurodollar market proved highly competitive vis-à-vis the United States financial market and other advanced financial markets.[13] Free of national controls and regulations, offshore markets enabled international banks to engage in more profitable international transactions under favorable regulatory and fiscal treatment. Countries hosting offshore markets in return enjoyed positive externalities as financial institutions established offices, hired local workers, imported technology and information, raised the tax base and attracted new business opportunities.[14]

15. To jumpstart the Asian currency market, Singapore authorities introduced tax and regulatory incentives to induce international commercial and merchant banks to locate their regional business operations in Singapore. These included exemptions for nonresidents from withholding tax on interest income; zero reserve requirements; no deposit insurance premiums; and a 10 percent concession on taxable income. A liberal employment policy was also adopted to attract skilled foreign workers. With these measures, the government also hoped foreign financial institutions would attract new business activities and have positive spillovers on the domestic economy through more efficient mobilization of savings and better risk management techniques so as to create a strong financial system which in turn is a key contributor to economic growth.

16. The government also exhibited flexibility and pragmatism, responding quickly to emerging market trends and competitive threats by aggressively broadening fiscal and regulatory incentives. The authorities eliminated the 20 percent liquidity requirement on foreign currency deposits that had put the Asian Dollar Market at a disadvantage to the Euromarket in the early 1970s. Following Euromarket trends, the Asian Dollar Market widened its product ranges in the 1970s by introducing money market products and longer

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[12] Asian currency market and Asian Dollar Market are used interchangeably.

[13] The Euromarket offered attractive deposit rates because it had no reserve requirements, deposit insurance premiums or interest-rate ceilings (regulation Q); its lower lending rates reflected the absence of entry restrictions and cartel-like structures that characterized United States banking. (Sarver, 1988).

[14] For fuller discussion on the development and role of international offshore financial centers, see Cassard (1994).

term securities such as the Asian dollar bonds. Tax incentives encouraged the establishment of international money brokers to intermediate sales and purchases of foreign exchange.

17. All told, the creation of the Asian Dollar market was a success and Asia's rapid economic growth fueled its explosive expansion in the 1970s and early 1980s.[15] It played an important role in channeling savings from Europe, the United States, the Middle East and Japan to the fastest growing countries in Asia. The Asian dollar market together with special tax incentives helped lure multinational corporations to establish their regional headquarters for regional treasury and financing operations in Singapore, buttressing demand in the foreign exchange market.[16] Regional central banks also flocked to Singapore's foreign exchange market because of strict prudential and supervisory standards, which restricted participation to only the most creditworthy and strongest financial institutions.[17] Interbank lending, largely to finance trade, accounted for roughly two-thirds of the Asian Dollar Market's business, with the remainder going to nonbank customers (Figure III.1). Most of the lending was denominated in foreign exchange and was short-term and unhedged, with maturities averaging less than three months.

18. The rate of expansion of the Asian dollar market slowed in the mid 1980s, and contracted in the 1990s when Japan—a large provider of interbank offshore funds—went into a recession, forcing Japanese banks to consolidate their international positions. Deregulation in OECD financial markets also caused a gradual shift toward securities-based lending in the home markets and the Eurobond market. Still, the Asian Dollar Market remains one of the largest offshore markets, with total assets reaching US$503 billion at end-1998 more than 600 percent of Singapore's GDP.

The "separation fence"

19. The second major initiative was to introduce financial legislation that would separate domestic financial intermediation from international banking (the Asian currency market).[18] Separate accounts were introduced for international and domestic transactions. Banks were required to record their international transactions in the Asian currency market through so-called Asian Currency Units (ACUs), while Singapore dollar transactions with residents were booked through domestic banking units (DBUs).

20. The bifurcation served a threefold aim. First, the government wanted to discourage the Singapore dollar from being traded internationally (known as the policy of "non-internationalization of the Singapore Dollar") to stem currency speculation and preserve

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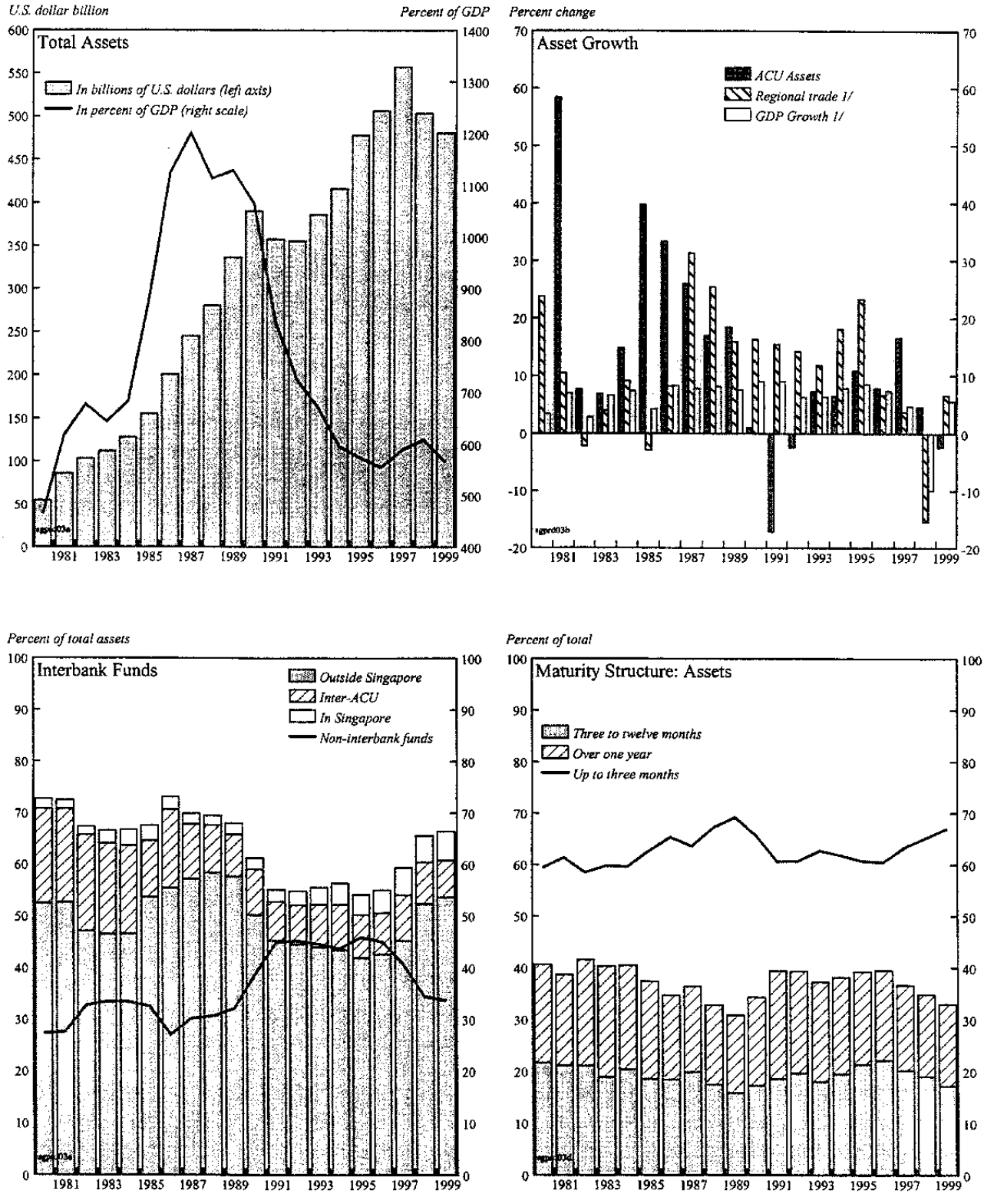
[15] For a detailed account of the development of the Asian currency market in the 1970s, see Hudjera (1978).

[16] Currently more than 5,000 multinational corporations have made Singapore their regional headquarters for treasury and financing operations.

[17] Cassard (1994).

[18] Roberts (1994).

Figure III.1. Singapore: ACU Market



Sources: IMF, World Economic Outlook; CEIC Database; and Monetary Authority of Singapore.

1/ Comprises Hong Kong, Indonesia, Korea, Malaysia, Philippines, and Thailand.

control over domestic monetary policy.[19] Second, the government also wanted to nurture the local banking industry. With the large influx of foreign banks interested in establishing ACUs it feared that the domestic banking sector would quickly become overbanked. The government introduced protective barriers, restraining the retail banking activities of nonresident banks.[20] Restrictions were not imposed, however, on banks wanting to access the rapidly expanding Asian Dollar market. Third, for prudential reasons, the government wanted to maintain some control over the allocation of domestic savings and insulate domestic financial intermediation from international banking which was subject to less stringent regulations.

21. Under this two-system regime, ACUs could carry out international transactions under favored regulatory and fiscal treatment, while the DBUs were subject to stricter liquidity and reserve requirements and higher tax rates. Singapore residents were not initially allowed to transact with ACUs. However, these restrictions on residents were fully relaxed by the late 1970s when capital and foreign exchange controls were completely removed. Singapore residents are now free to lend and borrow from ACUs in foreign currencies. Nevertheless, although restrictions imposed on Singapore dollar denominated financial activities by nonresidents have progressively been liberalized, several remain in place, covering credit lines, derivatives such as options, swaps and forward agreements in Singapore dollars. These restrictions form part of the government's policy to "not encourage the internationalization of the Singapore dollar." In essence, most of the restrictions are aimed at limiting speculative trading activities taking place in the Singapore dollar.

Conservative prudential practices and controlled deregulation

22. The third feature has been the pursuit of orderly and controlled development and the conservative regulatory approach adopted by the Monetary Authority of Singapore (MAS)—which is charged with supervising and promoting the financial industry. This approach sets Singapore apart from other financial systems. Highest priority was given to protecting the soundness and resilience of Singapore's financial system and the interests of depositors and investors. Every effort was undertaken to minimize risks, banking failures and financial scandals so as not to undermine Singapore's market credibility.

23. Indeed, prudential standards (capital, cash balances and liquidity standards) have been far more conservative than most anywhere.[21] Foreign banks are allowed in primarily on the

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[19] For the purpose of this policy, Singapore residents are defined as: (i) Singapore citizens; (ii) individuals who are Singapore tax residents and (iii) companies incorporated in Singapore or overseas which are jointly owned or majority owned by Singapore citizens.

[20] The authorities introduced a three-tier banking system in the early 1970s. Established local and foreign commercial banks received a full banking license, allowing the full range of domestic and offshore activities, while new foreign entrants could only obtain a restricted or an offshore license. No restrictions on offshore activities were imposed. Restrictions on domestic retail banking varied with offshore license having their activities severely curtailed.

[21] See Section D.

strength of their home regulation. Comfort letters are required stipulating that head offices will meet liquidity or capital shortfalls of their offshore affiliates. Strict consultative procedures with MAS have guided financial transactions and activities, which issued notices stipulating which activities were permitted. MAS would regularly monitor bank loan files, accounts and transactions and internal controls. Furthermore, the authorities were unwilling to allow untrammeled competition and growth in the financial sector. New types of financial activities typically required MAS approval.

24. As financial activities tend to be attracted to centers with a low regulatory burden, including light handed prudential supervision, the authorities have had to walk a fine line between ensuring financial soundness and credibility while not overly hampering financial innovation and market development. The twin objectives have sometimes been at cross purposes. The MAS has been criticized for being heavy handed, imposing burdensome monitoring of financial activities and complex consultative procedures. In many cases, financial institutions have not undertaken activities to avoid time consuming prior consultations with MAS. Likewise, the high prudential standards have come with a cost, having been identified as a constraint to capital market development and imposing a high regulatory cost on domestic banks.

25. Recognizing that previous attempts to develop capital markets had not borne fruit and that issuers and investors were still attracted by the more liquid Eurobond market, the government began shifting in the early 1980s its focus to promoting the capital markets and broadening the financial system. This was also in part a response to emerging international financial trends toward securitization (see Section C).

26. To kick-start the local capital market, the government launched various initiatives, including (i) opening in 1984 a futures and options exchange—the Singapore International Monetary Exchange (SIMEX); (ii) establishing a new Singapore Government Securities market in 1987 to offer a wider range of Singapore dollar government debt instruments; and (iii) establishing in 1987 a new stock exchange catering to smaller companies—the SESDAQ.

27. Despite these efforts, Singapore's financial center has remained largely an international banking center with a well developed foreign exchange market. It benefited from "first-mover" advantage in the region with the Asian currency market. By contrast, its bond, equity and futures markets remained relatively underdeveloped. The securities markets were marked by thin liquidity, lack of issuers and instruments, and low trade volume. Several key features were holding back capital market development:

- Government bond issues were not a source of government funding. Typically chronic government deficits have helped create highly liquid markets for government securities, especially in OECD countries. Singapore's government, by contrast, has run surpluses and has had no need to issue debt. Further, large public sector infrastructure funding requirements were largely tax revenue financed. The government securities market has consisted largely of primary issues to meet bank reserve requirements and to soak up excess funds in the Central Provident Fund (CPF), Singapore's mandatory pension system.

- Corporate bond issuance has not been a source of corporate funding. Corporations relied instead chiefly on bank financing, or as is the case of multinational corporations, on their parent company. Statutory boards and government linked enterprises also relied on the government budget as a source of funding.

- An unintended consequence of the authorities' policy of controlled deregulation and limits on internationalization of the Singapore dollar has been to thwart the development of Singapore's capital markets by limiting trading activity and product development. Until recently, government restrictions on borrowing Singapore dollars by nonresidents forbid corporations and supranational borrowers from issuing Singapore dollar denominated debt. Restrictions on foreign listings as well as on investment choices of CPF members have likewise constrained the development of the securities markets.

C. Trends in Global Finance and the Effects of the Asian Crisis

28. Asia's financial crisis exposed significant shortcomings both in the region's financial systems and in corporate financial structures. Although most Asian countries have a high degree of financial depth (measured by ratios to GDP of broad money, total banking assets and private credit), their financial systems have been largely bank-centered, heavily regulated, and closed compared to most OECD countries (Figures III.2, III.3 and III.4).[22] A heavy reliance on bank debt along with substantial institutional weaknesses—inadequate supervision, substandard corporate governance practices, weak accounting and disclosure standards and poorly defined legal rights—are widely cited factors contributing to the crisis. Risks were heavily concentrated in the banking system.[23]

29. An important but widely overlooked reason for Asia's heavy reliance on bank financing may have been the underdevelopment of local capital markets. Financial market deregulation in Asia lagged behind most OECD countries. Little use was made of more sophisticated and longer term financial products such as bonds, convertible bonds, asset-backed securities or derivative products to hedge exposures to interest- and exchange-rate risks. Indeed, in several countries, including Singapore, the domestic bond market was more a placement market than an active trading market. Price discovery was limited by the lack of liquid benchmarks to price credit risks and credit ratings for most corporations. Most financial systems (except Hong Kong SAR and Singapore) were protected and relatively closed to foreign competition and investors. Securities market development was also retarded by lack of transparency, including poor disclosure and weak governance practices and heavy regulation. Institutional investors played only a marginal role in providing long-term capital and developing sophisticated hedging products.

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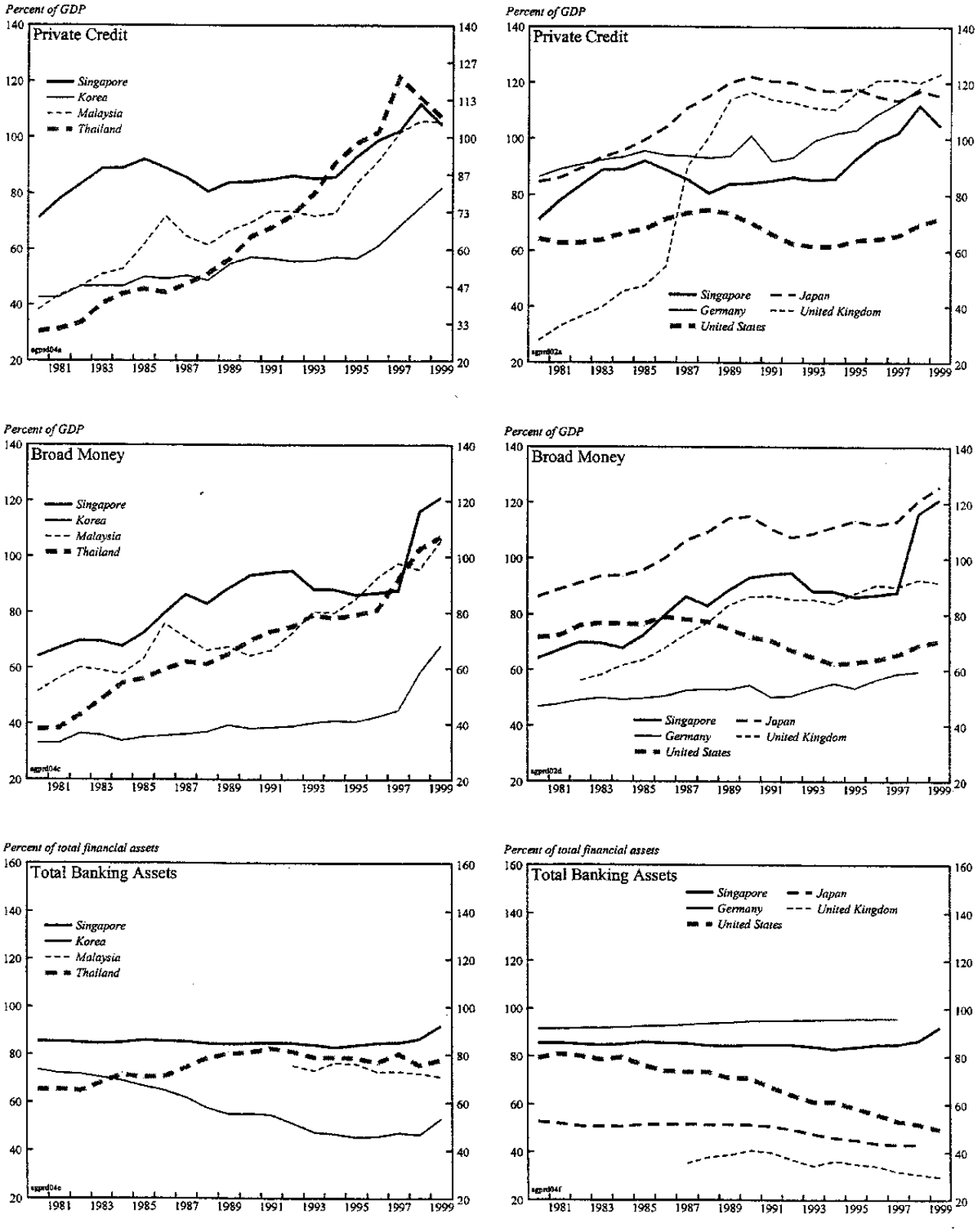
[22] Claessens and Glaessner (1997 and 1998).

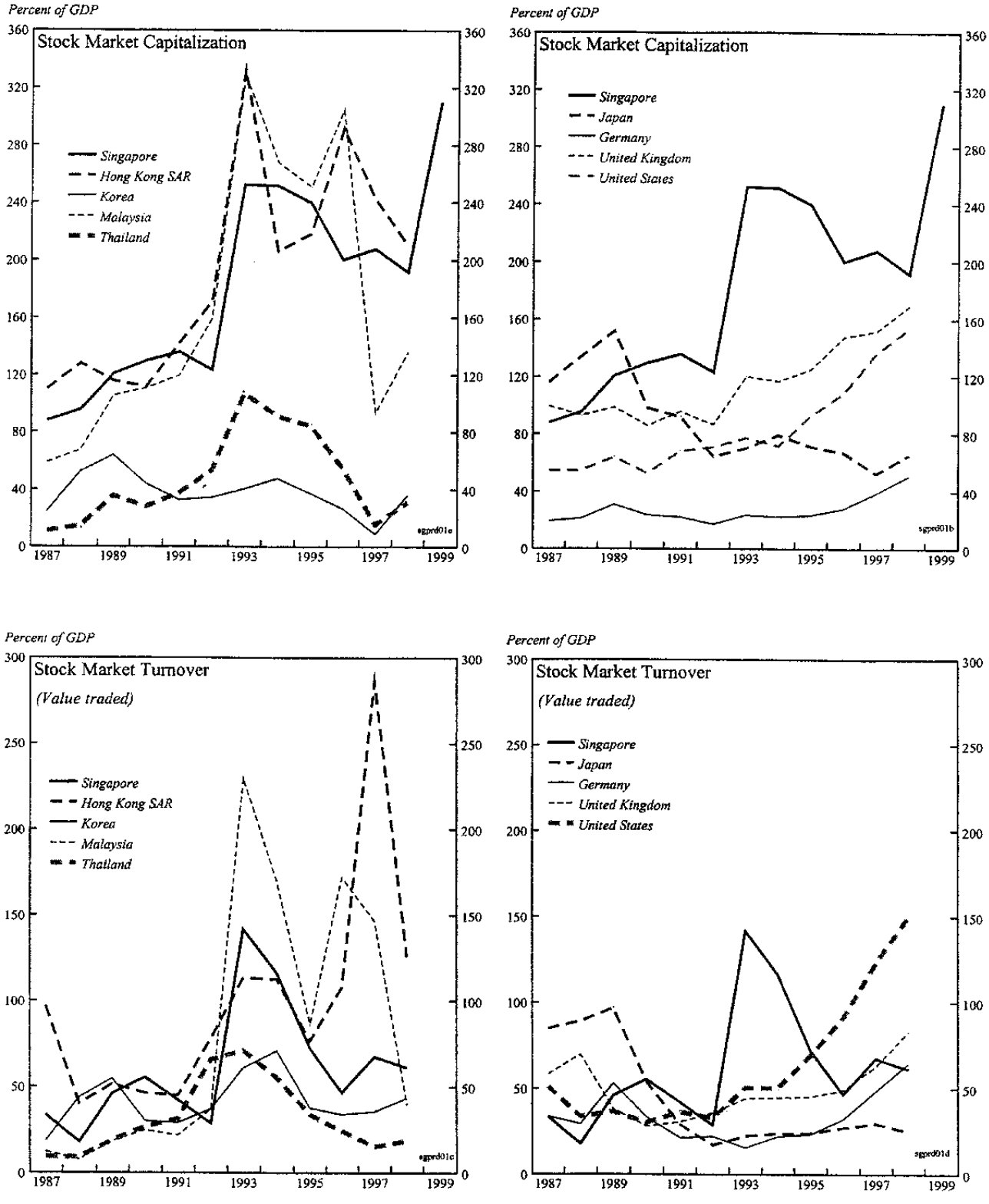
[23] For a fuller discussion of the causes of the financial crisis, see Lindgren and others (1999) and Harwood et al. (1999).

Figure III.2. Singapore: Financial Indicators



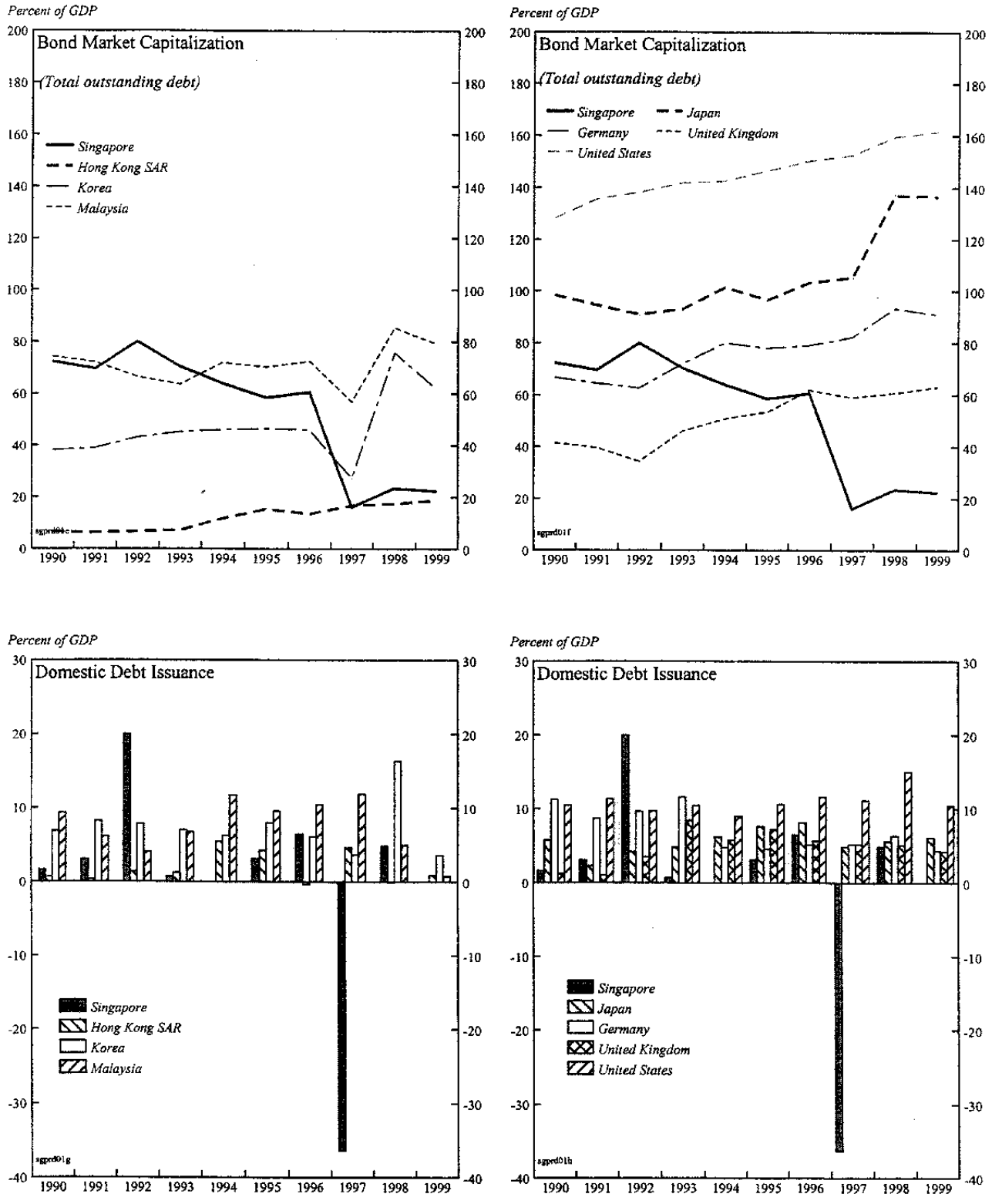
Sources: IMF, International Financial Statistics; and WEFA.

Figure III.3. Singapore: Indicators of Stock Market Development



Sources: International Finance Corporation; and CEIC database.

Figure III.4. Singapore: Indicators of Bond Market Development



Source: Bank of International Settlements.

30. The Asian crisis spotlighted the advantages of open, broad and deep financial systems. More liquid bond and equity markets and reliance on longer-term fixed income securities by corporations may have lowered the real sector's vulnerability to the weaknesses in the banking system. Alternative instruments such as asset backed securities and more liquid secondary markets could have mitigated the liquidity squeeze banks were facing. Thin and illiquid markets amplified asset price volatility and deepened losses in the severe downturn.

31. Studies show the importance of well developed financial systems for economic development.[24] They reduce transaction and information costs, enhance price discovery, improve resource allocation and allow investors to trade, hedge, diversify and pool risks. Although empirical evidence so far does not suggest a clear-cut superiority between bank-centered systems as in Germany or Japan and market-based financing systems as in the United States or the United Kingdom, since the 1980s, global finance has been trending toward market-based systems, with capital markets taking over the function of channeling savings at the expense of banks.

32. Both supply and demand factors have supported this general trend toward securitization:[25]

- Progressive deregulation in the banking and securities industries has heightened competition among financial service providers. The line between banks and nonbank financial institutions has blurred with banks competing with nonbank financial institutions for fee- and commission-based business, as well as savings intermediation.

- The removal of capital and exchange controls also increased competition and cross-border flows, allowing companies and investors to tap international financial markets to find the lowest cost funding and highest risk-adjusted return. Corporations are now directly issuing debt, equity or hybrid securities and are increasingly seeking listings on large, liquid foreign exchanges, using these as a wider platform to raise funds and expose themselves to a broader and more sophisticated investor class. The same holds true for debt securities, with the growth of international bonds outstanding outpacing the growth of most domestic bond markets. In contrast, (syndicated) bank lending—the main vehicle for raising funds in the 1970s—has been on a declining trend since the 1980s.[26] The recent upturn in such lending (which still remains below the levels of the 1980s and early 1990s) reflects an acceptance by borrowers of the higher prices and spreads as being rational, as well as some large cross-border M&A activity.

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[24] See Levine (1996 and 2000), Claessens and Glaessner (1998), and Demirguc-Kunt and Levine (1999).

[25] Most of the information in this section was drawn from "Institutional Investors in the New Financial Landscape," OECD (1998) and various IMF Capital Markets Reports (1997–99).

[26] See Annex V, International Capital Markets, IMF 1998.

- Institutional investors—pension funds, insurance companies and fund managers—have had a profound impact on capital market development and are now the key suppliers of long-term funds and risk capital. They have spurred the development of new risk products and have led the movement to improve corporate governance and disclosure practices, as well as bankruptcy procedures and legal protection of creditor and investor rights. The proliferation of new financial products is enabling investors to better manage and tailor risks so that each counterparty can match their own risk and return profile. Market activity in derivatives and securities trading has surged as a result.

- Advances in information technology and telecommunications are lowering transaction costs, fueling product innovation and erasing the advantages of geographic location. With round-the-clock and around-the-world electronic trading, investors now have the capability to move across markets rapidly, arbitrage price opportunities almost instantaneously, and manage money and access markets from just about anywhere. As a result, financial institutions have begun consolidating their trading operations in fewer financial centers. National exchanges, in the face of intense competition, are looking to attract more listings, investors and wider product ranges by seeking alliances with other exchanges, as in the recent merger of the London Stock Exchange and the Deutsche Bourse. Several stock exchanges, including Australia, Hong Kong SAR, Singapore and Toronto, have demutualized to encourage broader membership and brokerage participation, while providing the exchanges more flexibility to enter new alliances.

- As for demand factors, households have begun to shift from bank deposits to performance-based financial instruments such as money market or equity funds.[27] Moreover, an aging demographic profile in OECD countries has boosted demand for higher-yielding retirement products, channeling more savings into longer-dated securities products such as equities and fixed income products. Tax incentives and a shift from defined benefit to defined contribution plans in many countries has raised demand for capital market products and asset management services.

33. The Asian financial crisis has accelerated Asia's adoption of these global trends. The pace of financial deregulation in the region has sharply accelerated as governments have moved to strengthen and diversify their financial systems. Many are deregulating their domestic capital markets and introducing a wider range of products. Several countries are focusing on developing deeper securities markets and upgrading their corporate governance and regulatory practices. Inevitably, more emphasis will shift to capital markets to satisfy the large capital funding needs of banks, corporations and public infrastructure projects. Asia also needs to prepare for the transition towards an aging population, which will raise demand for higher yielding investment instruments. Institutional investors will play an increasingly

[27] In the United States, bank deposits as a share of total financial assets of the household sector has fallen to 59 percent in 1995 from 63 percent in 1980. By contrast, in Japan the ratio rose to 65 percent in 1995 from 55 percent in 1980.

dominant role in channeling and managing capital, forcing greater competition and allocation efficiency in capital markets.

D. Singapore's Recent Capital Market Reforms

34. The authorities in Singapore have long recognized that trend changes in global finance and intense global competition could threaten Singapore's position as a leading financial center. This recognition is exemplified in the following statements by Deputy Prime Minister (and Chairman of the MAS) Lee Hsien Loong:

"*Increased competition and globalization have encouraged consolidation of financial activities in fewer major centers....A similar consolidation can happen in our time zone. We cannot tell how many centers the Asia Pacific will have. But whatever the final count, we want to be in that number.*" (November 1997).

"*Financial innovation has continued unabated, institutions are rationalizing and consolidating, and transactions and services are rapidly going on line. Singapore has been directly affected by these global trends. These trends mean that institutions will increasingly prefer to centralize their activities in one single center.... In Asia, this will pose a strong challenge to Singapore.*" (April 2000).

35. Key barriers to the development of Singapore's capital markets are that its financial sector lacks a large domestic "hinterland" that would naturally feed its capital markets. As noted earlier, countries in Southeast Asia, that have, in the past, used Singapore as a financial service center, are aspiring to develop their own financial centers and are in the course of liberalizing their financial systems. Its other advantages—a favorable time zone, infrastructure and legal system—will be less critical as globalization and technological advances proceed.

36. Driven by concerns that Singapore may not fully benefit from the rapid changes in global finance in 1997, the authorities began a fundamental review of their approach towards regulating and promoting the financial industry, in close consultation with the private sector. An important aim was to identify potential new business opportunities as well as those regulations and market structures constraining the financial sector.

37. Within a year, MAS unveiled a comprehensive package of reforms with essentially a fivefold aim: (i) bring regulatory and supervisory practices in line with current best practice, shifting the emphasis from regulating to supervision and from rules-based to a risk-management approach, with improved disclosure practices; (ii) remove remaining entry restrictions in domestic banking and insurance to fully open the financial industry to foreign competition; (iii) develop deep and liquid fixed–income and equity markets; (iv) promote the asset management industry; (v) and gradually liberalize the use of the Singapore dollar by nonresidents.

38. The reforms to the regulatory framework constitute a break from the past policy paradigm focused on tight and conservative government control and, at times, onerous regulatory guidance of the financial industry. The new emphasis is on allowing market

participants more freedom to assume their own risk profiles, promoting transparency, and introducing more competition.[28]

39. At the same time, however, the authorities indicated that they will only proceed very gradually in easing their policy of non-internationalization of the Singapore dollar. Several changes have recently been announced to relax limits on the use of the Singapore dollar. But (as discussed below), there remain substantial restrictions on borrowing and trading by nonresidents that are limiting the development of a more active and deeper capital market. Prudential concerns about destabilizing speculative capital flows and the ability of speculating to launch an attack on the Singapore dollar will continue to determine the pace of reforms in this area.

40. The authorities recognize the importance of deep and liquid financial which allow market participants—especially large-volume traders such as institutional investors—to transact large volumes rapidly with minimal effect on prices and at low transaction costs. Accordingly, a high priority has been assigned to enhancing market liquidity.

Government and corporate bond market reforms

41. The authorities have undertaken several market structure reforms aimed at enhancing the efficiency of government and corporate bond markets. A core aim is to improve market liquidity in the government securities market, establish a benchmark yield curve and increase issuance activity in the corporate bond market.

42. To establish a benchmark government bond yield for longer-dated issues, the government established a pre-announced auction schedule, auctioning issues at key maturities.[29] These efforts have had a noticeable impact on market size and trading volume (Table III.1). The amount outstanding of Singapore Government Securities (SGS) increased markedly, from S$23 billion at end-1997 to S$36 billion at end-1999. Average daily trading turnover in SGS has increased to S$602 million in 1999 from S$534 million in 1997. Bid-ask spreads have narrowed on on-the-run issues.[30]

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[28] For further information on the reforms aimed at changing the regulatory and supervisory framework and improving bank disclosure practices, see SM/99/53.

[29] The government launched in September 1998 its first 5Y bond issue, followed in October 1998 with a 7Y bond issue, and a 10Y bond last year. As a result, the government has now a regular pre-announced issuance schedule of 91 and 364 day t-bills and 2,5, 7 and 10Y bonds

[30] On-the-run issues are the most recently issued securities of a given maturity class. On-the-run issues turn into off-the-run when a new security of the same maturity class is issued.

Table III.1. Net Funds Raised in the Domestic Capital Market

	1973	1975	1980	1985	1990	1995	1998
Net Funds Raised by Government (A)	640.6	987.2	1,742.8	4,611.3	5,117.9	10,417.9	11,491.5
Gross isue of government securities 1/	750.0	1,165.0	2,300.0	--	1,850.0	7,200.0	12,800.0
Less							
Redemption of government securities	45.3	138.9	291.4	100.5	1,199.0	4,000.0	5,438.4
Government holdings of government securities	24.8	57.8	64.9	-63.9	-0.9	--	-0.1
Conversion from accumulated advance deposits	--	--	2,146.6	--	--	3,000.0	5,000.0
New advance deposits	-39.3	18.9	1,927.5	4,647.9	4,466.0	10,217.9	8,829.8
Net issue of statutory board's securities	--	--	18.2	--	--	--	300.0
Net capital raised by private sector (B)	575.0	216.4	863.5	495.4	3,036.6	1,680.0	1,606.0
Public issues of shares	62.9	18.8	414.7	250.0	898.5	644.6	411.2
Rights issues	111.5	74.9	448.8	245.4	1,486.5	571.5	822.2
Private placements of listed shares	221.2	91.2	--	--	651.6	463.9	372.6
Issues of debt securities (C)	--	48.2	70.0	230.0	1,632.3	3,766.6	4,208.6
Listed bonds, debentures and loan stocks 2/	--	48.2	50.0	20.0	499.3	1,695.0	721.4
Unlisted bonds	--	--	20.0	--	395.0	1,784.6	3,425.2
Revolving underwriting facilities/note issuance facilities	--	--	--	210.0	728.0	280.0	--
Negotiable certificates of deposits 3/	--	--	--	--	10.0	7.0	62.0
Total net funds raised (A + B + C)	1,215.6	1,251.8	2,676.3	5,336.7	9,786.8	15,864.5	17,306.1

Source: MAS Annual Report.

1/ Government registered stocks and securities, excluding Treasury bills.
2/ Singapore dollar - denominated bonds listed on the SES.
3/ Refers only to Singapore dollars reserve-free NCDs issued during the year.

43. Several reforms are aimed at developing the **corporate bond market** by stimulating more corporate issuance, broadening the issuer and investor base and credit spectrum:

- The government took the first important step in August 1998 with Notice 757, for the first time allowing nonresident foreign corporations to raise money in Singapore dollars through bond and equity issues. However, if the funds are not used to finance activities in Singapore, proceeds must be swapped out to a foreign currency. The aim of this restriction was to maintain some disincentive to the internationalization of the Singapore dollar.

- While Notice 757 originally applied only to corporations with high credit ratings, it was extended a year later to unrated foreign corporations in order to expand the issuer base and credit spectrum, and especially to attract lower grade Asian companies to the Singapore dollar bond market.

- The government also encouraged local corporations, government-linked enterprises and statutory boards to tap the local capital markets.

- Finally, tax incentives were introduced to promote issuance, underwriting, and origination out of Singapore.

44. The results have been positive. Corporate bond market activity rose sharply in 1999, with active bond issuance by high grade foreign companies and statutory boards. The breadth of issuance rose and attracted banks, multinationals and corporations with very high credit grades while lower grade corporations have yet to enter the market. Since the third quarter of 1998, Singapore dollar bond issuance by nonresident firms has totaled S$4 billion. Local firms issued S$9 billion in 1999, compared to S$7 billion in 1997 and S$4 billion in 1998 (a year affected by the Asia crisis). Most notably, while most issues before 1998 were private placements, they are now public issues, enhancing price discovery and liquidity.

Promoting institutional investors and the asset management industry

45. The second major reform area targets institutional investors, including asset management, insurance companies and pension funds. Institutional investors are to play a more active role in channeling both foreign and domestic savings to Singapore capital markets and in pushing for wider selection of capital market products, including diversifying the range of retirement products. The authorities envisage Singapore becoming the home base for private sector fund managers and a major regional funding center for fixed-income and equity products.[31]

- Several measures have been implemented to catalyze the fund management industry. Tax and regulatory incentives include relaxing the criteria to obtain an investment

[31] Outside of Tokyo, Hong Kong SAR is the leading center for asset management in the region.

advisor license; making regulatory requirements for unit trusts more transparent; and expediting processing time for applications to launch a unit trust.

- The decision has been taken to farm out the management of part of government assets to qualifying private sector fund managers based in Singapore. A total of S$35 billion is expected to be farmed out over the next three years (1999–2001) to private managers.[32]

- The investment limits on CPF approved unit trusts have been increased, so that fund managers have more room to improve the risk-return rewards of their funds.

46. These measures are expected to increase the size of the fund management industry, which has already grown markedly. Assets managed in Singapore rose from S$18 billion at end-1990 to S$112 billion at end-1998, while the number of fund companies tripled to 157.

Equity market

47. Equity markets are a third key focus of the capital market reforms. In terms of market capitalization, Singapore's equity market is already well advanced. However, the issuer base remains narrow and liquidity low. The exchange also has been slow in developing online trading. The authorities' aim is to make the Singapore Exchange the leading stock exchange for the region, with several reforms targeting this objective:

- As noted earlier, the Singapore Stock Exchange was demutualized in 1999, creating a stock-company structure. This will allow the exchange to pursue more broadly the interests of investors, fund managers, and traders rather than just member brokers.

- Following demutualization, the Stock Exchange of Singapore and SIMEX merged in late 1999. The merger is expected to spur the development of complementary products, reduce overhead costs, and improve the stock exchange's leverage to pursue cross-border alliances with other exchanges.

- To expand the issuer base, listings of SMEs and foreign companies are being strongly encouraged, although they are subject to Notice 757, which requires them to swap the funds so raised out of Singapore dollars if they are not earmarked for activities in Singapore.

- To attract investors, disclosure and other corporate governance practices are being upgraded.

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[32] In selecting Singapore-based fund managers, GIC requires the fulfillment of four sets of criteria: (i) a minimum 3-year track record; (ii) the investment team in Singapore should comprise at least three fund managers who also have to meet minimum standards of qualifications and experience; (iii) the size of funds under management should be at least S$500 million in Singapore or S$5 billion at the group level; and (iv) the fund management firm is required to commit resources to training.

- Broker commissions, now fixed at high rates, will become fully negotiable at the beginning of 2001, and brokers will be allowed to compete with banks by offering money market funds and advisory services. All told, the measures are expected to lower transaction costs, increase trading volume and improve market liquidity.

Remaining constraints

Statutory liquid asset ratio

48. Despite these encouraging developments, several market structures remain as constraints to bond market development. First, the **statutory liquid asset ratio** is considered very high compared to other countries with similarly developed financial systems. Banks are presently subject to a liquid asset ratio requirement of 18 percent of their liability base, of which they are required to hold a minimum of 10 percent in SGS. As a result, banks have been holding roughly two-thirds of the S$36 billion in total outstanding SGS at end-1999. Since banks typically hold these securities until maturity, their large holdings for statutory purposes are severely constraining the development of an active secondary market in SGS.

49. Experience has shown that liquid asset ratios are misleading and do not necessarily provide an adequate protection of financial institutions' soundness. The ratios may not take into account banks' maturity profile, off-balance sheet activities, marketability of the assets, including availability of sufficiently deep secondary markets, or the ability of banks to access market or credit lines. The authorities are therefore reviewing these regulations with a view to adopting a maturity ladder system to allow banks more flexibility in managing their liquidity requirements. The maturity ladder approach compares cashflows and outflows short-term (day-to-day) and over an extended period, and attempts to construct an analysis of banks net funding requirements as well as cumulative net deficits of funds at selected maturity dates.[33]

Accounting regulations

50. Second, **the present accounting regulations** require that financial institutions value their SGS holdings at the lower of cost or market value. This has had an adverse impact on secondary trading as banks in their role as dealers have been reluctant to trade in part due to the valuation effect this could have on their bond holdings which are held for regulatory purposes. In line with international best practice standards, the authorities are considering introducing amortization cost accounting for SGS holdings for liquidity requirement purposes so to isolate the valuation impact from trading activities.[34]

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[33] For a full discussion on developments in sound practices for managing bank liquidity and trends in supervisory practices, see BIS (February 2000).

[34] Commonly, all financial assets are measured at fair value. There are exceptions to this rule, however. Amortization cost can be applied to securities such as bonds that are held to maturitiy.

Repo market

51. Third, regulations of **repos** continue to constrain the development of more active repo and secondary markets. In repo transactions, securities are exchanged for cash with the agreement to repurchase the securities at a future date. The securities thus serve as collateral for what is effectively a short-term cash loan. Repos can be used for such activities such as hedging, leverage and securities lending.[35] MAS does not allow government securities obtained through a repo trade (so-called term repos) to be counted toward bank liquidity requirements. Only overnight repos can be counted towards bank minimum liquid asset ratios (up to a maximum of 5 percent), which could account for the much higher liquidity in the overnight repo market.

52. In this context, several recent initiatives suggest that the authorities are prepared to move rapidly in this area. First, the S$20 million consultation limit on repo transactions with nonresidents was lifted in November 1999. Banks can now, without prior consultation with MAS, enter into a repo transaction in SGS and any other Singapore dollar denominated bonds with any party and for any amount, on the condition that there is a full delivery of a collateral.[36] Second, in May 2000, the authorities announced that government securities obtained through a repo transaction could be counted towards bank liquidity requirements and that longer dated government securities would be used more actively to influence market liquidity. Third, also in May 2000, the authorities announced the issuance size in benchmark issues would be raised from the present S$1.5 billion to S$2.5 billion. Further, the authorities announced that offshore banks will be allowed to transact in repos with nonbank customers.

Derivative products

53. **Markets for hedging products**, such as options, futures and forward contracts, on government securities still remain to be developed. These instruments play an important role in attracting trading activities by permitting the pooling and trading of risks. The availability of futures markets would also foster price discovery in the cash market.

Swap market

54. The **swap market** is not considered adequately liquid, especially farther out the maturity spectrum. As a result, corporate issues have been limited to 3–5 year maturities. Average daily volume in Singapore dollar interest rate swaps is around S$100–200 million while cross-currency swap trading volume is more variable with periods of inactivity.[37] Several restrictions, especially on nonresidents, are limiting liquidity in the swap market. Interest rate swaps (IRS) are restricted to Singapore corporates and banks. Other counterparts may trade IRS only if a Singapore denominated asset is underlying the trade, but prior

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[35] For more on repos see MAE OP/97/3 and BIS (1999)

[36] This means that financial institutions can borrow Singapore dollars through a repo transaction but have to first buy a Singapore dollar asset.

[37] The Singapore Bond Market, Deutsche Bank, August 1999.

approval for such a transaction is required from MAS. Liquidity in the swap market is, however, important; foreign corporate bond and equity issuers are required to swap out their proceeds from issuing Singapore dollar denominated debt if the proceeds are not used to finance economic activities in Singapore.

55. As in the case of the repo market, recent measures have been aimed at addressing these problems. The MAS has lifted the requirement that longer bonds obtained via a swap transaction be subject to the minimum liquid asset requirement. This should help lower the cost of a swap transaction. In addition, banks may now transact with nonresidents all interest rate derivatives products, including interest rate swaps, without prior consultation with MAS. As part of the banking liberalization the government has established a new category of banks—the Qualified Full Banks—which would receive the same rights as fully licensed banks. QFBs will be allowed to lend up to S$1 billion (from currently S$300 million) and engage in Singapore dollar swaps without any restrictions on the purpose of the swap and will not require prior approval by MAS.

Policy of Discouraging Internationalization of the Singapore dollar

56. The most critical hindrance to the development of deeper and broader capital markets is the numerous remaining regulatory restrictions on trading activities in Singapore dollars by nonresidents. Experience in other financial centers suggest that markets for short-sales of securities hedging products and access to domestic currency credit lines by residents and nonresidents are essential to deepen liquidity and encourage trading. Although the restrictions have been eased over the years, they continue to limit potential trading activity and development of market liquidity. For instance, nonresidents still face a S$5 million consultation limit in the amount they can borrow to finance trading activities, including derivatives, in Singapore dollar denominated financial assets. This has deterred traders from taking short positions in Singapore dollar securities (borrowing bonds and selling them in the hope interest rates will rise) since the trader may run into the risk of not being able to settle when payment is due. These restrictions restrain a large number of financial institutions with presence in Singapore from more actively lending in Singapore dollar financial instruments and thus limit market depth.

57. Moreover, although it is unlikely that the Singapore dollar will emerge as a medium of exchange outside the region (in the same way as the dollar or the yen have become), there is the potential for the Singapore dollar to be used more widely as a store of value given its political stability and high degree of credibility of its government. This would allow Singapore to reap the seignorage gains from issuing domestic currency to nonresidents.

E. Conclusion

58. Like other financial centers, Singapore faces considerable challenges in keeping its competitive edge. Capital market development, including the promotion of complementary services such as fund management, are vital for Singapore's financial center to stay competitive. Given that critical mass in capital markets is essential to attract more investors,

intermediaries and issuers, and to lower the cost of funding, Singapore must find ways to overcome the "size problem."[38]

59. The first step has been taken by allowing foreign companies to issue debt and equity in Singapore dollars. Yet, even here Singapore may run into limitations because of the "home bias" factor, with evidence indicating that equities, especially, are traded most actively with exchanges where companies have their primary listing. To expand its currently narrow trading platform, the Singapore Exchange is reviewing possibilities of forming alliances with other exchanges, both in the region and globally.

60. Singapore's policy approach has been to lift restrictions gradually to minimize systemic risks. But, the authorities are fully aware of the potential inconsistencies that can arise from this approach. As Deputy Prime Minister Lee Hsien Loong said in April 2000, "*the liquidity of the Singapore dollar market, and MAS rules to discourage the internationalization of the Singapore dollar, constrain the growth of the bond market.*" At the same time, however, Deputy Prime Minister Lee also said that the authorities "*are not likely to change our basic stance against S$ internationalization, but we have relaxed the specific restrictions, and will continue to review regularly how much further we can safely go.*"

61. However, as global competitive forces are speeding financial innovation and capital flows faster than regulations can keep up, and when capital market size and liquidity have grown so critical, Singapore may no longer be able to afford this gradual approach.

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[38] Recent empirical evidence indicates that size may matter and can lower the cost of capital. Hardouvelis et al. (1999) find that the average saving in the cost of capital from market integration in Europe for the period between 1992 and 1998 amounted to around 200 basis points. Stulz (1999) also finds that financial integration encouraged by globalization has lowered cost of capital.

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IV. Singapore's Central Provident Fund: Options for a Comprehensive Reform[1]

A. Introduction

1. Singapore's national saving rate far exceeds that of its neighbors and of other countries with comparable income (Table IV.1). Much has already been written about this remarkable saving performance and the role it has played in Singapore's economic success over the past three decades.[2] Notwithstanding the lack of reliable data on public and private saving and, within private saving, between the corporate and household sectors, there is little doubt that the mandatory contributions to the Central Provident Fund (CPF) have played a significant role in mobilizing savings.[3]

2. Singapore's CPF contribution rates are much larger than in countries with comparable, mandatory defined-contribution pension schemes (Table IV.2). The CPF contribution rate, initially set at 10 percent of wages, was gradually raised to a peak of 50 percent in 1984. The targeted long-term contribution rate of 40 percent was reached in 1994 but in 1997, in response to the crisis, the rate was cut to 30 percent. The authorities, however, plan to raise it back to 40 percent in five years.[4] Countries with higher contribution rates than Singapore, such as France and Germany, have schemes that cover the entire range

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[1] Prepared by Roberto Cardarelli (x38059) who is available to answer questions.

[2] Indeed, in this context, questions that have received particular attention include whether household saving is entirely voluntary or there is a significant component of "forced saving" (Husain 1995), and whether Singapore has been oversaving with respect to some optimal benchmark (Ostry, 1997 and Besanger, Guest and McDonald, 2000). The evidence is mixed: Husain finds that changes in the ratio of CPF savings to private disposable income have no statistically significant impact on total private saving and takes this as evidence against the existence of "forced saving." Ostry uses a consumption smoothing approach to the current account and finds no evidence of oversaving in Singapore. In contrast, Besanger Guest and McDonald (2000) find that Singapore "oversaved" to a significant degree in the period 1996–97.

[3] Data on the consolidated current surplus of the public sector, including the government and the major statutory boards, were published only until 1985 (see Huff, 1995). These data show that in the period from 1974 to 1985, public sector saving grew from 23 percent to around 66 percent of the gross national savings and that, by the latter date, CPF savings constituted 75 percent of private savings.

[4] This long-term contribution rate "was rationalized as the one being sufficient to cover various CPF schemes for housing and medical needs as well as to generate a retirement annuity equivalent to between 20 and 40 percent of the individual's last take home pay" (Low and Aw, 1997).

of social security programs rather than just pension contributions, and have higher pension replacement ratios (Table IV.2).

Table IV.1. National Saving Rate in Selected Countries
(In percent of GDP)

	1969–79	1980–90	1991–99
United States	19.6	18.3	17.2
United Kingdom	23.5	14.1	16.3
France	24.3	20.1	19.7
Japan	35.9	31.7	31.6
Malaysia	6.3	30.1	35.1
Taiwan	28.1	33.0	28.0
Korea	24.0	31.0	34.7
Australia	21.8	21.6	18.1
Singapore	23.8	40.7	50.8

Source. World Economic Outlook.

3. The CPF has recently been criticized for failing to provide adequately for post retirement financial security (see Beckerling, 1996, Wong and Donghyun, 1997, and Asher, 1999). Survey data (reported in Section B) shows that the most important source of income for the aged is provided by their children. While this practice has been encouraged by the Singapore authorities in several forms, future prospects for this form of social safety net are weakened by the aging of the population.[5] According to the World Bank demographic projections, the old age dependency ratio (the ratio of the number of individuals aged 65 and above to the working age population) is expected to rise from 10 percent in 1999 to approximately 40 percent by 2050.

4. The objective of this note is to address the reasons why a scheme with such high contribution rates has been found to be inadequate in providing income for old age, and outline some options for a re-design of the scheme.[6] In particular, it will be argued that:

- the CPF has been used to serve too many objectives, thus diverting its focus away from assuring financial security during retirement;
- in view of the aging of population and the approaching demographic hump, the program needs to be rationalized so as to serve its original purpose of providing for old age needs. Such a rationalization would also involve shifting the typical portfolio composition of Singaporean households away from housing and towards financial assets. This would also serve to promote the development of capital markets.

[5] Key measures include the fiscal incentive to top-up parents' CPF accounts and the Maintenance of Parents Act, a law introduced in 1995 that makes it a criminal offense for a son not to take care of his aged parents.

[6] Box IV.1 summarizes the main characteristics of CPF as of 1999. For a comprehensive description of the CPF, see Carling and Oestricher (1995), and Low and Aw (1997).

Box IV.1. Central Provident Fund

The Central Provident Fund was established in 1955 as a mandatory, fully funded, defined contribution, individual account system designed to provide a degree of financial security for workers in their old age.

Accounts

Each CPF member has four accounts: (1) Ordinary Account—savings in this account are available for pre-retirement withdrawals for home purchase, education, approved financial investments, and for topping-up parent's retirement accounts; (2) Medisave Account—savings in this account can be used for meeting hospitalization and to pay premiums for approved medical insurance schemes such as MediShield (designed to help meet the cost of catastrophic illnesses); (3) Special Account—savings in this account are reserved for old age and contingency purposes and can only be withdrawn at age 55; and (4) Retirement Account—at age 55, a member can withdraw the remaining balance in the Ordinary Account and the balances in the Special Account as a tax exempt lump sum after setting aside a minimum sum in this account. This minimum sum in the retirement account is currently S$60,000 (out of which S$40,000 can be in pledged property and S$20,000 in cash). From the retirement age, currently 62 years, each member may receive a monthly income from this sum (plus interest). Alternatively, it can be used to buy an approved annuity product or be deposited into an approved bank.

Contribution Rates

Both the employer and the employee contribute to the CPF. Contribution rates rose from 10 percent at the inception of the scheme in 1955 to a peak of 50 percent in 1984/85. During the past 15 years, contribution rates have been lowered and raised 7 times. At present, the contribution rates are 20 percent of the wages for employees aged 55 and below and 12 percent for employers subject to a wage limit of S$6000 per month (beyond which no contribution is payable). Progressively lower rates apply to those aged between 55 and 60, those aged between 60 and 65, and those aged above 65. About ⅔ of the labor force is covered by the scheme.

Investments of CPF Balances and Returns to CPF members

CPF balances must by law be invested in government bonds. The proceeds from the sale of government securities to the CPF are invested on behalf of the government by the Government Investment Corporation (GIC). The portfolio investments of the GIC are not revealed to the public but most of its funds are invested abroad. The interest rate paid to CPF members is set on the basis of the 12-month fixed deposit rate and month-end savings rates of the four major local banks. The guaranteed statutory minimum interest rate is 2½ percent on ordinary account balances and 4 percent on special account balances. The average interest earned on CPF accounts since 1980 has been in the range of 4–5 percent. Employees contributions and the interest earned on their CPF balance are all tax-exempt. The authorities estimate the average replacement rate to be between 20 percent and 40 percent of last drawn income.

Table IV.2 Contribution and Gross Replacement Rates

(In percent)

	Contribution Rates 1/	Gross Replacement Rates 2/
Countries with mandatory defined Contributions schemes		
Australia	9	41
Malaysia	24	--
Switzerland	15	49
Mexico	16	--
Chile	13	--
Sweden	23	74
Other countries		
United States	18	56
United Kingdom	22	50
Finland	27	60
Germany	41	55
Japan	28	52
France	49	65

Sources: Social Security Programs Throughout the World, 1999, U.S. Social Security Administration (Table 3, page 43) and Blondal and Scarpetta, 1999.

1/ 1999 figures.
2/ 1995 figures. Replacement rates at the age of 55.

5. The rest of the paper is organized as follows. Section B will analyze the main weaknesses of CPF as a pension fund; Section C discusses some potential remedies to these weaknesses, and Section D contains some concluding remarks.

B. Evolution of CPF and Key Problems

6. There are three separate pieces of evidence supporting the view that CPF is inadequate to provide financial support for retirement. First, the average final cash withdrawal from the CPF is quite low (it was around S$19,000 during the period October-November 1998, which is approximately 60 percent of the current annual average wage). The median CPF balance for active contributors (including the amount withdrawn) is also quite low (it was between S$50,000 and S$60,000 at the end of 1997). These amounts would not be sufficient to provide even the minimum subsistence level of income during the individuals' retirement years.

7. Second, a 1995 survey of senior citizens (generally defined as those older than 55) by the Ministry of Health and the Ministry of Community Development of Singapore showed that around 60 percent of the elderly in the sample does not have any CPF savings and 56 percent of those with an account indicated that CPF would be inadequate for old age support. Moreover, the survey found that over three quarters of senior citizens receive income from children, and 64 percent of them revealed that their children constitute the most important source of support.

8. Finally, simulations performed by Wong and Donghyun (1997) show that the replacement ratios provided by the CPF vary within a range of 25–35 percent. Similar simulations carried by the actuarial firm Watson Wyatt and reported in Beckerling (1996) show replacement ratios ranging from 15 percent (for a high income, married contributor with a dependent spouse) to 48 percent (for a low income, single contributor). These ratios are well below the 66 percent of the final wage, generally considered as the benchmark for a comfortable level of income on retirement, and are considerably lower than the equivalent figure for other industrialized countries (see Table IV.2).

9. These studies typically point to two reasons to explain why the CPF fails to provide sufficient funds for retirement:

- Low return on CPF balances.
- Heavy pre-retirement withdrawals, especially for housing.

10. On the issue of low returns, Asher (1999) shows that over the period 1983–98 the real annual return on CPF funds (defined as the difference between the nominal rate less inflation as measured by the GDP deflator) has been on average 1.7 percent. This is well below the real average return on pension funds in other industrialized countries (Table IV.3).

11. However, this comparison has to be qualified on several grounds. First, the return on CPF funds is risk-free. Nominally, CPF funds are invested directly or indirectly (through the Monetary Authority of Singapore) in government bonds, and the return is fixed as an average of the deposit and saving rates of the four major local banks (subject to a minimum nominal rate of 2.5 percent for the Ordinary and Medisave Accounts and 4 percent for the Special and Retirement Accounts). Proceeds from the government bond sales are invested abroad by the Government Investment Corporation, which manages them professionally and earns a much higher return than the one paid on CPF contributions.[7] The assertion that the difference between the returns on GIC investments and those paid on CPF balances amounts to an implicit tax for CPF members must be weighted against (i) the absence of taxation on CPF savings (neither the contributions, the interest or the withdrawals are taxed), and (ii) the possibility of using CPF funds to repay housing mortgages at a fixed, low rate (0.1 percent above the return on CPF).[8] On balance, therefore, low returns may not be the only factor contributing to the low replacement rates under the CPF scheme.

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[7] The rate of return earned by the GIC is not revealed publicly. However, it is estimated that over the past 10 years the GIC could have made nearly 10 percent on its portfolio, broadly equally divided between stocks, bonds and cash.

[8] Another issue is the absence of administrative costs that are usually associated with pension schemes based on individual accounts. The case of Chile is probably the most famous one, as the administrative costs of that type of individual accounts have been estimated in the order of 3 percent of average taxable earnings in 1991 (see Diamond, 1993).

Table IV.3. Real Annual Pension Fund Returns, 1984–93

(In percent)

United States	United Kingdom	Japan	Germany	Netherlands	Singapore 1/
10.6	11.8	6.6	7.4	8.0	1.7

Source: European Federation for Retirement Provision (1996) and Asher (1999).

1/ Singapore's figure is for the period 1983–98.

12. A key reason for the low replacement rates provided by the CPF may be found in the evolution of the CPF scheme over time. When it started in 1955, CPF was a mandatory, fully-funded old age social insurance scheme where only those workers earnings less than S$500 a month contributed 5 percent of their wages, with employers contributing another 5 percent. It was conceived as a form of saving scheme designed to provide low-income workers with financial means during retirement. Over the years, however, CPF has expanded it role, reflecting a variety of social and political objectives (Box IV.2 presents the main steps of this evolution). A key change occurred in 1968, when it was decided that members could use CPF funds to purchase public houses, provided by the Housing Development Board (HDB). In 1981 the home ownership scheme was expanded, as CPF funds were made available to buy private residential houses.

13. The impact of these measures on home ownership has been remarkable. In 1995, 81 percent of the total population lived in owner occupied public flats, and 62 percent of CPF members owned houses purchased with CPF funds. In 1998, public housing and residential property schemes accounted for 58 percent of total withdrawals, against the 9.4 percent of the withdrawals for reaching 55 years of age.

14. The predominant role played by housing withdrawals implies that Singaporeans tend to be "asset rich but cash poor." In the present circumstances, to assure sufficient funds in old age CPF members would need to be able to either (i) disinvest at retirement, by selling and downgrading their housing, or (ii) access a reverse mortgage. However, so far there has been no sign of the adoption of these practices on a large scale, as the elderly still count on family support as their main source of income. As noted above, population aging will make it increasingly difficult to rely on children support as well as housing disinvestment. In particular, in the absence of either strong immigration flows or very high productivity growth, the prospect of problems in the housing market arising from excess supply cannot be ruled out. This perspective makes the investment in housing very risky, and would argue for a much greater degree of diversification in the use of CPF savings.

15. As early as 1986 the authorities recognized the need to provide incentives to CPF members to diversify their investments. In 1986 they permitted small withdrawals for investments in approved stocks. In 1993 and 1997, the size of permitted withdrawals for this purpose was increased and the range of assets widened. However, these incentives have not had the same effect as in the housing scheme. In part this is because CPF members must satisfy the minimum sum requirement before they are allowed to withdraw funds for investments in financial assets. Withdrawals for housing are the only ones not subject to the

Box IV.2. Evolution of CPF Withdrawal Rules

1955 ***Retirement withdrawal***: CPF savings can be withdrawn at the age of 55, or if the member becomes permanently disabled or leaves Singapore permanently.

1968 ***Public housing scheme***: Members can use up to 100 percent of the Ordinary Account savings to buy public flats from the Housing and Development Board. If taking up a loan they can use future CPF contributions to pay installments.

1978 ***Singapore Bus Services (SBS) limited share scheme***: Members are allowed to use CPF savings to buy SBS shares.

1981 ***Residential property scheme***: Private residential properties are included in the housing withdrawal scheme.

1982 ***Home protection insurance scheme***: Withdrawals permitted to buy mortgage insurance which helps the insured members and their families pay off their outstanding housing loans in the event of the insured members' permanent incapacity or premature death before age 60.

1984 ***Medisave account***: Introduced to ensure savings that can be used for meeting hospital expenses.

1986 ***Approved investment scheme***: CPF members are allowed to withdraw 20 percent (40 from 1987) of their CPF savings above the Minimum Sum for investment in gold, approved stocks, and bonds and approved unit trusts.

1987 ***Minimum sum***: At the age of 55 a member can withdraw his saving from the Ordinary and Special Accounts as a tax exempt lump-sum after setting aside a Minimum Sum in the Retirement Account. This amount, initially S$30,000, has increased steadily since 1987, currently is 60,000 (2/3 of which can be pledged in property) and is going to be S$80,000 by the year 2003 (with 50 percent as a limit on the pledged property). From the retirement age, currently 62 years (increasing to 67 by 2003), each member may receive a monthly income from this sum (plus interest). Alternatively, he may use it to buy an approved life annuity or may deposit it in an approved bank.

1989 ***Family protection schemes***: CPF members may use their Ordinary Account savings to pay the premium toward a life-insurance scheme (should the member die or become permanently incapacitated, his family will receive up to a certain amount, currently $36,000)

1989 ***Education scheme***: Members can use up to 40 percent of their CPF balance (Ordinary and Special Account savings plus the amount of CPF that has been withdrawn for housing, investment and education) in excess of the Minimum Sum to pay tuition fees for full-time degree and diploma courses at approved tertiary institutions in Singapore. Since 1989 the withdrawal limit has risen, and is currently 80 percent.

1990 ***Medishield***: Medical insurance scheme designed to help meet the cost of large medical bills and whose premium is deducted from the Medisave Account.

1993 ***Basic and enhanced investment scheme***: These schemes replace the Approved Investment Scheme. Under the Basic scheme a CPF member can withdraw up to 80 percent of his CPF balance in excess of the Minimum Sum for investment in gold, approved securities and approved unit trusts. Under the Enhanced Scheme he could withdraw up to 80 percent of CPF savings in excess of S$50,000 for investment in a broader range of financial assets.

1997 ***CPF investment scheme***: Replaces the Basic and Enhanced Approved Investment Scheme. This scheme allows members to invest up to 100 percent of their CPF balance in excess of the Minimum Sum (or the remaining balance of the Ordinary Account after setting aside the required cash component of the Minimum Sum, whichever is the lowest) into fixed deposits, insurance policies, Singapore Government or Statutory Boards bonds, approved unit trusts and fund management accounts (which are governed by investment guidelines set by the CPF Board). Moreover, the scheme allows investment of up to 50 percent of the CPF balance in excess of the Minimum Sum into shares, corporate bonds and loan stocks listed on the mainboard of the SES or SESDAQ and traded in Singapore dollars, and up to 10 percent in gold.

restriction that CPF members must maintain minimum balances in their retirement accounts. Moreover, housing is the only asset eligible to make up the non-cash component of the minimum sum.[9] Together with the subsidized mortgage rates offered by the HDB, these rules impart a strong bias in favour of housing.

16. In a nutshell, CPF has been transformed from a simple pension fund to a multi-purpose scheme, which has been used both as a channel of resource allocation and as a macroeconomic stabilization device.[10] In particular, contribution rates have tended to be used pro-cyclically—decreased in order to improve competitiveness during recessions and increased to mop up liquidity during booms. Further, in most instances when the contribution rate was reduced, the cut involved mainly the contribution to the Special Account, which is associated with savings for the old age. For example, in response to the recessions in 1985–86 and 1997–98, the contribution rate to this account was temporarily reduced to zero.

17. The remainder of this paper focuses on the following point: with the objective of universal home ownership basically fulfilled and with the demographic changes approaching, the problem of insufficient funds for retirement calls for a re-design of the scheme, marked by a smaller emphasis on housing and an increased emphasis on its original role as a core pension fund.

C. Government Reforms

18. As previewed above the Singapore authorities have been aware of the problem associated with financial security in the old age. Over the past years, several measures have been taken to improve the adequacy of CPF in providing for post-retirement support. Among the most significant ones are the following:

- CPF members have been allowed greater scope to invest CPF funds in the financial market for the purchase of approved stocks and approved unit trusts, and the rules governing investments by the unit trusts have been substantially liberalized and the disclosure requirements greatly enhanced (see Asher, 1999);

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[9] A CPF member can use up to 100 percent of his Ordinary Account saving to purchase a residential property either public or private. As there is no guarantee that his Special Account covers the Minimum Sum (in its cash component), he can well find himself without this amount at retirement (in which case he can still withdraw at least half of what is left in his Ordinary and Special Accounts). The other schemes prevent this from happening, as they only allow the use of CPF balances in excess of the Minimum Sum, or of the remaining balance of the Ordinary Account (after setting aside the required cash component of the Minimum Sum), whichever is the lowest.

[10] This has been recognized by various commentators. For example, Asher (1999) states that: "the various investments and other schemes have enabled the government to direct a significant part of the disposable income towards government determined socio-political and economic objectives." And Low and Aw (1997) note that through CPF "consumption is strategically guided into desirable merit commodities, like housing, rather than frivolities."

- the Minimum Sum to be kept in the Retirement Account will be increased every year in order to reach S$80,000 by 2003 (from its original amount of S$40,000 in 1995);

- the proportion of the Minimum Sum that can be pledged in housing will be reduced to 50 percent in 2003 (it was 90 percent in 1995).

19. As a response to the tight labor market, the minimum retirement age was raised from 55 to 60 in 1993 and will reach 67 by 2003. However, the withdrawal age has remained at 55, and after that age the contribution rates are drastically lower (see Box IV.2).[11]

20. The budget for the year 2000/01 contains several measures involving income for retirement. In particular, (i) tax exemptions will be extended to annuities bought with CPF savings beyond the minimum sum; (ii) tax relief for support provided to aged parents and for the topping-up of their CPF funds will be increased; and (iii) additional saving within the Supplementary Retirement Scheme will be deductible at the time of contribution (with taxes being payable only when the savings are withdrawn). However, the efficacy of tax incentives in solving the problem of inadequate retirement funds for those in the lower income brackets is weakened by the fact that only 35 percent of the population pays income tax.

21. The authorities established in 1998 an Inter-ministerial Committee to study the potential problems arising from the demographic transition in Singapore. The key recommendations relating to the CPF are: (i) to increase the contributions paid to the Special Account (from 4 to 8 percent); (ii) to increase the cash component of the Minimum Sum beyond the 50 percent planned for 2003; and (iii) to peg the interest rate on savings in the Special Accounts to the rate of return of long term investments. The report states that these measures "*should generate an annuity corresponding to the prescribed subsistence level...Beyond this basic level every individual should ascertain his or her desired standard of living and make independent provision.*"[12]

22. With respect to the last recommendation on additional saving outside the CPF, there is some question about whether Singaporeans are in a position to contribute 40 percent of their labor incomes to the CPF and simultaneously take more responsibility for additional savings. Estimates of private non-CPF saving in Singapore vary widely. Low (1997) concludes that private non-CPF savings in Singapore is quite high (around 56 percent of the gross national saving in 1995). However, only the central government current surplus rather than the public sector operating surplus is counted as public saving. Moreover, no distinction is made between corporate and household saving. Using the 1993 Household Expenditure

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[11] This structure of contribution rates can also be seen as a measure against the bottlenecks arising from the labor market, as lower contribution rates should encourage the employment of older workers (see Low and Aw, 1997).

[12] The level of subsistence advocated by the report is not clearly specified. In their simulations on the replacement rates provided by the scheme, CPF officials assume that the minimum standard of living is guaranteed by S$300 per month. The average earning per month is currently around S$3,000.

Survey, Wong and Donghyun (1997) state that voluntary saving comprised only 5 percent of total household savings in 1993.[13] Husain (1995) finds that there is a nearly complete offset in voluntary (non-CPF) saving by households, resulting from increases in CPF savings. This suggests that unless CPF contribution rates are lowered the scope for additional household saving is likely to be limited.

D. Options for a Comprehensive Reform

23. The measures taken so far by Singapore authorities to address the inadequacy of the CPF are steps in the right direction, as they try both to stimulate a higher return on these funds (by giving members more freedom to invest in the financial market) and to impose more stringent restrictions on pre-retirement withdrawals. However, questions remain as to whether these measures are capable of significantly improving the replacement rates provided by the CPF or whether there is a need for a more substantial modification, possibly a re-engineering of the scheme.

24. In order to answer these questions a simple simulation is performed that permits the estimation of the replacement rate that a representative CPF contributor may expect on retirement, allowing for typical withdrawals on housing, education, health care and investments. Box IV.3 shows the assumptions used to generate the replacement rates implicit in the current CPF scheme.

25. Table IV.4 shows the results of the simulation in the baseline scenario, together with some sensitivity analysis on the relative importance of higher returns and lower withdrawals for housing. The key finding is that the low replacement ratios characterizing the CPF are mainly due to the withdrawal of funds before retirement, in particular for the house-ownership scheme. With no withdrawal for housing, the replacement ratio would more than double (case 3), while even doubling the rate of return the current average housing withdrawal would keep the ratio at a relatively low level (case 2).[14]

26. Table IV.5 presents an alternative scenario with a more narrowly focused CPF scheme. If withdrawal is allowed only at the age of 65, a larger replacement rate can be achieved through the combination of either smaller, age-independent contribution rates and a higher real return (case 4); or of larger contribution rates and a lower return (case 2). Both larger contribution rates and a higher real return on savings would allow a much higher replacement ratio (60 percent) to be reached at the age of 60 (case 5).

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[13] Moreover, Wong and Donghyun (1997) also quote Prime Minister Goh Chock Tong saying that "*many Singaporeans do not save anything beyond what was in their CPF accounts*" (*The Sunday Times*, October 6, 1996).

[14] The simulations focus only on the replacement rates for those who start working today and ignore old Singaporeans, who have not contributed to the CPF for their whole working life and thus are likely to face even smaller replacement rates.

Box IV.3. CPF Replacement Rates: Main Assumptions Underlying the Baseline Scenario

Wage profile

The representative Singaporean enters the labor market at the age of 20 and contributes without interruption to the CPF until he retires. The wage profile is obtained by assuming an initial wage of S$10,000 (according to the General Household Survey, 1995, the average income from work for those aged 15–19 was around S$9,000) and annual real wage growth of 4 percent (in the period 1985–98 the average monthly earnings deflated by the CPI grew at an average of 4.2 percent).

Contributions

The individual contributes to the CPF according the targeted long-term (pre crisis) structure of contribution rates as showed by the table.

CPF Contribution Rates

(In percent)

Age	Ordinary Account	Special Account	Medisave	Total
-34	30	4	6	40
35–44	29	4	7	40
45–54	28	4	8	40
55–59	12		8	20
60–64	7		8	15
65+	2		8	10

Return on savings

The real rate of return on CPF is assumed to be 2 percent.

Withdrawal for housing

At the age of 30, the representative Singaporean buys a flat with a 20 percent cash down-payment financed by his CPF funds. For the following 25 years he uses his CPF funds to repay the loan contracted with the HDB at a mortgage rate equal to the CPF rate plus 0.1 percent. As most of the Singaporeans live in flats built by the HDB the housing cost is the average direct purchase price from HDB for a two bedroom flat (S$70,000), a three bedroom flat (S$100,000) and a four bedroom flat (S$130,000).

Other withdrawals

As for the other types of withdrawal, they are assumed to occur at the average rates (across the whole population and for the last three years). These are equal to 2 percent of total contributions for Medisave, and to 23 percent of total contributions for both education and asset investments. While Medisave withdrawals start at the age of 20, the other types of withdrawal start only when CPF funds are in excess of the Minimum Sum (equal to S$60,000).

Return on annuities

CPF funds withdrawn at retirement are converted into annuities at a real rate of return of 4 percent.

Table IV.4. Replacement Rates of CPF

(In percent)

	Retirement Age		
	55	60	65
Baseline 1/	28.2	31.5	36.8
High Return 2/	34.4	40.9	51.1
No housing withdrawals 3/	59.5	68.5	82.5
Low housing withdrawals 4/	33.1	37.2	43.7
High housing withdrawals 5/	18.8	20.4	23.1
High return and high housing withdrawals 6/	19.5	22.0	25.9

1/ R= real rate or return on CPF contributions. R = 2 percent; house price = S$100,000.
2/ R = 4 percent; house price = S$100,000.
3/ R = 2 percent; house price = 0.
4/ R = 2 percent; house price = S$70,000.
5/ R = 2 percent; house price = S$130,000.
6/ R = 4 percent; house price = S$130,000.

27. These results suggest that a more narrowly focused CPF scheme, explicitly and solely targeted to old age support, could achieve larger replacement rates. The main characteristics of such a scheme would be:

- a much smaller contribution rate, that remains constant from the beginning of contribution to the final withdrawal
- the aligning of the age of final withdrawal with the retirement age
- the absence of pre-retirement withdrawals
- a larger return on savings (to be achieved through a greater freedom in investment choices)

Table IV.5. Replacement Rates of a "Restricted" CPF

(In percent)

	Retirement Age		
	55	60	65
R = 2 percent; contribution = 15 percent	25.3	32.1	42.9
R = 2 percent; contribution = 20 percent	33.7	42.8	57.3
R = 3 percent; contribution = 15 percent	29.6	38.3	52.3
R = 4 percent; contribution = 15 percent	34.9	46.2	64.5
R = 4 percent; contribution = 20 percent	46.6	61.6	86.1

Note: In all cases the contribution rates remain constant over the whole working period.

28. The low contributions associated with this version of the CPF would provide scope for individuals to use their discretionary saving for the purchase (or rental) of a house and for covering education and medical care needs.

29. As for the return on CPF funds, contributors should be able to choose the combination of return and risk that they prefer. However, the experience of the CPF Investment Scheme has revealed that individuals accessing capital markets tend to face very high transaction costs (administrative and management fees, bid-ask spreads etc.). To prevent these costs from reducing the incentives to seek higher returns on CPF savings, the CPF board could act as an intermediary which pools the funds from the different accounts and transacts with the market (that is, with unit trusts and fund managers) on a wholesale basis, thereby bargaining down transaction costs and monitoring the performance of the managers.[15]

30. Further, the success of any individual account scheme in providing for old age financial security depends on the existence of a well-developed private market for real (inflation indexed) annuities. As in other industrialized countries such a market is still lagging in Singapore, and measures should be taken to encourage its development. Among them (and in the light of the planned development of a bond market in Singapore) is the issuance of government indexed bonds (promising a fixed real return) which would make it possible for the insurers to offer real annuities without bearing inflation risk (see Brown, Mitchell and Poterba, 1999).

E. Summary and Concluding Remarks

31. Singapore's Central Provident Fund began as a mandatory, individual-account scheme initially designed to provide financial means for retirement and was gradually transformed into a multi purpose program used (a) to channel resources toward government determined social and economic targets and (b) for macroeconomic stabilization.

32. While the CPF has been very successful in mobilizing savings, problems have risen with regard to its original role of pension fund, and thus far the most important source of income for the aged is the financial support provided by their children. Low fertility rates and rising longevity will make it increasingly difficult to overcome the inadequacy of CPF pensions through intergenerational redistribution.

33. The two main weaknesses of the CPF as a pension fund can be identified as low returns and heavy pre-retirement housing withdrawals. The authorities are trying to address the problem by giving CPF members more freedom to invest in financial markets and by reducing the bias in the scheme toward investment in housing. At the same time, Singaporeans are encouraged to save more if they want to achieve higher standards of living in retirement.

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[15] The centralization of the investment function with professional fund managers selected and monitored by the Board is not a new concept in Singapore, as this is the what happens with the Saver Scheme of the Armed force (see Asher, 1999).

34. An alternative proposal is presented here based on (a) a re-design of the CPF to narrow its focus to being a core pension fund which pays a market-related rate of return and (b) the development of other markets-mechanisms to increase discretionary saving outside the CPF and invest it in financial instruments, that would provide greater protection against longevity risk. According to this proposal CPF members would contribute to a "no-withdrawal" account for their whole working life at a constant contribution rate that is lower than at present, while choosing among different risk-return profiles for the investment of their CPF savings.

35. Simple simulations show that such a core CPF pension fund would help achieve replacement rates in line with those of other industrialized countries. Further, the lower contribution rate would provide scope for individuals to use their discretionary saving to satisfy pre-retirement needs (housing, medical care, education) and/or to build up funds for a supplementary pension.

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V. Generational Accounts for Singapore: Is Singapore Ready for the Demographic Transition?[1]

A. Introduction

1. Prudent fiscal policies have been the cornerstone of Singapore's financial management, with the government budget recording an overall surplus in every year but two since 1970. Between 1970 and 1990, the overall surplus averaged around 4 percent of GDP. In the 1990s, prior to the Asian crisis, overall surpluses grew especially large. Between 1990/91 and 1997/98, the overall surplus averaged 11½ percent of GDP. These surpluses (together with balances in the CPF—discussed in Chapter IV) have been used to accumulate assets, mostly through overseas portfolio investment. By March 2000, it is estimated that gross government assets were the equivalent of over 200 percent of GDP, while net assets (gross assets less explicit liabilities) were estimated to be equal to about 125 percent of GDP.

2. The accumulation of sizable estimated net government assets has generated interest in Singapore's medium- and long-term fiscal policy stance. A 1997 IMF study of the long-term fiscal policy stance suggests that, even taking into account the impact of population aging on revenues and expenditure, under present policies the government would continue to accumulate assets at a rapid rate. The study concluded that "While economics were not the only consideration, from a welfare perspective, there appeared to be a strong case for a larger reduction in the fiscal surplus over time than presently planned...."

3. This paper uses the generational accounting framework with a view to assessing the sustainability of fiscal policy and measuring the fiscal burdens facing current and future generations as a result of current fiscal policies (Auerbach, Kotlikoff and Leibfritz, 1999). The growing interest in generational accounting amongst policy makers has been stimulated by the rapid aging of the population that is taking place in their countries (Kotlikoff, 1993). In most cases, the conduct of past fiscal policies implies the prospect of funding large fiscal bills in the future. The key question in these cases is how large a fiscal burden current fiscal policy leaves to future generations and what additional measures are necessary to ensure that future bills can be paid. In the case of Singapore, the accumulated net asset position suggests a different question, namely, whether Singapore is prepared for the fiscal pressures likely to arise from the demographic transition (see Chapter IV). The methodology outlined in this paper could provide an organized framework in which to simulate the impact of aging and other structural changes on revenues and expenditures on the public finances and thereby, examine the present versus future orientation of fiscal policy.

4. It should be emphasized, at the outset, that the discussion in the paper is based on illustrative scenarios showing the long-term implications of current fiscal policy using the generational accounting framework, where the emphasis is on the impact of demographic changes. The main objective of the methodology is not to make specific recommendations

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[1] Prepared by Roberto Cardarelli (x38059) who is available to answer questions.

about fiscal policy changes, but to highlight the implications of current policies in the face of the likely effects of the demographic changes. Any policy implications of these results can only be drawn in the context of a broader analysis, which takes account of the authorities' objective function and a more extensive examination of underlying economic and structural assumptions. The results of the exercise in this paper should therefore be seen as illustrative and not as specific policy recommendations.

5. The rest of the paper is organized as follows. Section B briefly outlines the concepts behind generational accounting and Section C describes the indicators used to assess long-term fiscal imbalances[2]. Section D discusses the data and the mechanics of estimating generational accounts for Singapore, Section E presents the key findings and Section F concludes.

B. What Are Generational Accounts?

6. In simplest terms, generational accounting is based on the government's intertemporal budget constraint, which requires that either current or future generations pay the government's bills—defined as the present value of the government's projected future purchases of goods and services taking into account what is needed to service its official net financial liabilities or what is earned on the stock of net assets. Subtracting from these bills the present value of projected future net tax payments of current generations gives the present value of the net tax burden facing future generations as a result of current fiscal policies. By comparing the growth-adjusted lifetime net tax burden facing members of future generations with that facing current newborns (who are assumed to pay only the net taxes implied by current policies), it is possible to assess the generational imbalance and the sustainability of current fiscal policies. [3]

7. Generational accounts are thus defined as the present value of net taxes (taxes paid minus transfer payments received) that individuals of different age cohorts can expect, under current policies, to pay over their remaining lifetimes. Adding up the generational accounts of all current living generations gives the collective contribution of those generations toward paying the government's bills. According to the government's intertemporal budget constraint those bills left unpaid by current generations must be paid by future generations. This intertemporal budget constraint can be expressed in a simple equation as shown in Table V.1, where A is the sum of the generational accounts of those currently living, B is the sum of the generational accounts of future generations, discounted to the present, C is the government's net debt or net wealth, and D is the sum of future government purchases, discounted to the present (see Table V.1). For a size of the government's bills, C+D, the

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[2] For a more detailed description see Cardarelli, Kotlikoff and Sefton (1999).

[3] It is important to note that the generational accounting framework can only evaluate the generational imbalance between current and future generations and not past generations. The burden borne or benefits enjoyed by past generations is only taken into account through the inclusion of accumulated net wealth or debt in the intertemporal budget constraint.

smaller is A, the net payments by those currently living, the larger is B, the net payments of those yet to be born[4].

Table V.1. The Intertemporal Budget Constraint

Present value of net remaining lifetime taxes that will be paid by current generations (A)	+	Present value of net lifetime taxes that will be paid by future generations (B)	=	Government net financial debt (C)	+	Present value of current and future public expenditure (D)

8. As noted above, a key aim of generational accounting is to assess the sustainability and generational equity of fiscal policies. If the intertemporal budget constraint above holds as an equality, current fiscal policies are sustainable in the long term. In cases where countries have net debt, the **sustainability** condition amounts to imposing the familiar condition that current public debt cannot continually be serviced through the accumulation of further debt.[5] A symmetrical application of this condition in the case of net wealth is that the interest income from government wealth should be consumed rather than continually accumulated. While it is intuitive to see how a situation that gives rise to ever increasing debt is not sustainable, it is much less intuitive when the situation is reversed as in the case of Singapore where there is a sizable initial stock of public wealth. The concept of "sustainability" in this latter context is better understood in terms of optimality—i.e., whether it is optimal for a country to postpone consumption and accumulate an increasing stock of assets continuously into the future, or in terms of efficiency—i.e., to what extent it is efficient to accumulate public assets through taxation.

9. As for **intergenerational equity**, if future generations face a higher lifetime net tax burden than do current newborns, current policy is not generationally balanced. The same is true if future generations face a smaller growth-adjusted lifetime net tax burden than do current newborns.

10. The generational accounting framework provides a systematic framework for long-term fiscal policy formulation, but the approach also has several shortcomings (Haveman, 1994).

- First, it is a partial equilibrium accounting framework which does not take into account the behavioral changes induced by the implied changes in policies, and

[4] A more technical exposition is contained in the Appendix.

[5] It is worth stressing that this method does not impose the condition that public debt should be paid back, but only that fiscal policies should generate primary surpluses that allows the stock of debt to be serviced without recourse to further borrowing.

therefore their impact on GDP. For example, there are no consumption or labor supply responses to changes in taxes or transfers.

- Second, the framework does not allow for Ricardian economic agents who are altruistically linked to their descendants and use bequests to offset redistribution between generations caused by government policies. It is consistent with the neoclassical life-cycle model, which does not take into account either liquidity constraints or precautionary savings.

- Third, it does not take into account changes in the structure of the economy that are likely to occur in the longer-term horizon within which the framework is set.

- Fourth, the construction of generational accounts requires that taxes and expenditures be allocated to individuals of different ages. The construction of the tax and expenditure profiles is fraught with difficulties, requiring the use of assumptions, which in turn can affect the results of the analysis.

C. Indicators of Long-Term Fiscal Imbalance

11. How are long-term generational imbalances arising from fiscal policy evaluated within this framework? One indicator is calculated assuming that only future generations bear the whole burden of the adjustment arising from current fiscal policies. First, the net lifetime taxes of current living generations and the newborn is calculated, then the present value of government purchases is calculated, and finally, the accounts of all future generations are derived residually, as the amount of net taxes or net transfers that would satisfy the intertemporal budget constraint shown in Table V.1. Based on this amount, the average lifetime net tax payment of each future generation is estimated under the assumption that every future generation pays the same share of its lifetime labor income in net taxes, i.e., that each future generation faces the same lifetime net tax rate. By comparing the accounts (in terms of taxes due or transfers receivable) of the current generation (the term A in Table V.1) and the growth adjusted accounts of a future generation (the term B in Table V.1), one can therefore evaluate the imbalance implicit in current fiscal policies.

12. A second indicator of generational imbalances can be obtained assuming that future generations also face current fiscal policies (this amounts to applying to future generations the same relative age and gender profiles for taxes and transfers that apply to current individuals), calculating the difference in the generational accounts—the so-called intertemporal budget gap—and then obtaining a measure of the policy changes that may be needed to eliminate this gap. This method allows the estimation of immediate and permanent changes in specific taxes or transfer payments that would be necessary (for all generations) to close the intertemporal budget gap.

D. The Mechanics of Generational Accounting

13. Generational accounting extrapolates current fiscal policies into the future by projecting all taxes and transfers using the age and gender profiles and demographic projections.[6] The first step in constructing generational accounts for Singapore is to identify the set of aggregate taxes and transfers to be allocated among individuals of different age and gender. This exercise starts from the 1999 budget data on Singapore government revenues and on the functional classification of government expenditure (Table V.2).

Table V.2. Government Revenues and Expenditures, 1999

(In millions of Singapore dollars)

Revenues		Expenditure	
Operating revenues		Operating expenditure	
Income tax: personal	6,110	Health	944
Income tax: corporate	3,290	Education	3,420
Taxes on goods and services	7,098	Other social and community services	7,747
Taxes on assets	1,150	Security	1,085
Other tax revenues	3,819	Economic services	1,053
Nontax revenues	7,491	General services	876
Investment income	6,736	Development expenditure	
Capital receipts	6,634	Health	220
Operating surplus 1/	2,831	Education	1,706
Overall surplus 2/	5,700	Other social and community services	1,425
		Security	3,357
		Economic services	3,051
		General services	895
		Other current expenditure	348
		Debt servicing	839
		Net lending	9,362
		Fund transfers	300

1/ Operating revenues - Operating expenditure - Other current expenditure - Development expenditure.
2/ Total revenues - Total expenditure.

14. Several points are to be noted with respect to the data for Singapore.

- First, investment income and debt servicing are not included among taxes and transfers as they are already taken into account through their impact on the stock of net government financial assets.

[6] The age and gender profiles are meant to capture the status quo of fiscal policies. As they do not change in the future, the age- and gender-specific average tax and transfer amounts are equal to those for the base year, with an adjustment for growth. Apart from this scale factor, the aggregate amounts vary in the future only because of the changes in the demographic structure.

- Second, because net lending reflects loans to statutory boards that are repaid (with the exception of the subsidy to the Housing Development Board), they are not included in expenditure.

- Third, the treatment of capital receipts, which in Singapore mainly reflect revenues from leasing government owned land, is a difficult issue. Typically, the value of the government's physical assets (land, infrastructure, parks, etc.) are not included in measures of government wealth for generational accounting on the grounds that including such assets would have no impact on the estimated fiscal burden facing future generations—the projected flow of government purchases would have to be adjusted by an offsetting flow of imputed rent on these assets. In Singapore, however, capital revenues arise not from land sales but from long-term leases of government land. Therefore, in this paper, they are treated as part of revenues.[7]

15. The second step of generational accounting is to obtain an age and gender distribution of as many of these taxes and transfers as possible. This requires building age and gender profiles from household or individual survey data. Box V.1 describes the relative profiles that were built for Singapore. As most of the survey data refers to the age of either the head of the household or the main income earner, the general rule for distributing taxes and transfer payments is to allocate them to the head of the household, with no attempt being made to estimate the redistribution within the family.

16. For other expenditure items included in the government budget—security, social and community services other than health and education, economic services, general services, and other current expenditure—that cannot be distributed among age groups, an artificial profile has been generated that allocates them uniformly among all age groups. The constructed profiles are shown in Figure V.1.

17. The third step is to obtain an estimate of the government's net financial debt or wealth. In the case of Singapore, this task is complicated by the lack of complete information on the government's net asset position. For the purposes of this analysis, government net wealth is estimated from the statement of assets and liabilities published in the 2000 budget, which reports the net financial assets for the fiscal year 1999/00. Two caveats are in order here. First, from the assets (which includes cash, investment and others, for a total of almost S$319 billion) only the liabilities reported in the Government Securities Fund are subtracted. All other funds are not considered as financial liabilities because they do not represent explicit expenditure commitments, but are more in the nature of contingency funds. Second, any potential underestimation of the financial liabilities resulting from this assumption will likely be offset by the fact that the assets are reported at their historical book value rather than at market value. These assumptions produce an estimate of net government financial wealth of around S$181 billion or about 125 percent of GDP.

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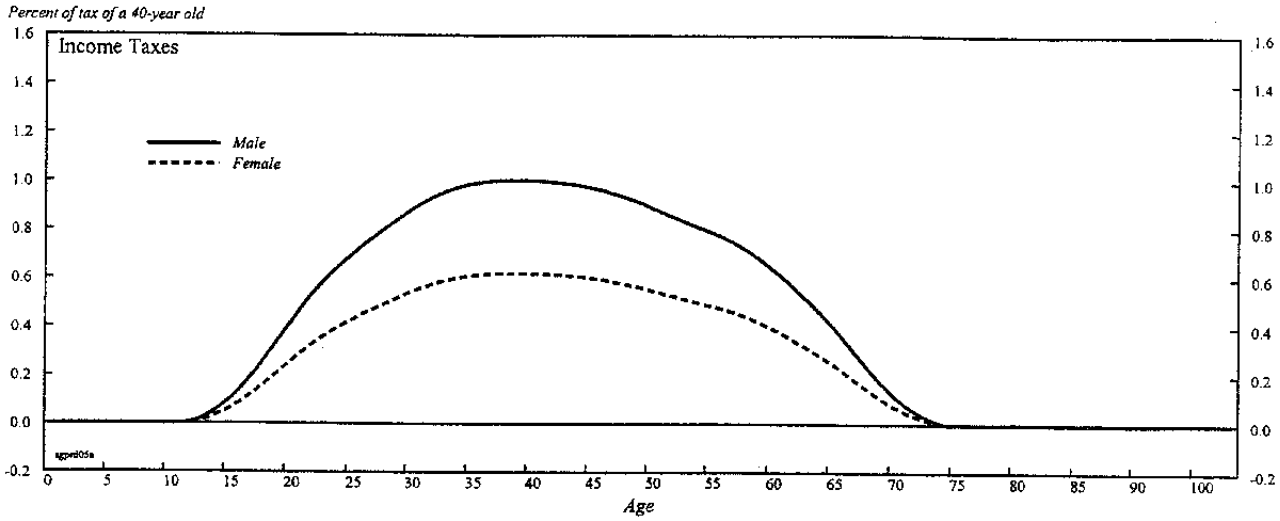
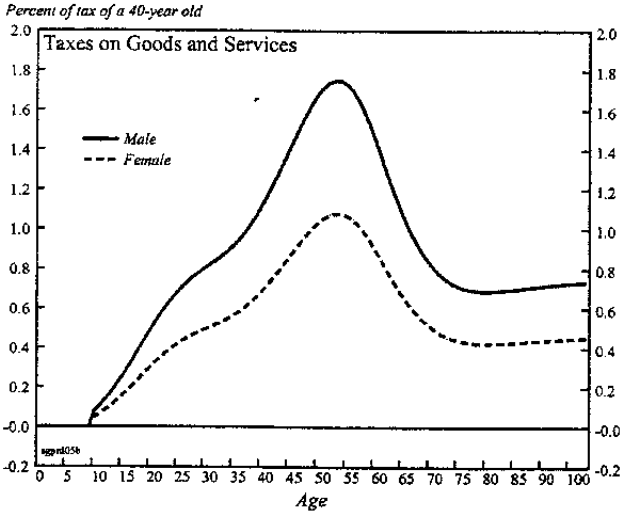
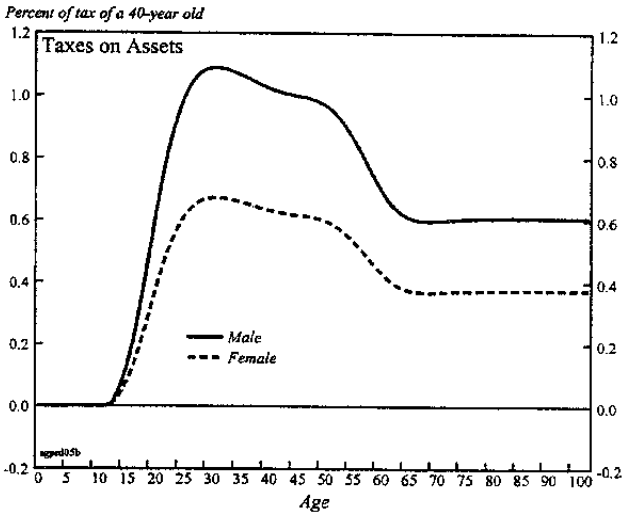
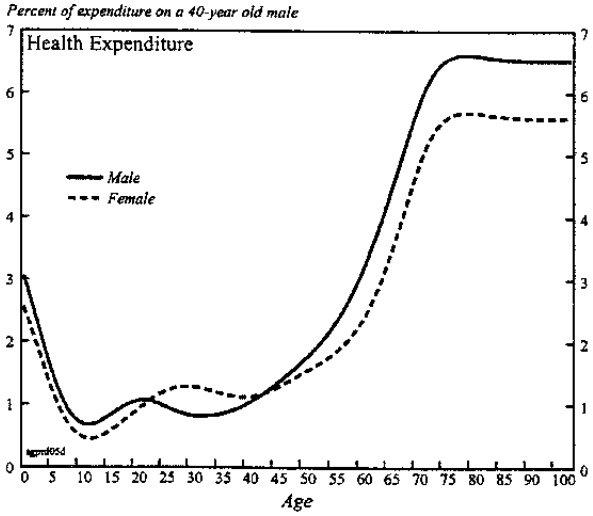
[7] Alternative scenarios in which revenue from land leases is excluded from the generational accounts are also discussed to evaluate the sensitivity of the results.

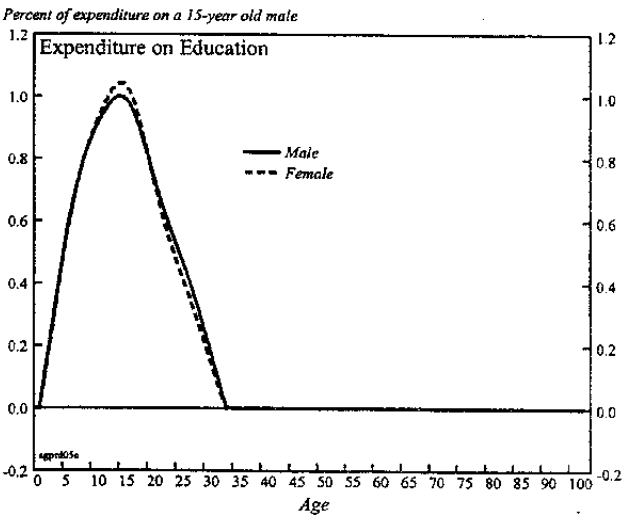
Figure V.1. Singapore: Relative Profiles











Source: Staff calculations.

Box V.1. Relative Age and Gender Profiles of Taxes and Transfers

- **Income taxes**: The age and gender profile for income taxes has been obtained using the median monthly income by age groups contained in the General Household Survey (Socio Demographic and Economic Characteristics) 1995, undertaken by the Department of Statistics. This profile is applied to income taxes paid by both the household and the corporate sector. The reason is that in the case of small open economies, like Singapore, corporate income taxes are assumed to be borne by (and are therefore allocated to) labor. This profile is applied also to capital receipts, other tax revenues and other non tax revenues.

- **Taxes on goods and services**: This profile has been built using the average monthly expenditure per household by the age group of main income earners, as showed in the Report on the Household Expenditure Survey, 1992/3, published by the Department of Statistics.

- **Taxes on assets**: This tax is allocated using the data on the assets owned by age group of main income earners (in addition to a household own residence), contained in the Report on the Household Expenditure Survey, 1992/93.

- **Health expenditure**: This expenditure has been distributed using the admission rates of public sector hospitals by age and gender, as published by the Ministry of Health, 1997.

- **Education expenditure**: This profile has been built using the number of resident students aged 5 years and over by age and gender, reported in the 1995 General Household Survey, and giving a larger weight on the age groups in the university education (under the assumption that university education is more expensive, on a per capita basis).

18. The final step is the estimation of long-term projections of population by age and sex. For the purpose of this study, demographic projections made by the World Bank in 1996 are used. These projections are based on the following assumptions. The total fertility rate rises slowly from the current low level (1.8) toward levels that are closer to the replacement rate (around 2.1 by 2150); life expectancy at birth, which as an average for men and women is 75 in 1999, rises to approximately 80 in 2030 and 86 in 2150; and, finally, annual net migration is assumed to decline linearly to zero from a rate of change of around +5 percent in 1999. Under these assumptions, the old age dependency ratio (the ratio between the number of those aged 65 or more and those aged 18–64) jumps from the current 10 percent to 30 percent in 2025, and reaches around 40 percent in 2050 before settling at around 35 percent thereafter.

E. Sustainability and Intergenerational Equity in Singapore

19. Five scenarios are examined to study the issue of intergenerational equity and sustainability of fiscal policies in Singapore. All scenarios use the population projections outlined above, and all are based on the same assumptions about labor productivity growth—namely, that labor productivity grows at 3½ percent per annum until 2020 and at 2 percent per annum thereafter. All future taxes and transfers are discounted at a rate of 5 percent per annum.[8] Theoretically, generational accounts are derived in an infinite horizon framework. In the empirical work discussed here, the horizon converges at 200 years given the range of chosen discount rates. Different assumptions about the treatment of revenues from leasing land, and the structure of taxes and spending are made in the different scenarios, with Scenario 1 corresponding to current fiscal policies (or the status quo), and the impact of the projected demographic trends.

Table V.3. Singapore's Generational Accounts

(In 1999 Singapore dollars)

Age of current living cohorts	Per capita taxes (+) or transfers (-)		
	Average	Male	Female
0 (newborn)	-20,063	70,909	-111,035
5	38,365	146,232	-69,501
10	108,026	228,036	-11,985
15	232,409	391,838	72,979
20	295,158	455,541	134,775
25	291,905	435,533	148,276
30	271,070	403,196	138,944
35	216,796	324,149	109,442
40	182,056	280,003	84,110
45	177,173	289,275	65,072
50	76,345	144,619	8,070
55	27,063	87,273	-33,146
60	-18,019	16,755	-52,793
65	-54,018	-27,963	-80,072
70	-56,194	-42,108	-70,280
75	-50,893	-42,713	-59,074
80	-33,179	-27,914	-38,443
85	-26,115	-21,924	-30,306
90	-20,612	-17,258	-23,966
95	-24,171	-20,171	-28,171

Scenario 1

20. Using the demographic projections, the age and gender profiles of all taxes and transfers, the rate of growth of labor productivity and the discount rate, and data on revenues and expenditures in 1999, generational accounts of currently living generations are calculated (Table V.3).[9] (The term A in Table V.1 can be derived by multiplying the per capita net tax/transfer figures shown in the second column in Table V.3 with the population in the corresponding age cohort and then summing over all living cohorts).

[8] This rate exceeds the real government short-term borrowing rate in most developed countries which seems justified given the uncertainties surrounding the revenue and expenditure flows being discounted. To further test the robustness of the simulations, results based on a range of alternative discount rates are presented.

[9] Any other change in the economic structure (i.e., labor force participation rates and unemployment rate) and in immigration flows (beyond what is implicit in the demographic projections) are ignored.

21. Table V.3 shows that those born in 1999 will receive on average from the state during their lifetime a net transfer of around S$20,000 (in 1999 prices). The net transfer received by a newborn female is larger than the net tax paid by a newborn male, a difference mainly due to the smaller amount of taxes paid by women because they have lower labor force participation rates.[10] The average currently living cohort between the ages of 5 and 60 is a net payer of taxes over the remainder of their lifetime, with the highest amount of net taxes being paid by the cohort currently aged 20–25 for men, and 25–30 for women. Cohorts older than 60 begin receiving a net transfer from the state targeted to the elderly (such as pensions and health care services).

22. As for intergenerational equity, the two measures of long-term fiscal imbalance are shown in Table V.4.

Table V.4. Generational Accounts

Scenario 1

	Average	Male	Female
	(In 1999 Singapore dollars)		
Per capita transfers received by newborns	-20,063	70,909	-111,035
Per capita transfers received by future generations	-386,096	-295,124	-477,068
Difference	366,033		
	(In percent of GDP)		
Intertemporal budget gap	-375		

- First, a comparison of the generational accounts for newborn and future generations implies a significant increase in net transfers to future generations. While the generation born in 1999 receives, on average, S$20,000 of net transfers from the state, future generations will receive around S$386,000 at 1999 prices. This result stems from the combination of surpluses and a large stock of government wealth in the base year.[11]

- The second measure—the intertemporal budget gap—is negative and equal to about 375 percent of GDP. Such a gap suggests that there is an adequate cushion to meet the needs of an aging population and that there may also be scope for a reduction in taxes, increases in expenditures or some combination of the two.

[10] The distinction between men and women should not be taken too literally in this context, as the methodology does not capture the redistribution within the family (and thus between partners) of the burden and benefits associated with taxes and transfers.

[11] One source of the estimated generational imbalance could be the implicit tax arising from the difference between returns on the CPF funds invested by the Government Investment Corporation and the returns actually credited to the members' accounts (Asher, 1999). In the generational accounting framework, this tax emerges from the difference between investment income and debt servicing, which is capitalized in the stock of government wealth. This would also imply that the effective tax burden is substantially higher than measured tax rates would suggest.

23. Table V.5 shows that these results are quite robust to changes in assumptions about the discount rate or in the labor productivity growth rate. The fiscal imbalance becomes smaller for higher values of real productivity growth and/or lower discount rates. This is because the smaller is the difference between the interest rate and the rate of growth of income, the smaller is the present value of the interest income that must be distributed in order to restore sustainability.

Table V.5. Scenario 1: Sensitivity Analysis

Labor productivity Growth (Π)	Discount rate r	Difference in net lifetime transfers between newborns and future generations 1/	IBG 2/
1999–2020:	3	279,841	-635
3.5 percent	5	366,033	-375
2021+: 2 percent	7	449,547	-288
	3	121,058	-1000
1999+: 3.5 percent	5	219,609	-454
	7	315,128	-306

1/ In 1999 Singapore dollars per capita.
2/ In percent of GDP.

24. The remaining scenarios examine different assumptions about the likely evolution of expenditures and revenues to determine whether the financial cushion will remain in place, despite aging, rising health care costs and possible erosion in the revenue base in an increasingly digital world.

Scenario 2

25. This scenario is based on the same assumptions as Scenario 1 with one important exception. It makes the conservative assumption that revenues from land leases are excluded from the total revenues, for the reasons discussed above. As shown in Table V.6, excluding receipts from land leases reduces the size of the gap but does not reverse the result that future generations will receive larger transfers than current living generations. The intergenerational budget gap is reduced to 150 percent of GDP.

Table V.6. Imbalance Indicators in Different Fiscal Scenarios

	Difference in net lifetime transfers between newborns and future generations 1/	IBG 2/
Scenario 1	366,033	-375
Scenario 2: Scenario 1 excluding revenues from land leases	165,095	-153
Scenario 3: Higher expenditure on health and education	272,969	-226
Scenario 4: Scenario 3 but with lower Revenues and lower capital expenditure	244,090	-200
Scenario 5: Scenario 3 excluding revenues from land leases	71,314	0

1/ In 1999 Singapore dollars per capita.
2/ In percent of GDP.

Scenario 3

26. The third scenario attempts to take into account the impact of aging on health and education operating expenditure over and above that implied by an increase in old-age dependency ratios. Specifically, operating expenditure on health is assumed to increase six-fold over the next 30 years, from 0.7 percent of GDP in 1999 to 3.6 percent of GDP in 2030, due to population aging, larger expenditure per hospital admission (reflecting the increase in demand for more qualified medical staff and better drugs and equipment), etc.[12] Moreover, operating expenditure on education is projected to increase to 4 percent of GDP in 2030, despite the aging of the population which would normally reduce this expenditure, because of an assumed increase in expenditure per student, higher student enrollment rates in each education category (primary secondary and tertiary education) and larger government subsidies. All other receipts and expenditures per beneficiary are assumed to grow in line with labor productivity.

27. Table V.6 shows the two measures of fiscal imbalance under these assumptions. Even incorporating a sizable increase in operating health and education expenditure, future generations will receive net transfers that are some S$273,000 higher than those received by current generations, and the estimated IBG will remain around 225 percent of GDP.

Scenario 4

28. The fourth scenario retains the assumptions made in Scenario 3 about health and education expenditures, but assumes (i) that operating revenues will decline as a percentage of GDP due to the competitive pressure on tax rates coming from globalization and to the decline of the tax base caused by the rise in e-commerce; (ii) that capital receipts will fall as a result of a moderation in land sales and leases; and (iii) that other operating expenditure will remain constant as a share of GDP and total capital expenditure declines marginally as a share of GDP.[13] Table V.6 indicates that the finding that fiscal policies are oriented towards the future is not reversed.

Scenario 5

29. The final scenario retains the assumptions made in Scenario 3 about health and education expenditure, but reverts to the conservative assumption of excluding revenues from land leases. This scenario is thus based on the most conservative set of assumptions in this paper. In this case, the simulations suggest that the intergenerational imbalance is largely eliminated. The results suggest that future generations will still receive slightly larger

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[12] It should be noted that these are more conservative estimates than others in the literature. For example, Heller (1997) estimates the impact of aging and rising health care costs to result in an increase in health expenditures of less than 2 percentage points of GDP by 2030.

[13] For a fuller discussion of long-term fiscal projections based on these assumptions, see Annex III of accompanying Staff Report.

transfers than will current generations, but the IBG measure suggests that generational accounts for current and future generations are broadly in balance.

30. To summarize, the scenarios outlined above suggest that under various assumptions about the future path of revenues and expenditures, Singapore's fiscal position is well-equipped to handle the financial pressures that are likely to emerge from the aging of the population; rising health care costs; and downward pressure on revenues from globalization. Only in the case where revenues from land leases are disregarded altogether is the tilt of fiscal policies toward future generations eliminated; in other cases, there would be some scope to raise expenditures, lower taxes, or some combination of the two. However, to go from the results discussed here to specific policy recommendations about tax and expenditure policies in the future would require a discussion of the authorities' objective function and a fuller analysis of the underlying assumptions about the structure of the economy and other forces likely to impact fiscal and economic developments.

31. Two such assumptions are: first, the discount rate can be seen to represent not only the degree of uncertainty about future taxes and expenditures needs but also, more broadly, the degree of risk aversion on the part of the policymakers. In Singapore, the authorities believe that the small size of the country, political uncertainties in neighboring countries, and the lack of natural resources justify the accumulation of a sizable "rainy day" reserve. Taking account of a relatively high degree of risk aversion would imply a higher discount rate which, in turn, would imply a smaller imbalance across generations. The second assumption relates to immigration flows and labor force participation rates (especially by females). There is scope for these to be larger than assumed in this exercise. In this case, the future tax base is likely to be larger than under the baseline, thus tending to heighten the estimated tilt in favor of future generations.

F. Concluding Remarks

32. Generational accounting suggests that current budgetary policies in Singapore involve a significant redistribution between generations. Contrary to the majority of industrialized countries, however, for Singapore the redistribution is tilted toward future generations. The large stock of net wealth that has been accumulated through past fiscal surpluses is the channel through which this redistribution takes place. This stock of net wealth provides an adequate cushion to absorb not only the impact of aging but also rising health care costs, and downward pressure on tax revenues. Only in the conservative case where revenues from land leases are disregarded altogether is the generational imbalance eliminated.

33. One point that deserves emphasis in this context is that the tilt toward future generations of fiscal policy is mitigated by the intergenerational redistribution that occurs **within the family** in Singapore, spontaneously, and through both encouragement (via tax relief for financial support provided to aged parents) and enforcement (via the Parent Maintenance Act, which makes it illegal for a son not to take care of his aged parents). The extent of this redistribution is indicated by survey data which show that the most important source of income for Singaporean elderly is support from their children (Low and Aw, 1996). In this manner, the household sector partially offsets the redistribution across generations that occurs via public finances.

34. In conclusion, it bears repeating that generational accounting provides a different perspective on fiscal policy analysis than traditional measures and methodologies. Specifically, it raises the possibility that redistribution between generations is greater than traditional fiscal analysis might suggest. A discussion of any consequent need to adjust fiscal policy would hinge on an assessment by policy makers and the public of the extent to which such a redistribution is desirable.

A TECHNICAL EXPOSITION OF GENERATIONAL ACCOUNTING

The Government's Intertemporal Budget Constraint

The intertemporal budget constraint (with all variables expressed in real terms) can be expressed as follows:

$$(1) \qquad \sum_{s=0}^{D} N_{t,t-s}P_{t,t-s} + \sum_{s=1}^{\infty} N_{t,t+s}P_{t,t+s}(1+r)^{t-s} = \sum_{s=0}^{\infty} G_{t+s}(1+r)^{t-s} + D_t$$

- The term $N_{t,k}$ stands for the present value of the average remaining lifetime net tax payment - the generational account measured on a per person basis—at time t of the generation born in year k. The present value is formed as of year t for generations alive at time t and as of the year of birth for generations not yet born. For example, $N_{t,t}$ is the time-t present value of lifetime net tax payments of those born at time t, i.e., it is the generational account of time-t newborns; $N_{t,t-65}$ is the present value of the average remaining lifetime net tax payments—the generational account—of those who are 65 years olds at time t, and $N_{t,t+30}$ is the present value to the year of birth (t+30) of the average lifetime net tax payments—the generational account—of those who will be born 30 years from year t.

- The term $P_{t,k}$ stands for the time-t population of the generation born in year k.

- The term r is the government's real, before-tax, discount rate.

- The index k in this summation runs from t-D where D is the maximum length of life for each generation, assumed to be 100 years.

- The first summation on the left-hand side of (1) adds together the generational accounts of existing generations. The second summation on the left side of (1) adds together the present values of the generational accounts of future generations, discounted back to year t in the summation using the government's real, before-tax return r.

- The first term on the right-hand side of (1) expresses the present value of government purchases.

- The remaining term on the right-hand side (D_t) denotes the government's wealth, defined as financial liabilities minus the sum of its financial assets and the market value of its public enterprises. For Singapore, in the absence of a consolidated public sector accounts, this term includes only the net financial assets of the central government.

What is a Generational Account?

The generational account $N_{t,k}$ is defined by:

$$(2) \qquad N_{t,k} = \sum_{s=\max(t,k)}^{k+D} T_{s,k} \frac{P_{s,k}}{P_{t,k}} (1+r)^{-(s-t)}$$

where $\kappa=max(t,k)$. In expression (2) $T_{s,k}$ stands for the projected average net tax payment to the government made in year s by a member of the generation born in year k. The term $P_{s,k}$ stands for the number of surviving members of the cohort in year s who were born in year k. For generations who are born prior to year t, the summation begins in year t and is discounted to year t. For generations born in year $k>t$, the summation begins in year k and is discounted to that year.

The term $P_{s,k}/P_{t,k}$ indicates the proportion of members of cohort k alive at time t who will also be alive at time s. Hence, it represents the probability that a particular member of the year-k cohort who is alive in year t will survive to year s to pay the net taxes levied, on average, in that year on year-k cohort members. Hence, $N_{t,k}$ is an actuarial present value. It represents the average value in the present of the amount of net taxes that members of cohort k will pay in the future, where the averaging is over not just net tax payments, but also survivorship.

A set of generational accounts is simply a set of values of $N_{t,k}$, one for each existing and future generation, with the property that their combined present value, when multiplied by the appropriate, generation-specific population counts at time t, adds up to the right-hand side of equation (1). Though we distinguish male and female cohorts in the results presented below, we suppress gender subscripts in (1) and (2) to limit notation.

Tax and Spending Profiles by Generation

In equation (1), generational accounts reflect only taxes paid less transfer payments received. Producing generational accounts require projections of population, taxes, transfers, an initial value of government net debt and a discount rate. The typical method used to project the average values of taxes and transfer payments by age and gender starts with the value of the aggregate amounts of each type of tax and transfer payment in the base year. These aggregate amounts are then distributed by age and gender based on relative age-tax and age-transfer profiles derived from cross-section micro data sets.

Equation (3) helps clarify the method of distributing tax or transfer aggregates in a particular year to contemporaneous cohorts. Again, to simplify the presentation the distinction between genders is omitted:

$$(3) \qquad H_t = \sum_{s=0}^{D} T_{t,t-40} R_{t,t-s} P_{t,t-s}$$

In (3), H_t stands for an aggregate tax or transfer amount in year t (i.e., income tax payments). The term $T_{t,t-40}$ is the average amount of income tax paid by the generation that is age 40 in year t. $R_{t,t-s}$ is the relative distribution profile for income taxes in year t. Specifically, it stands for the ratio of the average income tax payment of members of the cohort born in year $t-s$ to the average income tax payment of 40 year-olds in year t. Finally, $P_{t,t-s}$ stands for the number of people in year t who were born in year $t-s$, i.e., it is the population size of the age $t-s$ cohort. Given H_t and the values of the $R_{t,t-s}$ and $P_{t,t-s}$ terms, one can use equation (3) to solve

for $T_{t,t-40}$. To form $T_{t,t-s}$, the terms that enter equation (2) that are used to calculate each current generation's account, note that

$$T_{t,t-s} = T_{t,t-40} R_{t,t-s}. \tag{4}$$

For all the years beyond the base one the following holds:

$$H_{t+j} = \sum_{s=0}^{D} \left(T_{t,t-40} R_{t,t-s}\right) (1+g)^{j} \; P_{t+j,t+j-s} \tag{5}$$

Hence, the age- and gender-specific average tax and transfer amounts are assumed to equal those for the base year, with an adjustment for growth.

Measures of Fiscal Imbalance Across Generations

1. In order to measure the generational imbalance one possibility is to assume that current fiscal regime apply only to currently living generations and that if a change in taxes and transfers is needed to restore sustainability, that would concern only future generations. Hence, given the right-hand side of equation (1) and the first term on the left-hand-side of equation (1), one finds, as a residual, the value of the second term on the left-hand side of equation (1), the collective payment required of future generations measured as a time-*t* present value.

Based on this amount, the average present-value lifetime net tax payment of every member of each future cohort is calculated using the assumption that each successive future cohort pays the same share of its lifetime labour income in net taxes (faces the same lifetime net tax rate). Assuming that earnings from labour grow in line with labour productivity, the net lifetime taxes for members of each successive future cohorts will rise at the economy's rate of labor productivity growth *(g)*.

More formally, let *N* stand for the growth-adjusted generational account of future generations. *N* is the amount that each member of a future cohort would pay in lifetime net taxes if her lifetime labor income were the same as that of a current newborn. Hence, the actual amount the cohort born in year *t+1* will pay is *N(1+g)*. The actual amount the cohort born in year *t+2* will pay is *N(1+g) 2*. The actual amount the cohort born in year *t+3* will pay is *N(1+g)3*, and so on. The value of *N* is found through the following equation:

$$\sum_{s=0}^{D} N_{t,t-s} P_{t,t-s} + \sum_{s=1}^{\infty} N(1+g)^{s} P_{t,t+s} (1+r)^{t-s} = \sum_{s=0}^{\infty} G_{s} (1+r)^{t-s} + D_{t} \tag{6}$$

Since *N* is the lifetime net tax payment of future generations adjusted for growth, it is directly comparable to that of current newborns, $N_{t,t}$, as both refer to net tax payments over the entire lifetime and are discounted back to their respective years of birth. If *N* equals $N_{t,t}$ generational policy is balanced. If *N* exceeds (is smaller than) $N_{t,t}$ future generations face larger (smaller) growth-adjusted lifetime net tax burdens than do current newborns.

2. A different method that allows a clearer distinction between the two concepts is to

calculate the accounts for future generations assuming that they too face current fiscal policies (this amounts to applying to them the same relative age and gender profiles for taxes and transfers that apply to current individuals) and then to obtain a measure of what is needed to fill the gap. This amount is called the **intertemporal budget gap** (or IBG):

$$(7) \qquad IBG = \sum_{s=0}^{\infty} G_{t+s}(1+r)^{t-s} + D_t - \sum_{s=0}^{D} N_{t,t-s}P_{t,t-s} - \sum_{s=1}^{\infty} N_{t,t+s}P_{t,t+s}(1+r)^{t-s}$$

Once this gap is calculated, further, one could ask what immediate and permanent change in either taxes or transfers would be necessary to close the intertemporal budget gap IBG. Suppose, for example, to find the immediate and permanent percentage reduction in government purchases needed to achieve intertemporal balance. Denoting this percentage reduction by *d,* this is found solving the following equation:

$$(8) \qquad \sum_{s=0}^{D} N_{t,t-s}P_{t,t-s} + \sum_{s=1}^{\infty} N_{t,t+s}P_{t,t+s}(1+r)^{t-s} = \sum_{s=0}^{\infty} (1+d)G_s(1+r)^{t-s} + D_t$$

As a second example, consider the immediate and permanent percentage increase in income taxes needed to achieve generational balance. Calling this percentage increase v, this is found solving the following equation:

$$(9) \qquad \sum_{s=0}^{D} vN_{t,t-s}P_{t,t-s} + \sum_{s=1}^{\infty} vN_{t,t+s}P_{t,t+s}(1+r)^{t-s} = \sum_{s=0}^{\infty} G_s(1+r)^{t-s} + D_t$$

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