Saving and Investment:

The Economic Development of Singapore 1965-99

by

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And it strikes me, I'm starting to learn a thing or two about science.

Bertolt Brecht
The Life of Galileo

Executive Summary

The first chapter of the dissertation removes Singapore's saving performance from its pedestal as an outlier in economic history, with the reputation of being hardly transferable and possibly not even desirable. Instead, the results of the benchmarking exercise clearly show the transferability of at least the saving aspects of Singapore's economic history. Moreover, the particular econometric approach applied highlights those circumstances, which are not directly related to saving policies but must be taken into consideration if transferability is assessed, particularly the demographic structure and external position.

The exercise shows that Singapore's saving performance between 1965-99 was far from extraordinary once the country's circumstances are controlled for, even though a mere comparison of averages of saving rates across countries would have us believe differently. Given Singapore's purely non-policy environment, it could have been expected of the country to achieve at least world average saving levels, substantially higher than its savings at time of independence. Above world average levels could have been expected if we also take into consideration the country's very successful external situation. Finally, if we also allow for potential peer-group mechanisms by placing Singapore within a group of successful Asian countries, the average benchmark saving ratio comes very close to the country's actual saving rate.

What is indeed extraordinary about Singapore's saving performance, is not the high saving rates in the late 1980s and 1990s, which usually attract the most attention, but rather the speed of transformation of the country's saving behaviour in the first half of the period, when Singapore was able to overcome its initial low saving performance much faster and much more strongly than could have been expected given her circumstances. The key to understanding Singapore's saving behaviour must lie in the turnaround achieved during the first decade of the country's independence. Therefore, looking merely at the country's more recent saving

performance will not be able to answer how Singapore was able to achieve its world-record saving ratios.

Chapter Two investigates the country's saving ratios in a time-series regression analysis. It is able to show that strong income developments are the main force behind Singapore's saving behaviour, while the demographic transition seems to have been the initial catalyst and also the enabling factor for the important compulsory saving scheme. However, the exercise also shows that the different subaggregates of gross national saving have very different driving factors and that contrary to parts of the past literature all main influences, which theory generally suggests, can be shown to have had a significant impact on the country's savings. Income, particularly its dynamic, i.e. transitory, component is the single strongest factor followed by the CPF, whose dynamic effects were offset by lower voluntary and public savings but its long-term effects more than compensated. Falling dependency is shown to have had opposite effects, positively adding to voluntary savings particularly during the early years but reducing public savings for the whole period. The lowering of borrowing constraints over time has led to more consumption and thus lower savings among the private sector, which was however compensated by a positive impact on public savings. Full Ricardian Equivalence has not been present, so that public saving has had a positive net effect on the country's gross national savings.

Since voluntary savings was the driving force behind the early saving transition and voluntary saving in the early years was itself largely driven by the rising labour force ratio, the favourable demographic environment must be considered as having been central to Singapore's saving 'take-off'. Moreover, the fact that the positive effect of the CPF was largely due to positive net-contributions to the fund, shows how important this demographic change was even outside of voluntary savings. Singapore used the chance to exploit this demographic dividend very well, by both kick-starting a changed voluntary saving pattern and by using the demographic window for the creation of a CPF 'hump-saving'.

The accounting exercise in the Third Chapter is able to offer quantitative evidence for a number of general speculations about Singapore's economic history. It is able to show that Singapore's government was in control of the equivalent of eighty percent of the country's gross national savings - as a lower bound limit. However, the analysis also shows that the government only made final investment decisions for two-thirds of the funds it controlled. Moreover, as a lower limit about one fifth of the total investment pool or fourteen percent of cumulative 1965-99 GNP was used as working capital, which would indicate that a more efficient use of the funds, i.e. less foregone consumption, could have still been possible without affecting the investment success. As a conservative estimate Singapore could have reduced its savings by at least three percent of cumulative GNP between 1965-99 without negatively affecting the economy's capital efficiency. The working capital appears to have been accumulated solely by the public sphere, which has surrendered some of it to compensate the financial limitations of the private sector.

The exercise finds that private investment was predominantly directed towards the service sector and public investment largely towards overseas. Based on their investment decisions Singaporeans did not see an exploitable comparative advantage in manufacturing. Even foreign investors, who dominated the comparatively little manufacturing investments made, primarily committed their funds to the tertiary sector. The analysis also shows that Singapore was not a flying goose in the strict sense. Singapore's development did not follow a flying geese pattern in which the country copied another country's earlier development success story and invested in a successive list of increasingly advanced industries. Instead Singaporeans decided to invest in the tertiary sector from the start. If at all, it was the foreigners who were the flying geese, using Singapore for their own industrial sequencing. Additionally, it becomes apparent that Gross Fixed Capital Formation captures only about half of total investments made, which shows the limitations and potentially misleading results of other analyses merely concerned with GFCF.

Table of Contents

Introduction

Singapore's real per capita GNP measured in 1990 constant Singapore dollars stood at S$4,224 in 1965, the year of the country's separation from the Federation of Malaysia, which marked its final step towards independence. By 1999 this figure had increased more than eight-fold to S$34,965. Converted at purchasing-power-parities, this ranks Singapore seventh in the world - one rank behind Switzerland.[1] The country's economy managed an average compound growth rate of aggregate real GNP of 8.5 per cent annually for the 35 years since its independence.[2]

While there is still controversy over exactly how much of this spectacular growth performance can be attributed to productivity improvements and how much to capital accumulation, the discussion by now seems to be about which shade of grey is the most appropriate one. Both sides agree that the majority of Singapore's growth was due to capital accumulation. This brings Singapore's saving behaviour to the fore-front of the discussion. In 1965 Singapore saved 11.2% of its GNP, which was already a big improvement from negative savings in the early 1960s. In 1961 and 1962 the Gross National Saving (GNS) Ratio stood at -2.4% and -2.3% respectively. By 1984 Singapore had further raised its GNS-ratio to 45.6%, among the highest in the world. After a short-term decline of the ratio in the second half of the 1980s, national saving increased again to a peerless

[1] World Bank (2001), p. 275

[2] During this time Singapore has transformed itself into, for example, the world's largest disk-drive producer, the fourth largest global foreign exchange centre after London, New York and Tokyo and fifth in derivatives trading. It is also one of the world's largest offshore financial centres (IMF, 2000, p.5 and p.26). It has also become the third largest oil refining centre after Rotterdam and Houston, the third largest oil trading centre after New York and London, and the largest fuel oil bunker market (Lee, 2000, p. 68). In 2001 its economy has been ranked the second most competitive in the world behind the USA by the Institute for Management Development, which ranked 49 countries on 286 criteria in four categories: economic performance, government efficiency, business efficiency and infrastructure (The Economist, May 5th 2001, p. 124).

54% of GNP in 1999.[3] From 1988 onwards Singapore was able to finance gross capital formation solely through its national savings.[4] Over the whole period 1965 to 1999 Singaporeans saved 46.1% of their GNP.[5]

The nation's savings has always been considered central to the country's economic development. Dr. Goh Keng-Swee, the nation's first finance minister and a permanent member of the government cabinet until 1984, summarised the government's understanding of the importance of savings in a 1979 speech:

> How was it possible for a small island state with no natural resources to achieve such an economic performance? A detailed answer would have to describe many complicated economic as well as political and social issues. Here I want to briefly discuss one crucial element in our recent economic progress to which inadequate attention was paid in the past. This is the role of domestic savings. There is no real secret about the way in which nations and individuals grow rich. They must save a good part of their incomes and invest their savings profitably. The more you save and the more wisely you invest, the faster you get rich.[6]

Since then quite a few studies have investigated the country's saving performance on the one hand and its resulting growth success on the other hand. The bridge between the two, namely investment allocation, has rarely been studied. Yet, even on the question concerning the country's savings behaviour a robust answer is still outstanding. This dissertation is trying to fill these gaps in the understanding of Singapore's economic history and therefore help its potential application to other country's development plans.

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[3] World Bank (2000, p. 299): Singapore's Gross Domestic Saving in 1999 equalled 52% of its GDP. The average in East Asia stood at 37% and among the world's high income countries at 22%. The closest to Singapore was Angola with 48% and China with 42%.

[4] Singapore Dept. of Statistics (1995), p. 31

[5] Total savings 1965-99 / Total GNP 1965-99; The ratio gives thus higher weight to saving ratios in years with high GNP. The (unweighted) average of the annual GNS-ratios would equal 36.1% over the same time period.

The most developed string of the literature about Singapore's economic development is clearly the discussion about the relative importance of the country's sources of growth, though even here controversy still exists about exactly how small the contribution of productivity gains has been to Singapore's growth and how respective industries and time periods have performed differently.[7] The general conclusion of low productivity gains has cast some doubt over Singapore's economic success story. Paul Krugmann (1994) has probably driven home this aspect the furthest by comparing Singapore's growth with that of the Soviet Union in the 1950s and 1960s, thus arguing that Singapore's development strategy is at least not sustainable and through the particular comparison indirectly hinting at even worse. The results of the TFP discussion have also found different interpretations. For instance, Singh (1997) explicitly putting himself into the tradition of the classical economists and with special reference in that of Kaldor (1965 and 1967) argues that, on the contrary, high rates of investment actually lead to greater turnover of machines and therefore to faster technical change, greater learning by doing, more and quicker product development, and hence greater international competitiveness. In Singh's view, this alternative non-neoclassical analysis gives no reason to assume that eventual decreasing returns should set in within a situation of high rates of investment.[8] Miles and Scott (2002) interpret the TFP results on several analytical levels. On the one hand, they argue that the achieved increases in the standard of living cannot be denied. They are not a statistical mirage. Moreover, that Singapore did not achieve TFP growth in the past, does not mean that it will not

[6] Goh (1995, p.78) in a speech given in 1979 to Singapore's National Trade Union Congress. After his retirement from parliament, Dr. Goh also held the post of Deputy Chairman of the Monetary Authority of Singapore from 1985-1992

[7] The TFP literature on Singapore is not summarised in detail since a number of encompassing and comprehensive literature reviews have been published recently. See for example Owyong and Thangavelu (2002), Peebles and Wilson (2002, pp. 58-65), Miles and Scott (2002, pp.106-111) and IMF (2000, pp. 6-8).

[8] Singh (1997, p. 232), referring as further support for this interpretation to Akyuz and Gore (1996) and Singh (1996)

do so in the future. On the other hand, they point out that the results of Young (1994) and others clearly reveal that the country's future development strategy will need to move away from just boosting factor inputs to focus on productivity improvements and that the past growth success has been far from miraculous since it was built on sacrifices. The current generation of Singaporeans are benefiting from these sacrifices, but their high standard of living has come at a cost.[9]

Casting doubt over Singapore's future growth success and removing the country from the pedestal of economic miracles of sustained development has thus in summary been the main outcome of the TFP controversy kick-started by Young's 1992 and subsequent papers. But while Singapore's growth has come mainly from capital accumulation, the sheer scale of these increases in real per-capita income is still impressive. Moreover, the less than miracle status tells other countries that indeed here is a potentially simple success story waiting to be copied. Therefore, other developing economies could benefit from studying how Singapore realised such high saving rates and how it turned these into investments to achieve the country's capital accumulation and thus its tremendous increases in per-capita income and through these increases in living standards.[10] As Collins and Bosworth (1996) have pointed out if the TFP growth story is correct then the main lessons from East Asian success come not from identifying which policies best promote TFP growth, but how economies can achieve and sustain high rates of saving and investment.[11] Showing that Singapore is not a miracle, the TFP controversy has made the country's capital accumulation processes even more of a case study worth investigating.

[9] Miles and Scott (2002, pp. 111-112)

[10] Miles and Scott (2002, p.111). They also point out that increases in labour inputs have also been important. Yet, there may be less to learn form this aspect, since similar increases in the working age population and a shift away from agriculture, which was the case not for Singapore but for other Asian NICs, are not easily reproduced in other nations nor politically feasible.

[11] Collins and Bosworth (1996, p.139)

On a theoretical level processes of capital accumulation are far from miraculous because they can easily be explained and modelled. In practical terms, however, successfully implementing the theory is still a tremendous struggle full of unknowns and potential pitfalls. The relationship between saving and growth has been emphasised by early writers, such as Rosenstein-Rodan (1943), Singer (1952), Nurske (1953) and Lewis (1954, 1955). Yet only a handful of countries have so far succeeded down this path, Singapore being one of them. This dissertation intends to retract the country's steps along that path, so that other nations are able to see whether this path might be an option for their own development and possibly even how to improve upon it.

With that intention in mind, the first substantial part of the dissertation tries to establish how much Singapore's saving performance might have been 'sui generis' and therefore how much we can truly learn from the country's development success. Furthermore, it tries to quantify how much policy choices in Singapore mattered, by normalising for influences on the country's national saving rates other than (saving) policies so that it can be seen to what degree Singapore's saving performance was due to exogenous factors. In other words, the exercise tries to establish what saving rates could have been expected of Singapore given the country's circumstances. Determining these factors and quantifying their influence should allow other economies to weigh their relative position to Singapore's history more precisely and thus allow them to make a judgement on how likely a reproduction of Singapore's saving success might be in their own countries and what they might need to compensate for in their distinct situations in order to finance similar capital accumulation levels. The methodology employed uses cross-sectional regression analyses both on a pooled and annual basis across a world sample to derive models for 1965 to 1999 with the Gross Domestic Saving Ratio as the dependent variable. The obtained coefficients of the explanatory variables are then used to calculate an expected,

benchmark GDS-Ratio for Singapore for each year given its actual data for the respective independent variables.

The second part of the thesis tries to remedy the fact that past attempts at explaining Singapore's saving behaviour have not been satisfactory - largely on methodological grounds. Therefore, no clear picture has yet emerged. A detailed time-series analysis for 1965-97 of all main saving aggregates, namely voluntary private, compulsory private and public national savings, will try to fill this gap, testing for all main influences argued for by the relevant theories, particularly income, demographics, borrowing constraints and the role of the government, including the role of Singapore's Central Provident Fund. The individual saving aggregates are then combined to form the country's Gross National Savings in a novel additive procedure, which is able to avoid a number of statistical pitfalls and offers a more differentiated insight into Singapore's spectacular saving transition since the country's independence. The final models are able to 'explain' over ninety percent of Singapore's evolution from a low saving to one of the highest saving nations of the world, which in turn is fundamental to understanding the country's overall economic development.

Investment behaviour is the essential link running from saving to growth, but has rarely and if at all only to a limited degree been investigated in Singapore's case. This has largely been due to the lack of a readily accessible data source. In an attempt to close this gap, a large variety of government and private sources have been combined into a new database, which allows a much more revealing investigation into Singapore's investment pattern than hitherto possible and leads to a number of new insights about Singapore's recent economic history. This third part of the thesis offers the yet largely unexplored link between the literature on the country's savings and the literature on its growth performance.

Chapter One

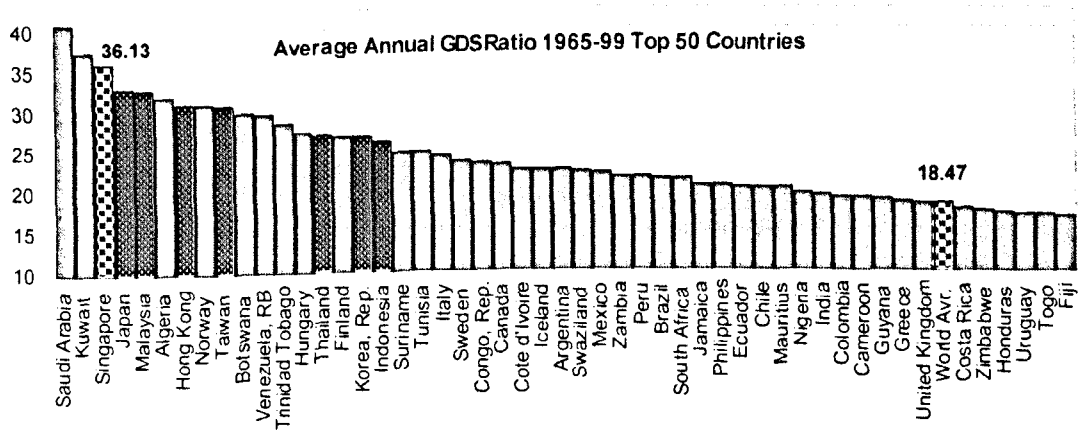
A Comparative View of Singapore's Gross Domestic Saving 1965-99

Table of Contents

I.1. Introduction

Singapore's average annual Gross Domestic Saving Ratio for the 35 years from 1965-99 stood at 36.13% of its GDP, which equals about double the world average.[12] The country's saving performance becomes even more dramatic if we look at the latter half of the period only. Annual GDS-ratios for the years 1981-99 average out at 45.6%, while the world's average was 15.8%. From 1995 onwards Singapore's Gross Domestic Saving accounted for more than 50% of her Gross Domestic Product.

Graph I.1.a: Comparative View of Singapore's Gross Saving Performance[13]



Such a sustained high-saving performance is easily seen as a mere outlier in economic history. However, no attempt has been made to quantify the degree of extra-ordinarity. This part of the dissertation will try to fill this gap by establishing how much Singapore's saving might have been 'sui generis' indeed and therefore how much we can truly learn from it. Moreover, it tries to quantify how much policy choices in Singapore mattered, by normalising for influences on the country's national saving rates other than (saving)

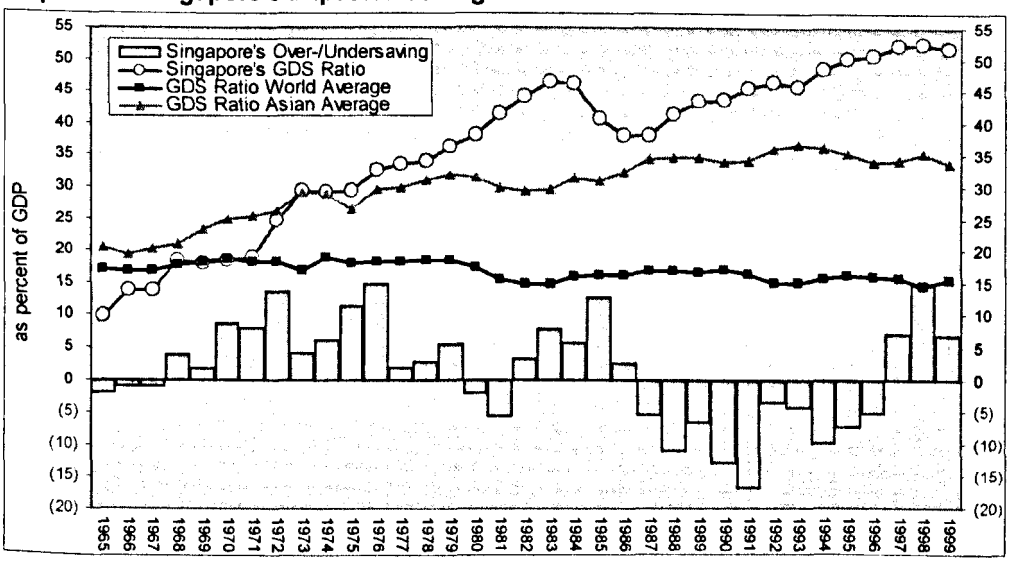
[12] The average given is an unweighted average of Singapore's 35 annual GDS-ratios. If the ratios were weighted by the respective GDPs of each year the overall saving ratio would stand at 46.13% since more recent years with higher GDPs and higher saving ratios would attract a higher weight.

[13] Sources: World Bank (2001) for all countries apart from Taiwan, whose data is taken from Council for Economic Planning and Development Republic of China: Taiwan Statistical Data Book (various issues); World Average refers to the average of all countries which reported GDS-ratios for each year of the period under investigation.

policies so that it can be seen to what degree Singapore's saving performance was due to exogenous factors. In other words, the exercise tries to establish what saving rates could have been expected of Singapore given the country's circumstances.

The methodology employed uses regression analyses across a world sample to derive models for 1965 to 1999 with the Gross Domestic Saving Ratio as the dependent variable. The obtained coefficients of the explanatory variables are then used to calculate an expected, benchmark GDS-Ratio for Singapore for each year given its actual data for the respective independent variables. If the expected GDS-Ratio lies above Singapore's achieved saving ratio, the country 'should' have actually saved more given its circumstances. Singaporeans 'over-saved' if the predicted saving ratio lies below the actual value. Graph I.1.b. shows Singapore's actual saving ratio, the world and Asian averages as well as the country's over-/(under-)saving derived with the above methodology.[14]

Graph I.1.b: Singapore's Expected Saving[15]



[14] The Asian average comprises: China, Hong Kong, Indonesia, Japan, South Korea, Malaysia, Taiwan and Thailand.

[15] For sources see section I.2.3.. The Over-/(Under-) Saving shown in this graph is based on the models calculated in section I.4.4. below. If all explanatory dimensions are controlled for and allowed to remain in the regression equation notwithstanding the possible loss of significance in some years, Singapore saved in average only 1.37% of GDP more than what could have been expected of the country given her circumstances.

As it turns out, Singapore's saving performance was far from extraordinary if we control for the country's circumstances, even though a mere comparison of averages would have us believe differently. Given Singapore's purely non-policy environment, it could have been expected of the country to achieve at least world average saving levels, substantially higher than its savings at time of independence. Above world average levels could have been expected if we also take into consideration the country's very successful external situation. And finally, if we also allow for potential peer-group mechanisms by placing Singapore within a group of successful Asian countries, the average benchmark saving ratio comes very close to the country's actual saving rate.

What is indeed extraordinary about Singapore's saving performance, is not the high saving rates in the late 1980s and 1990s, which usually attract the most attention, but rather the speed of transformation of the country's saving behaviour in the first half of the period, when Singapore was able to overcome its initial low saving performance much faster and much more strongly than could have been expected given her circumstances.

As a by-product of the exercise, it is also shown that export-promotion does not only allow a country to better exploit its comparative advantage but also allows the country to raise its saving levels and thus finance the further improvement and exploitation of this comparative advantage and possibly even to finance the creation of new comparative advantages. In turn this can potentially open up a virtuous circle of development. Additionally, the cross-country regression analyses demonstrate that it is generally a lengthy process to alter a country's saving performance. Saving inertia in the world sample takes over twenty years to lose its significance.

The next section will describe the methodology in more detail, followed by a literature review of past cross-country studies of national savings. The fourth section will present the results of the individual statistical models, including a very detailed sensitivity analysis. Finally, a conclusion will summarise.

I.2. Methodology

In a series of ten articles between 1956-67 Kuznets analysed inter-country variation in principal components of the gross national product and compared these results to historical changes in developed countries.[16] This research gave rise to Chenery and Syrquin's investigation of over 100 countries for the period 1950-75. Twenty-eight independent variables describing accumulation, allocation, demographic and distributional processes were independently regressed on semi-log functions with income, population and net capital inflows as explanatory variables.[17] One of the dependent variables investigated was the countries' GDS-ratios. Chenery and Syrquin were trying to summarise the relationships of these processes along growth paths and thus establish certain 'Patterns of Development', particularly structural changes of the economy as the country increases its level of economic development defined as per capita income.[18] Additionally, they also realised that the derivation of benchmarks can be one of the potential benefits of their approach, which is the route this article will take rather than investigating development patterns.[19]

[16] Journal of Economic Development and Cultural Change, various issues 1956-67. As Lal and Myint (1996, p.3) point out already J.S. Mill set out the logic of comparative studies explicitly in his 'A System of Logic' (especially book III, ch. VIII) and this comparative method was applied by Alexis de Tocqueville in his 'Democracy in America' and by Marc Bloch in 'Feudal Society'.

[17] Chenery and Syrquin (1975). In a later study, Syrquin and Chenery (1989), the period was extended to cover 1950 – 1983 and the sample size comprised 108 countries. For their exact regression formulas and an attempt to replicate their results see section I.4.1. Crafts (1984) applies their approach to 19th century Europe and Leamer (1987) extends the methodology to a three-factor, n-good General Equilibrium Model.

[18] As Chenery (1986, p.13) explains, one of their motivations for their analysis was the critical assessment of neo-classical growth theory: "In the neoclassical tradition, GNP rises as the result of the long-term effects of capital formation, labor force expansion, and technological change, which are assumed to take place under conditions of competitive equilibrium. Shifts in demand and the movement of resources from one sector to another are considered relatively unimportant because labor and capital produce equal marginal returns in all uses."

[19] Chenery and Syrquin (1975, p. 4): "By comparing countries that are following similar development patterns, it is possible to derive more valid performance standards and also compare the policies chosen by countries under similar conditions."

I.2.1. The Benchmarking Process

By deriving best-fit regressions for the world sample and then inserting in this case Singapore's actual data for the explanatory variables, an 'expected value' for the dependent variable is obtained. The relationship of this expected value with the actual value can be investigated over time to highlight significant deviations in certain periods. In other words, this exercise aims to obtain benchmark values for Singapore's GDS-ratio controlling for those explanatory variables, which prove to be significant in modelling the variation in GDS-ratios across a world sample. Moreover, the pool of potential explanatory variables is being restricted to those which are not or only to a limited degree influenced by the countries' policies. As a result the statistical model determines how much of the variance between individual countries' savings performance can be explained by variables exogenous to the countries' respective policy choices.[20] The modelling process works its way through three levels of control. The initial level controls only for the strictly non-policy environment. The second step adds the external situation and finally the peer-group factor is incorporated. Inserting Singapore's actual data into such a model will tell us how much the country should have been expected to save given her particular circumstances. What remain unmodelled are largely country-specific issues, which are open to policy choices and motivate the detailed time-series analysis in the next chapter.

It is important to emphasise that this article does not intend to explain Singapore's saving behaviour, even though the main technical tool used, namely regression analysis, is in its basic form identical to what would be used in an empirical attempt at 'explaining' behavioural statistics. Such an

[20] Generally, policy can impact the regression analysis in two ways. Policy can influence the respective variable's effect on savings, i.e. its coefficient, and also impact the observed level of the variable. The former effect is controlled for by the use of a world sample, i.e. Singapore is given the same impact the variable has in average across the world. The selection of the variables tries to contain the impact of the latter effect by prohibiting policy induced factors from being modelled.

intention, however, would necessitate a different model building process. Instead of explaining Singapore's saving behaviour, this exercise actually attempts to revise the country's saving performance by controlling for (largely) exogenous factors. In other words, rather than explaining the actual behaviour, the exercise tries to determine what behaviour could have been expected of Singapore.

The remainder of this section will discuss the individual variables used in the model, starting with the dependent variable, continuing with the non-policy, the external and the peer-group factors before closing with variables investigated in the sensitivity analyses.

I.2.1.1. The Gross-Domestic-Savings Ratio (GDSrat)

The GDS-ratio being in essence a plug in the national accounts is wide open to criticism. However, so far no clearly superior estimate of a country's saving has been established. Nevertheless, it is important to emphasise the weakness of this variable, stemming from problems with the quality of the national income accounts, which are particularly detrimental to cross-country studies.[21]

Hayashi (1989), for example, points out that much of the difference between the saving rates of the US and Japan is removed once common accounting practices are applied to the national accounts of both countries. Moreover, it can be argued that such items as education and private residential construction, which national accounting convention treats as consumption, should be considered as investments and thus added to Gross National Saving. The difference between developed countries with comparatively low saving rates but high educational spending and developing countries with

[21] See Collins (1991, p. 349) for an assessment of this problem and also section II.4.3. which discusses alternative measures of saving, particularly from a time-series point-of-view.

possibly higher saving rates but lower educational expenditures would then be less striking. Additionally, some authors also point to the fact that national income accounts do not account for capital gains. A study by Martin Barnes in the Bank Credit Analyst points out that customary saving ratios take into account taxes paid by individuals when they realise a capital gain from selling shares, but ignores the increase in income when the capital gain is banked.[22] Adding back the tax would have raised the saving rate in the United States by 1.7 percent in 2000. Including the whole capital gain would have increased personal income by 6.7 percent. These two adjustments together would have pushed the saving rate into positive territory for that year.

Due to these notorious data problems in measuring savings, empirical findings - particularly those stemming from cross-country comparisons - need to be interpreted with caution. Yet, lacking a superior estimate for international studies, no true alternative to saving estimates based on national accounts exists.

However, it is possible to avoid at least a number of data problems by selecting wisely among the different available saving aggregates derived from the national accounts. Particularly, the potential use of Gross National Savings is plagued by international differences in the measurement of remittances and other net-factor income from abroad. The compilation of this particular part of the Balance of Payments varies substantially from country to country, which is especially detrimental to the estimates of some developing countries. At times the respective transactions might simply appear in Errors and Omissions or potentially not appear at all. For this reason, this part of the thesis will use Gross-Domestic Savings although the time-series investigation about Singapore in the next chapter employs Gross National Savings. The potentially very revealing investigation of Net Saving rates is also prohibited by the very widely differing depreciation concepts

[22] As reported in the Economist (June 23rd, 2001, p. 108)

between countries, or within a country over time and even between different sources of the same country. Furthermore, many countries still lack estimates of capital consumption, which will make any cross-national comparison very sensitive to sampling errors.[23]

I.2.1.2. Non-Policy Factors

Factors which are not policy influenced include a country's demography, geography and its initial situation from just before the beginning of the period of observation.[24]

The Initial Situation

The initial situation is described by the country's average saving ratio and average per-capita income (in current US dollars) between 1962-64, i.e. the three years before the start of our regression analysis.[25] The inherited saving ratio (IniGDS) is a measure of behavioural inertia, arguing that a country's saving performance is at least partly determined by its past saving behaviour.[26] The initial level of GDP (IniGDP) allows for a classification of the individual countries into separate income groups, such as high, middle or

[23] Also see Collins (1991, p. 349) who finds net-saving estimates even in their limited availability very unreliable.

[24] A further, rather special type are regional dummies, which on first view clearly capture external factors because countries generally have a difficulty in choosing their regional neighbours. However, on a closer look the particular construction of the regional group can potentially capture other factors shared between the neighbours apart from their geographical proximity. Therefore, regional dummy variables are treated separately.

[25] For Singapore these years include the unfortunate merger with Malaysia, which ended in September 1965. While this does not affect the regression outcomes, it will impact the benchmarking results. One can argue that the actual Singapore numbers plugged into the regression outcome to obtain the benchmark are too negatively affected by the unsuccessful merger period. However, it is also inappropriate to use pre-merger data, which would assume that the merger and any related or unrelated events during these years had never taken place. Therefore, this study still considers 1965 as the starting point of Singapore's development and thus the years just before as a description of its inherited situation.

[26] For an example of another econometrical analysis of cross-country saving behaviour, which has used saving inertia variables, see Loayza et al. (2000).

low-income, and thus into levels of economic development without the loss of variance in the sample. Furthermore, it can be argued, that the higher per-capita income the higher is the potential saving beyond a basic level of consumption.[27]

A very important aspect of a country's initial situation, which is however also very difficult to capture, is the quality of its institutions. As famously argued by Douglas North and other new-institutionalists, countries with better institutions, more secure property rights, and less distortionary policies will invest more in physical and human capital, and will use these factors more efficiently to achieve a greater level of income.[28] This view has received some support from recent cross-country correlations between measures of property rights and economic development and from a few micro studies that investigate the relationship between property rights and investment or output.[29] Efforts which try to quantify a country's institutional environment are largely recent investigations, which hardly offer observations going back further than the 1970s.[30] This poses a problem in Singapore's case, because the country had already undergone a substantial institutional and social transformation by this time. Moreover, on a more general level, the recent ex-post studies are largely based on personal

[27] This argument, however, has mixed theoretical and empirical support, largely because per-capita income is not the same as a person's income. Furthermore, according to life-cycle and permanent income theory the change of income is actually the more important variable. See Section II.1 for a discussion of determinants of saving behaviour.

[28] See for example: North and Thomas (1973), Jones (1981) and North (1981)

[29] For examples of cross-country investigations see e.g. Knack and Keefer (1995), Mauro (1995), Hall and Jones (1999), Rodrik (1999), and for micro-studies see for example Besley (1995), Mazingo (1999), and Johnson et al (1999)

[30] The World Bank's governance dataset, for example, offers data only for 1997/8. The Heritage Foundation publishes political variables since 1995. The International Country Risk Group offers a dataset with observations starting in 1982. The related Gastil-index describes political rights and civil liberties from 1972 onwards, see Gastil (1978) and Freedom House (various years). The oldest direct observation on institutional quality can be obtained from Business Environmental Risk Intelligence (Beri) and stem from 1972. These will be tested in the sensitivity analysis only, because the inclusion in the original investigation would bias the results of the benchmarking due to the fact that by 1972 Singapore has undergone substantial institutional change. In a recent study, as reported by The Economist, April 7th, 2001, Asian Business Survey, the Political and Economic Risk Consultancy rated Singapore best in corporate governance and transparency in Asia ahead of Hong Kong, Japan, and with South Korea at the tail end. It also ranked Singapore best in terms of quality of legal system, ahead of Japan and Hong Kong, with Indonesia the worst. This perception of high institutional quality, particularly the status of being ahead of Japan and Hong Kong, is not likely to have been the case at time of independence.

assessments and are therefore very likely biased by the respective countries' subsequent economic development.

Fortunately, three datasets are available which offer at least proxy variables if not direct estimates of institutional quality for the required time period. However, the sample sizes are comparatively small and their coverage varies. A study by Adelmann and Morris (1967), which weights twenty-two socio-economic indicators into a single index, offers an ex-ante view of the social capability of seventy-four developing countries with data from the early 1960s and has performed well in recent tests, e.g. Temple and Johnson (1998).[31] Unfortunately, it does not include an estimate for Singapore.[32] The second dataset, constructed by Nehry, Swanson and Dubey (1993) and also used by Loayza et al. (1998a), offers an estimate of the human capital stock of a set of 85 countries with observations for 1965, including Singapore.[33] The variable describes the mean years of schooling of the working age population. The third set is taken from Acemoglu, Johnson and Robinson (2001), who try to explain how a number of ex-colonies have developed certain institutional arrangements and found that the difficulty of colonisation experienced by the former colonial powers is a very good proxy for the respective countries' institutional quality in their post-colonial economic history. They argue that the more difficult it was for a colonial power to reach and control a certain region, the more likely it is that the

[31] Adelmann and Morris' attempt at capturing the socio-economic development of a country has again taken centre-stage in development economics, particularly since Abramovitz (1986), but also more recently obtaining support from the work of Putnam (1993). Temple and Johnson (1998) find that the Adelman-Morris index can partly explain the respective countries' subsequent growth performance. However, they also point out that the direction of causality is uncertain, with links running most likely in both directions. A higher level of development is likely to be reflected in higher investment and lower population growth, raising steady state income, while economic development is often felt to bring far-reaching social changes in its wake.

[32] The value of Singapore's Social Capability is not needed for the regression itself, but for the calculation of the country's benchmark saving ratio. The Singapore value was therefore approximated by the average social capability of the top tier of developing countries according to Adelman and Morris' (1967) own categorisation. That top-tier includes twenty-five of the total of 76 countries. The dataset offers an observation for South Vietnam, which this study uses as the best approximation for the initial institutional quality once observations of the other variables for the later re-united Vietnam become available in 1986.

[33] The better known source, Barro and Lee (1993), unfortunately does not offer an observation for Singapore until 1975.

colonists established institutions tailored to exploit the colony from afar. These sub-optimal institutional arrangements, they argue, persisted beyond the countries' eventual independence. The degree of difficulty faced by the colonial power was quantified by the mortality rate among the colonising pioneers, which they have researched for sixty-four ex-colonies including Singapore. The variable performs very well in their models. After they control for the institutional quality proxied by this variable countries in Africa or close to the Equator do not have lower incomes than the other countries in their sample.[34] The Adelmann-Morris estimates (SocCap), the Nehry-Swanson-Dubey figures (HumCap) as well as the Acemoglu-Johnson-Robinson variable (Mortality) are therefore used as the best available proxies for the institutional quality at the beginning of our period of investigation.

Demography

The demographic development of a country - especially as it affects its saving performance - can be captured by the proportion of the population of working age (EcoAcRat), the degree of urbanisation (Urb) and the size of the total population (TotPop). EcoAcRat is defined as the number of people aged between 15 and 64 as a percentage of the total population. The higher the percent of people in working age, the lower will be the ratio of those dependent on the wage earners. Therefore, the wage earner in average should be able to save more of his/her income.[35] The inclusion of the urbanisation ratio is based on the argument that more rural societies find it more difficult to save due to a potential lack of sufficient financial institutions in rural areas. Urban societies, on the other hand, find it easier to

[34] Acemoglu et al. (2001) accept that differences in mortality rates are not the only, or even the main, cause of variation in institutions. However, they maintain that they are a source of exogenous variation. Their analysis shows that mortality rates faced by the settlers more than 100 years ago can explain over 25 percent of the variation in current institutional quality within their sample.

[35] For a more detailed discussion of the underlying theory see section II.1. about the theories behind saving behaviour.

establish and benefit from such institutions.[36] A more urbanised or more densely populated country is also more likely to benefit from agglomeration externalities.[37] The total population is a measure of the size of the economy. Its inclusion in the investigation stems from the Chenery-Syrquin exercise, although its theoretical backing in terms of its effect on a country's saving behaviour is ambiguous. Generally, the Chenery-Syrquin finding that size matters is not necessarily robust, see Balassa (1981) and Ellison and Gereffi (1990).[38] Furthermore, a small population doesn't necessarily mean a small market. In terms of income, for example, the modern developed Singapore has a much larger market than many developing countries with much larger populations.

Some governments have tried to control the fertility of their people, so that it could be argued that in the long term EcoAcRat and TotPop are to a degree policy influenced. Singapore has also had a government led programme on fertility control until the mid 1980s. This program, however, was only able to reinforce an already existing trend, which had its origin in the late 1950s and early 1960s. To what degree this re-enforcement potentially increased the magnitude and speed of the demographic transition in Singapore is arguable. The evidence appears to point to only a minor impact.[39] For the purposes of this investigation, therefore, all demographic variables are considered to be exogenous to Singapore's policies.

[36] Following the World Bank procedure, the required size of a town to be considered an urban environment is left to the respective country's own definition. Therefore, Urb describes the share of the total population living in areas defined as urban in each country.

[37] See for example Henderson et al. (2000) for an investigation into the role of cities in developing countries.

[38] Balassa (1981, p. 377) argues that the East Asian NICs are not really small in market terms compared to many other developing countries. In particular the comparison with Latin America, shows that while, for example, "Brazil and Mexico possess much larger populations, their highly unequal pattern of income distribution, low wages, and slow growth rates in recent years have effectively reduced the size of the domestic markets to levels closer to that of their smaller East Asian counterparts than population figures alone would suggest."

[39] See section II.3.2. for a discussion of the existing evidence.

Geography

The relationship between geography and economic development has seen an academic renaissance in form of the 'new geography' literature appearing in the later half of the 1990s by Jeffrey Sachs, Robert Barro, Paul Krugman, Anthony Venables and others. In general the literature assigns geography economic importance due to its effects on transportation costs and intrinsic productivity. The old real-estate mantra, it is argued, applies to development economics just as well: location, location, location. Gallup et al. (1999) extend this pure geography view somewhat by suggesting that climate just as much as location affect income levels and income growth, through its effect on transport costs, disease burdens, agricultural productivity, and even the choice of economic policy itself, among other channels.[40] More directly related to savings, Ghosh and Wolf (2000) found that gross domestic product per capita is the only variable other than distance that helps explain capital flows. According to the authors, these results help explain why Africa has traditionally had limited access to capital markets. It appears opportune, therefore, to also include geographic variables in order to capture the effect they may have on a country's saving performance. Gallup et al. (1999) offer a comparatively large set of geographical variables for a sample of 150 countries including Singapore.[41] Tropicar describes the percentage of land per country which lies in the geographical tropics. Pop100km measures the proportion of the population within 100km of the coastline and AirDist the minimum distance to the closest of any of three main economic centres of the world: New York, Rotterdam, or Tokyo. The Landlock dummy variable, takes the value of one if nobody in a given country lives within 100km of a coastline, i.e. if Pop100km = 0. Due to the potential link between geography

[40] The importance of climate has found early criticism stemming from the comparison of often very different developmental paths of pairs of countries in similar climatic circumstances, e.g. Meier (1995, p.62): "Neither Singapore nor Hong Kong – among the superperformers in development – has an ideal temperate climate. Nor are the climates of Ghana and the Ivory Coast different form each other, but the Ivory Coast was an 'economic miracle', while Ghana retrogressed."

[41] The data is available online at: http://www.cid.harvard.edu/ciddata/ciddata.html. The latest version was downloaded May 2002.

and disease burdens, Gallup et al. (1999) also offer a variable (Malaria) for a subset of 144 countries including Singapore, which measures the prevalence of malaria in a given country. The variable is defined as the product of the fraction of land area subject to malaria times the fraction of Falciparum cases, i.e. the malignant form of malaria. In respect to its effect on savings, it must be assumed that the higher the chances of malaria, the less likely individuals will save for old age.

I.2.1.3. External Factors

Next to strictly non-policy factors, the analysis will also try to control for Singapore's external situation, namely the country's Net-Export Ratio (or resource balance) and Net-FDI receipts. Due to Singapore's location, resource endowment and size these external influences can be considered to be predominantly (but not completely) non-policy in her case.

Net-Export Ratio / Resource Balance [42]

A country's current account situation is regularly included in saving analyses in order to capture the country's access to foreign savings and possible effects of external borrowing constraints. However, the argument that a current account surplus (deficit) is a sign that the country is (is not) experiencing external borrowing constraints is flawed as the excurse at the end of the chapter (Section I.6.) shows in some detail. Instead an external surplus affects savings simply because it allows for higher saving without the need to reduce the absolute level of consumption. In turn, a deficit will put

[42] Definition of Resource Balance = Exports of Goods and Services – Imports of Goods and Services; Goods and Services defined as: "goods and services represent the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal,

increasingly high pressures on national saving if domestic consumption is not relinquished to make up for the foreign imports. In other words, a net-exporting economy should always have higher savings.[43] Policy choices with the intention to implement an open economy and any government action designed to make this decision a successful strategy have, so to say, a free windfall return of rising savings. From this angle already, the effect of the resource balance should be controlled for in order to better separate and evaluate saving policy impacts.[44]

In Singapore's case the requirement to control for the effect of net-exports is further necessitated by the fact that the openness of the country has not even been determined by choice but by necessity, on both the import and export side of her external balance.[45] On the one hand, the country's resource endowments make it highly dependent on imports, while on the other hand its superior location on the main East-West trading routes and access to a massive but foreign hinterland make Singapore a natural (re-)export economy. In slightly over-stated form this means that if there ever was a policy decision for Singapore to be export-oriented, it was taken by Sir Raffles in 1819, when he founded the city as an entre-pot port. At the country's independence, this decision can certainly be considered exogenous.[46]

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and government services. They exclude labor and property income (formerly called factor services) as well as transfer payments." (WDI CD-Rom, 2001 edition)

[43] This relationship is even reflected in the basic accounting identity: $Y = I + C + G + NX$; which can be rearranged as: $Saving = Y - C - G = I + NX$.

[44] Controlling for this effect can be either accomplished through the net-export-ratio or the current account balance which only differ in the exclusion of transfer payments by the former. Net-exports are more widely available, which is not surprising because net-transfers are generally more difficult to trace than imports and exports. If the Current Account was used then the appropriate national income figure should be GNP instead of GDP and thus correspondingly the dependent variable would need to be Gross-National-Saving instead of Gross-Domestic Saving, which for the same reasons is also less frequently available and as argued above more prone to issues of data quality. Using current-account balances to model Gross-Domestic-Saving thus introduces empirical inconsistency and limits the sample unnecessarily. Therefore, the net-export-ratio was used, although the literature largely employs the current-account balance.

[45] See Lim, Chong-Yah (1991, p. 199) who concludes his assessment of Singapore's outward-looking strategy as one "born of necessity". Similarly, Kosai and Takeuchi (1998, p. 314), argue that Singapore's small domestic market forced it to be outward-oriented.

[46] This view is even further extended by Muscatelli, Stevenson and Montagna's (1995) finding that the success of the Asian NIC's manufacturing exports was largely due to the exploitation

However, even in such a rigid policy environment a government is still not completely without tools to influence at least to a degree a country's resource balance, particularly by controlling the income-elasticities of demand for foreign consumption. In respect to Singapore, it must be noted that the government did indeed try to influence the composition of domestic consumption which in turn can leave its mark on imports and thus the resource balance. The most easily observable example of such interference in Singapore is the high cost of car ownership due to a number of fee and tax instruments. Therefore, while the export orientation and the general dependence on imports can be taken as given, the exact manifestation in form of the country's resource balance is still partly policy influenced. Consequently, the net-export-ratio must be considered a largely but not completely non-policy variable.[47]

Net-Foreign-Direct-Investment (Net-FDI)

The argument about Net-FDI-inflows follows that for the resource balance in that higher Net-FDI-Inflows allow for a higher savings-ratio without the need to reduce the absolute level of consumption. Also similarly to the resource balance FDI receipts are potentially influenced by government policy. Huff (1995) points to the combined macro-economic stability and high infra-structural investments in Singapore as the main explanation for the country's high FDI receipts. This combination in turn, he argues, is due to the high degree of savings in Singapore, which would also point towards a

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of price and income elasticities in the customer countries, pointing to the fact that not only the export-orientation but also the export success was predominantly driven by exogenous factors. Moreover, Kosai and Takeuchi (1993) and Felix (1994) point to East Asia's low income elasticities of demand particularly for foreign goods, following similar developments in Japan. Felix (1994, pp. 128-133) argues persuasively that Asian consumers had more moderate income elasticities of demand for foreign-type consumables then for example Latin American consumers, who exhibited import-biased consumption preferences. In other words, the persistence of positive income elasticities for indigenously designed traditional consumables and thus low import-elasticities was culturally pre-determined.

[47] Unfortunately, the interaction between consumption, imports and savings potentially also creates a statistical problem of simultaneity, which requires a slightly different statistical methodology. See the sensitivity analysis for an assessment of the potential effect of simultaneity on the main findings.

potential simultaneity problem. Gordon and Bovenberg (1996) argue that a country needs to offer substantial subsidies in order to overcome a 'lemon' problem in a world with a perfectly elastic supply of capital but imperfect information, which would also support the view that FDI is influenced by policy. Hughes and You (1969) in their early study of FDI in Singapore argue that it was not necessarily the tax incentives, but rather the efficient administration which attracted foreign investors to the city-state.[48]

However, while the recipient country can try to attract FDI with its policies, the high volatility of FDI across the world seems to be driven by many more aspects, such as the domestic situation of the sending country, cyclical world-economy developments and international financial shocks.[49] Therefore, while the recipient countries might be able to influence at least to a degree where FDI is directed to, the amounts available and the time when they are made available seem to depend on factors not influencable by policies of the recipient country. Consequently, Net-FDI must be considered to a substantial degree a non-policy variable – especially in a cross-sectional world sample.

The potential simultaneity between Net-FDI and savings is more difficult to resolve than the same problem between the resource balance and savings, because if the variables are jointly determined then only over a longer period of time due to the longer time-horizons underlying investment decisions.[50] This makes both finding instruments for a 2SLS model extremely difficult and also suggests that the simultaneity, while possibly existing on an analytical level, is not likely to impact the empirical analysis, because the error terms of the regression models are not likely to be correlated with the Net-FDI observation for the respective year(s).

[48] Hughes and You (1969, p. 188)

[49] For a summary of the FDI literature see Edwards (2000) and World Bank (1997). For a recent assessment of FDI from Singapore's perspective see Ermish and Huff (1999).

[50] Regressing Net-FDI on its lags for the last three years only yields an adjusted R-squared of 0.36, in our sample (N=3057) for 1975-99, with all three lags significant at the ninety-five-percent confidence interval.

I.2.1.4. Asian Peer Group Factor and other Regional Dummies

The study works with three regional dummies, which intend to capture effects shared by the respective group of neighbouring countries beyond their individual non-policy and external situation. A dummy for Latin America (LA) comprises twenty countries from South America.[51] The Sub-Sahara (Sahara) dummy consists of forty-six African nations.[52] The Asian dummy (Asia) combines Japan, the four East-Asian Tigers (Singapore, Hong Kong, South Korea and Taiwan), the second-tier Asian NICs, namely Indonesia, Malaysia and Thailand, as well as the latest fast-track industrialising country, China.

These Asian countries are often investigated together in the same or similar formation. Meier (1986) groups together the four Tigers, the second-tier NICs and the Philippines. De Brouwer (1999) also investigates the four Tigers and the second tier NICs plus the Philippines and Australia. Collins (1991) uses the same set of Asian countries as this study less China but adding Burma and Turkey. Kosai and Takeuchi (1998) investigating the influence of Japan's development history have the exact same grouping as our Asian dummy. The World Bank's East Asian Miracle also works with a similar grouping, which they call HPAE (high-performing Asian economies). Page (1994) works on the same group of countries as our dummy except for China. The two main differences between the grouping used in this study and those just referred to are the inclusion of the Philippines and the exclusion of China. The Philippines are often included due to the fact that as early as the 1950s the country was picked to be the most likely candidate of an economic

[51] The twenty Latin American countries are: Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay and Venezuela.

[52] The forty-six Sub-Saharan African nations are: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Dem. Rep.), Congo (Rep.), Cote d'Ivoire, Equatorial Guinea, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Zambia and Zimbabwe.

miracle.[53] The exclusion of China is generally explained with the lack of data. However, the availability of data for China has improved and recently the country features more often in comparative analyses, e.g. Gamaut et al. (1995) and Kosai and Tackeuchi (1998). In order to evaluate the sensitivity of the Asian dummy in respect to these differences the Sensitivity Analysis will test the effects of a different Asian dummy which includes the Philippines and excludes China.

While the core configuration of the group of Asian countries is largely agreed upon in the literature, differences on what these countries actually share and thus what such a dummy measures are widespread. Geography, policy, culture, successful economic growth and demography are all referred to as important similarities. While the impact of geography, demography and growth can be investigated empirically, which the sensitivity analysis will undertake, the influence of the policy and cultural environment is more difficult to capture empirically.

Geography, Demography and Growth

The new-geography literature suggests that distance with its impact on trade, investment and income is the driving force behind the often found statistical significance of these regional variables.[54] They appear to model the costs of being outside of existing economic centres. This study, however, will already model geography via the separate inclusion of the geographical variables described above. If the dummy is significant even if the geographical variables are included or themselves insignificant, then the dummy appears to capture at least more than geography. If the dummy proves not to be significant once the geographical variables are included,

[53] For example see: World Bank (1993, p. 22): "In the 1950s, [the Philippines were] thought to have the best potential in the region, second only to Japan."

[54] See for example Hendersen et al. (2000)

then indeed geography seems to be the driving force. The effects of growth and demographic developments can be similarly investigated.

Policy

De Brouwer (1999) convincingly shows that the East Asian countries had very varied policies in respect to consumption, savings and their financial markets. Ito (1996) offers a comprehensive assessment of similarities and differences in the East Asian economies and finds that there is almost no generalisation that applies to every fast-growing country in East Asia, not even the fact of very high rates of investment and saving, where Hong Kong is the exception.[55] Therefore, no clear set of policies emerges which could distinguish East Asian countries. However, statistical analysis works with averages and thus it must be said that even if some individual countries differed on certain aspects, the successful East Asian countries tended to be more export oriented and have a more economically active state.[56]

The Flying Geese hypothesis gives a potential explanation why these tendencies might have been shared across the region. Bruce Cumings (1984) argued in his often cited analogy with flying geese that countries in East Asia followed one another in a developmental trajectory in which the latecomers replicate the developmental experience of the countries ahead of them, starting with the Japanese.[57] The simplicity of this view has attracted a fair share of criticism, e.g. Bernard and Ravenhill (1995). Yet, even Bernard and Ravenhill (1995) agree that a regional perspective is essential for

[55] For a further comparison of many East Asian countries' development policies particularly in respect to earlier Japanese policies see Yamada and Kuchiki (1997)

[56] Kosai and Takeuchi, (1993, p. 312), see the similarity in the income-elasticities, i.e. the conservative spending habits of Japan, which have been shared to some extent by other East Asian countries. Felix (1994) comes to a similar conclusion. While this finding might be helpful in respect to an analysis of the shared growth success, it is not very useful in explaining the potentially shared savings performance, because in essence it would simply explain savings with savings.

[57] As Bernard and Ravenhill (1995, pp.172-3) point out, the flying geese analogy goes back to an article by the Japanese economics Akamatsu Kaname published in 1937.

understanding the pattern of industrialization in contemporary East Asia.[58] Meier (1986) argues explicitly that the East Asian NICs followed Japan and as the first-tier NICs moved up the ladder of comparative advantage into capital-intensive and knowledge-intensive products, the second tier countries, namely Indonesia, Malaysia, Philippines and Thailand, followed behind with exports from light industries such as food processing, textiles, clothing and simpler electronics.[59] Kosai and Takeuchi (1993) also point out that in their view the East Asian economies have revealed a common pattern with growing intra-regional trade, investment and information exchange, all promoted by social, cultural and geographical proximity. In their view the flying geese model can even be understood as an external factor in East Asia, because latecomers simply use technologies and institutions of the other economies that took off first.[60] But they also admit that within the geese there are different flying patterns depending on resource endowments, size of country etc. The geese decided to fly particularly differently in respect to their views adapted towards FDI, with Japan, Taiwan and South Korea all restricting FDI inflows.[61]

Culture

Cultural assessments of East Asian success point to the Confucian tradition which is said to promote frugality, hard work, family loyalty, respect for authority, a strong achievement orientation, a keen sense of personal obligation to group welfare, an enormous prestige of education with the concomitant motivation to provide the best education for one's children and severe meritocratic norms and institutions, which while egalitarian in design,

[58] Bernard and Ravenhill (1995, p. 171)

[59] Meier (1986, p. 14).

[60] Kosai and Takeuchi (1993, p. 313)

[61] See Section III.1.3. for a more detailed discussion of the flying geese hypothesis. For a more detailed exploration of the applicability of the hypothesis to Singapore's economic history see Chapter Three, which among other aspects directly investigate this hypothesis by analysing Singapore's investment pattern over time.

serve to select out elites when they are at an early age.[62] Beyond the resulting high working ethics, these characteristics are thought to have facilitated the national consensus around high-speed economic growth evident in Japan and the East Asian NICs since the 1950s and 1960s. This culturally derived capacity for cooperation is supposed to have led political elites, industrial leaders, workers, and other citizens to agree on the primacy of economic objectives for the society as a whole and on the means to achieve those objectives.[63] Nevertheless, it is still controversial to which degree these cultural factors might actually be able to explain East Asia's economic success.[64] Chan (1993) points out that East Asia's rich traditions embody a variety of values that can have both growth-promoting and growth-retarding effects. Which of these effects will prevail seems to depend not on culture per se but rather on its interaction with the environment. He concludes that in itself a cultural outlook cannot account for the East Asian transformation.[65] Similarly, Gereffi (1994) argues that while generally containing valuable observations these generalizations based on cultural comparisons may be too sweeping:

> They often fit one region or time period reasonably well but falter when their scope is expanded. (...) Simplistic cultural arguments run into a variety of problems. First, regions are not culturally homogeneous; this is particularly

[62] See for example, Chan (1993, pp. 38-41), Berger (1988) or Kahn (1984)

[63] Gereffi (1994, p.29-31). See also Johnson (1983, pp. 6-10), and chapters by Lucien Pye, Gordon Redding, and Siu-lun Wong in Berger and Hsiao (1988). By contrast, Latin America is argued to have been plagued by a divergent set of cultural norms based upon Ibero-Catholic heritage impeding the economic advancement of the region, see Valenzula and Valenzula (1978) for a review of this argument.

[64] With regards to Singapore the origin of these potential values in the first place has also been taken into question. Peebles and Wilson (2002, p. 35) disucss what later have been called 'Asian Values' and have been associated with Lee Kuan-Yew's own views. They show that acutally these 'Asian Values' came most likely more from contact with Isreali development specialists and Singapore's Dutch economic adviser, Dr Winesmius, than from any Confucian heritage which, after all, was alien to the early PAP leaders. Another suggestion is found in Hill (2000), who proposes that Singapore did not adopt the general idea of 'Asian Values' until later in the 1960s and 1970s from the works of Western social scientists, who had argued that neo-Confucianism was more conducive to industrialization that had been supposed. Lee Kuan Yew (2000, pp. 512-13) himself recalls how he learned of the nature of some Asian societies through his visits to American universities and talks with Western academics. Dr. Goh Keng Swee identified the values that Singapore upholds and which are often presented as Asian as those of the Victorian era in Britain (Peebles and Wilson, 2002, p. 35). Backman (1999, p. 21) offers a cyncial redefinition of what Asian Values actually are.

> true of East Asia. In Taiwan and South Korea, for example, Taoism and Buddhism as well as Confucianism have important followings, and there is a significant Christian minority in some East Asian countries like South Korea. More importantly in terms of the timing of high-speed growth, [Confucian as well as Christian] traditions have existed for centuries. But especially in East Asia ... the dynamic shifts in economic performance have occurred primarily in recent decades. A more sophisticated cultural interpretation would see culture as historically situated, emergent, and mediated through institutions. (...) The impact of cultural variables probably is most important in outlining an acceptable range of solutions to development problems, rather than in determining specific economic outcomes. [66]

Peer Group

In summary, hardly any factors have been shared across the whole region, with the exception - as the sensitivity analysis will show - of a demographic transition, which however is not sufficiently strong to fully account for the Asian dummy's statistical behaviour. Neither culture, nor policy or shared economic success or geography is individually driving the Asian dummy. Nevertheless, they can also not be fully disregarded. How can such a controversial situation be reconciled?

Chan (1993) makes a case for the overall principle of "convergent goals, divergent conduct". Kosai and Takeuchi (1993) argue for a linked development among the East Asian countries, which - they observe - have all evolved along a shared but dynamic comparative advantage path.[67] This notion of collectively but different, where individual countries have observed each other and yet still followed their own particular development, is what this study will refer to as peer-group effects. Singapore, it is argued

[65] Chan (1993, p. 41)
[66] Gereffi (1994, p. 29-31), see also Swidler (1986)

by the inclusion of the Asian dummy, has 'played' within a league of fast-developing nations, using her similarly developing neighbours and regional competitors both as benchmarks and as sources for policy lessons, even though adaptation and implementation might have sufficiently differed. The Peer-Group notion is a somewhat less stringent variant on the flying geese hypothesis, able to incorporate other potentially shared factors beyond industrial sequencing.

Primary sources lend further support to this view. Goh (1995) for example refers to the useful lesson to be learnt from how Japan needed to change its institutional set-up before growth became feasible for the country.[68] The second part of Lee Kuan Yew's biography also refers to Japan as a source for ideas rather than a model to be copied.[69] With respect to Taiwan and Hong Kong Lee (2000) writes that he had "picked up useful pointers. If they could make it so could Singapore."[70] Almost defining the essence of a peer group Lee (2000) writes further:

> So I made a practice of finding out who else had met the problems we faced, how they had tackled it, and how successful they had been. Whether it was to build a new airport or to change our teaching methods, I would send a team of officers to visit and study those countries that had done it well. I preferred to climb on the shoulders of others who had gone before us.[71]

[67] Kosai and Takeuchi (1993, p. 314). They further argue that Latin America, by contrast, was not able to create similar linkages, because trade and investment there was shaped primarily by the desire for a relatively complete market in each country.

[68] Goh (1995, p. 144) in a speech delivered at the Royal Society in London in 1983 entitled 'Public Administration and Economic Development in LDCs': "Developing countries can learn much from the slow and painful way the Japanese adapted their social and political institutions before growth through industrialization became feasible."

[69] Lee (2000, pp. 521-529) Chapter 32 entitled 'Lessons from Japan'

[70] Lee (2000, p. 562)

[71] Lee (2000, p. 686). Lee (2000, p. 614 and p. 645) also describes how China under Deng Xiaoping also studied the local group of NICs and particularly Singapore for potential lessons to be applied in China.

I.2.1.5. Variables for Sensitivity Analysis

A number of further variables are of potential interest but suffer either from weak theoretical support or limited data availability. Additionally, some of the variables tested in the standard analysis described above exist in slightly different formats, employing differing measurement techniques or coming from different sources. The sensitivity of the findings obtained by employing the above set of variables, therefore, needs to be tested in order to ascertain that the conclusions are robust even if additional or different variables are used in the models.

Table I.2.1.5.: Variables for Sensitivity Analysis

Additional Variables	Differing Variables
1. Share of Agriculture in GDP (Agri) 2. Initial Income Distribution (IniInc) 3. Net-Fuel Exports (NetFuel) 4. Terms of Trade (ToT) 5. Per Capita Income (GDPpc) 6. Growth of per capita income (Growth) 7. Interaction variables: • EcoAcRat * growth • EcoAcRat * GDPpc • NetExRat * Asia	1. Institutional quality by Beri from 1972 (Beri72) 2. Composite Living Standard Measure (IniHDI*) 3. Initial Literacy Rate (IniEdu) 4. Initial GDP in PPP estimates (IniPPP) 5. Share of Labour Force as percent of Total Population (LaborRat) 6. Total Trade as percent of GDP (Trade) 7. Different Asian Dummy: exclusion of China but addition of Philippines (Asia2) 8. Small Island Dummy (Island)

Additional Variables

It can be argued that the higher the country's exposure to the agricultural sector, measured as the share of agricultural value added in total GDP (Agri), the more difficult it is for the respective country to create a saveable surplus. In reverse, this argument states that industry and services tend to create higher, saveable surpluses. This thesis was first proposed by Arthur Lewis' dual economy theory (1954), which predicts that the share of saving in GNP will rise due to the more rapid growth of the modern, capitalistic sector with

its higher saving potential.[72] Additionally, an agricultural economy will also be less urbanised and it is argued that more rural societies find it more difficult to save due to a potential lack of sufficient financial institutions in rural areas. Moreover, the central government, it is argued, will find it easier to tax and collect taxes of an industrial rather than a peasant-based economy.[73] However, these arguments are debateable, particularly once the agricultural sector moves beyond pure subsistence farming. The share of the agricultural sector in the economy might also simply capture income and growth of income, because as the economy develops the share of agricultural value added is likely to fall.[74]

Another hypothesis stemming from W.A. Lewis' work, is that higher savings requires growing inequality of income in favour of domestic capitalists. This argument motivates the inclusion of a measure of income distribution, particularly as it describes the countries' initial situation so that it can be regarded as non-policy induced. This is achieved by including Perotti's measurement of the income share of the second and third quintile, taken as close as possible to 1960 (IniInc). As Perotti (1996) points out, this measure has several advantages. It captures the notion of 'middle-class', whose size is often associated with the concept of equality. Additionally, the share of the middle-class is less sensitive to measurement errors.[75]

The obvious strong relationship between high saving ratios and oil-exporting countries, see graph I.1.a., poses the question whether the results of the

[72] Huff (1995, p. 750) applies this argument to the investment behaviour of Singapore, arguing that an urban economy like Singapore requires considerably more capital than one with a rural economy.

[73] For example see Goh, Keng Swee (1972, p. 78) in a 1965 paper prepared for a development conference when he was the Finance Minister of Singapore.

[74] As a matter of fact this is at the heart of the Chenery and Syrquin argument about the structural transformation of an economy as it moves through successive stages of development. Chenery and Syrquin (1983, pp. 21-26) find that the share of value added in agriculture declines sharply over the transition, while manufacturing and social overhead (construction plus utilities) double their share and the share of the services sector rises by about 50 percent.

[75] Perotti (1996, p. 154-55). Going beyond the basic W.A. Lewis thesis, Perotti (1996, p. 182) also argues that more equal societies have lower fertility rates and higher rates of investment in education, and that very unequal societies tend to be politically and socially unstable.

analysis are driven by a country's oil-exporting record. In order to model this effect, net-fuel-exports as a percent of GDP can be included as an independent variable. Data availability unfortunately is somewhat restricted.

Another variable with limited data availability and somewhat questionable data quality is the development of the terms-of-trade. The study by Loayza et al. (2000), for example, shows that a ten percent improvement in the terms of trade increases the private saving rate by 0.74 percentage points in the short term. Rodrik (1998) also finds that there is a positive and significant relationship between increases in the external terms of trade and saving. He too argues that it is primarily private saving that is affected by the terms of trade. Daval-Gulat and Thimann (1997) support this view as well, arguing that next to the access to foreign savings as measured by the current account balance terms of trade shocks are a second potential external factor. Reviewing the literature, they summarise that generally the Harberger-Laursen-Metzler effect, which states that positive terms of trade shocks increase saving through the positive effect on wealth and income, is supported.[76] Masson et al (1998), on the other hand, qualify these findings and argue that changes in the terms of trade have a significantly positive effect on saving for industrial countries, but not for developing countries or a combined panel. The terms of trade deteriorated due to the oil price shocks of 1973 and 1979, and the deterioration had large effects in reducing the industrial nations' private saving rates. Conversely, the terms of trade improved in oil-exporting countries and increased their saving, at least for a time. However, the effect was transitory. Moreover, because terms-of-trade changes balance out at the world level, there is no presumption that this variable will durably affect world saving.[77]

[76] See Ostry and Reinhart (1992), Fry (1986), and Masson, Bayoumi, and Samiei, (1995).
[77] Masson et al (1998, p. 497). It must, however, also be noted that their sub-sample for industrial countries had a longer sample period than their sub-sample for developing countries.

The relationship between per-capita income and the saving ratio is theoretically ambiguous and controversial. Additionally, it can be argued that policy choices matter substantially for the development of income over time. Yet, it is such a fundamental variable that it begs inclusion if only to investigate how it might affect the significance and coefficients of the other variables. Ideally, a large and reliable dataset on per-capita income adjusted for purchasing power parities should be used. Unfortunately, no such data set exists, even though recent efforts by Angus Maddison and by the Center for International Comparisons at the University of Pennsylvania have brought us closer. Moreover, even purchasing-power-parity estimates have recently attracted criticism, not only in respect to the problems inherent in matching products between countries across different areas of the world and across different developmental stages, but also on theoretical grounds, see for example Ark (1996) or Dowrick and Quiggin (1997). Therefore, three different varieties of per-capita income measures are tested: per-capita income in current US dollars (GDPpc), in 1990 international Geary-Khamis dollars (PPP) and adjusted according to the World Bank's Atlas method (GDPat).

The effect of growth on savings, on the other hand, has a much stronger theoretical backing.[78] However, it is also largely policy induced and should thus not be part of a benchmarking exercise. Nevertheless, it is important to investigate whether the other variables included in the equation might actually capture growth effects. For example, Gallup et al. (1999) have shown that geography variables are correlated with income levels and growth of income. Therefore, it is important to show that growth does not enter the equation significantly and thus the other significant variables can not simply measure growth effects. Growth rates for the three per-capita income measures are therefore tested, in order to see how they might affect the other variables.

[78] See section II.1. for a detailed description.

Finally, Collins (1991) makes a strong case for the inclusion of interaction variables, particularly between growth and (young) dependency. She argues that econometric estimates of the determinants of savings are mis-specified if the interactive effects, which she terms the 'growth-tilt' effects, are omitted.[79] Her econometric analysis shows that even though exclusion of these effects causes only a modest reduction in overall fit, it does severely bias the parameter estimates. Once the interaction variable is included, the dependency rate has a positive level effect on savings, i.e. an increase in dependency increases savings, but also a negative growth tilt effect. The positive level effect is consistent with an increased population share of children which, Collins argues, leads to raising household bequests or increasing household precautionary savings. In combination, the positive level effect on savings is offset by the reduction in the mean age of consumption in the economy relative to the mean age at which income is earned. The magnitude of this offset is tied to the economic growth rate. For her sample and time-period the negative growth tilt effect dominates for countries where the growth rate exceeds 6.8 percent. For those countries, the net effect of a rise in the dependency rate will be to reduce savings.[80]

For our analysis two further interaction variables might be of interest: EcoAcRat and per-capita income as well as the Asian Dummy and NetExRat. A high share of the economically active population but combined with low incomes will not allow the many wage earners to save even though demographics might suggest it. Together with Collins' 'growth-tilt- effect, this interaction might be able to explain the at times inconsistent findings of the savings literature in regards to dependency. An interactive variable between Asia and NetExRat will help to further investigate how important the export-success of the whole Asian peer-group was for the countries' saving performance, since the export orientation is one of the few shared

[79] Collins (1991, p. 362)
[80] Collins (1991, pp. 364-5)

phenomena of this group of countries. The interaction variable will therefore allow us to probe further what indeed the Asian dummy captures.

Differing Variables

Business Environmental Risk Intelligence (Beri) has continuously tried to measure the institutional quality of countries around the world. Beri offer estimates on Bureaucratic Delays (as a proxy for the quality of the country's bureaucracy), Nationalisation Potential (as a proxy for the risk of expropriation), Contract enforceability and infrastructural quality. The earliest observations are available for 1972 for altogether forty-three countries, including Singapore. Notwithstanding the late date, Beri72 might still be useful as a means to test the robustness of the other variables describing the countries' initial institutional quality. Following Knack and Keefer (1995) the four dimensions are combined with equal weights into a composite figure (beri72), which ranges from 4 for low quality to 16 for high quality. Knack and Keefer (1995) find that this composite figure has a greater impact on investment and growth than has previously been found for proxies such as the Gastil indices of liberties, and frequencies of revolutions, coups and political assassinations. These results are robust to the inclusion of measures of factor accumulation and of economic policy.

The United Nations' HDI-index could also be used as a further description of the initial situation, in place of IniGDP, HumCap and even SocCap. This composite living standard measure has the potential advantage of combining into one figure three separate dimensions: life-expectancy, educational attainment and per-capita income. The individual observation for each dimension is capped at a certain maximum level. Educational attainment is proxied using literacy rates and the combined primary, secondary and

tertiary enrolment rates.[81] This measure, therefore, describes the access to consumption via the income figure and the quality of a country's institutions as they impact the capability of the people to enjoy their consumption. Thus, for the purposes of this study, it would be an ideal description of the countries' respective situation at the beginning of our period of observation. Unfortunately, the United Nations does not publish HDI indices for the 1960s. Therefore, the index as it would relate to 1965 needed to be calculated using the World Bank's World Development Indicators. Enrolment rates are few to come by for this time period, consequently educational attainment was only modelled using literacy rates.[82] The maximum levels for income and life-expectancy were set at the respective 1965 observations for the United States. Per-capita income was adjusted for differing price levels using the World Bank's Atlas method. This information was available for seventy-seven countries, including Singapore.

A regression analysis also allows for the individual inclusion of the three dimensions, so that the respective weights are determined separately. Therefore, the initial literacy rates (IniLit70) and life-expectancies (IniLife) can also be included separately next to the initial per-capita income levels.

The initial income levels before 1965 have so far been modelled using per capita income measured in current US dollars. The Maddison dataset also allows for purchasing-power-estimates with a sample not substantially smaller, although somewhat different in coverage. Therefore, Maddison's 1964 estimate of purchasing power parity adjusted per-capita income (IniPPP) is also tested.

[81] For a detailed explanation of the exact calculation and critical assessment of the index see Dasgupta (1993) particularly chapters four and five (pp. 75-134) as well as Crafts (1997a and 1997b), who also uses the index as a tool to investigate economic history, including that of East Asia.

[82] Unfortunately, literacy rates for Singapore are only available from 1970 onwards. In order to allow for the benchmarking process, the initial HDI level therefore combines life-expectancy and income from 1965 with literacy rates from 1970. The literacy rates are given as a percent of people aged 15 and above.

A slight, but potentially important variation on the EcoAcRat variable, which measures the share of the population in working age, would be to instead measure the share of the labour force as a percent of total population (LaborRat). This alteration is motivated by the argument that it does not necessarily matter how many people are within working age. What matters is how many are actually employed and thus receive an income out of which a saving/consumption decision can be made. LaborRat captures participation and unemployment rates, which go unnoticed using the 'pure' dependency variable. On the other hand, the self-employed are excluded and furthermore the quality of the data can also be doubtful , particularly in countries with a large shadow economy. Furthermore, the use of LaborRat can lead to a reduction in sample size, due to its somewhat more limited availability than EcoAcRat.

Levine and Renelt (1992) argue in their sensitivity analysis of cross-country growth regressions that findings using the share of exports in GDP could be obtained almost identically using total trade or import share. This points to the argument that trade statistics basically capture the degree of openness of the economy. In order to investigate whether the Net-Export-Ratio in our standard set of independent variables does so as well, it would be helpful to substitute NetExRat with the sum of the export and import ratios, i.e. total trade as percent of GDP (Trade).

Since it is rather difficult to determine what exactly regional dummies capture in a regression analysis, it is especially important to investigate the sensitivity of these variables. In terms of this study, the Asian Dummy requires a particular probing. Therefore, next to the regional dummies for Latin America (LA) and Sub-Saharan Africa (Sahara), two additional variations of the Asian dummy are tested. Possibly questionable data for China would argue for the exclusion of China from the dummy variable, while at the same time some parts of the literature have included the Philippines as part of their comparative studies. Consequently, an Asian dummy (Asia2) with the Philippines but without China is tested. Yet another

part of the literature, has grouped Singapore into a set of countries consisting of small city or island states.[83] While the comparison of city-states in a stringent econometric analysis falters due to very limited data availability outside of the national accounting system, a construction of a small island dummy is possible. Following Findlay and Wellisz (1993) Hong Kong, Jamaica, Mauritius, Malta and Singapore are combined into such a binary variable (Island).[84] These countries do not only share the fact that they are small in the physical sense of area and population but also in the technical sense of being price takers in world commodity and capital markets. That is to say, they are severely limited in the extent to which they can influence their terms and conditions of trade. In addition to this equal exposure to the opportunities and the vicissitudes of world markets, these countries inherited similar institutions from their British colonial past. On the other hand, they differ notably in their natural resource endowment, in the ethnic variation in their population, and in the nature of their polities. Hong Kong, Singapore and Malta have no natural resources other than their excellent harbours, while Jamaica and Mauritius depend on their land and climate to support their plantations economies. Jamaica, in addition, is well endowed with a valuable mineral, bauxite. As for ethnic composition, the population of Hong Kong is almost entirely Chinese; Singapore's is predominantly so, but with substantial Indian and Malay communities; Malta is homogeneous; and Jamaica and particularly Mauritius have a diverse mixture of descendents of African slaves, Indian and Chinese indentured workers, and European planters. Politically, Jamaica, Mauritius, and Malta have democratic governments with active and open competition among their political parties; Hong Kong during the period of observation was largely governed by British civil servants and Singapore by a single dominant party and an elite bureaucracy.

[83] For example, see Stern (1989, p. 602) arguing for city-states and Findlay and Wellisz (1993) for small island states.

[84] The following summary description draws largely upon Findlay and Wellisz (1993, pp.1-2)

I.2.2. The Model-Building Algorithm

Linear regression models are estimated both on an annual and on a pooled (fixed-effects) basis. A full panel data analysis is unfortunately prohibited due to the sample properties, particularly the fact that it does not consist of a constant set of countries with observations for all years. Countries, which report data irregularly, would need to be excluded in order to allow for a minimum time-series dimension for each country.[85] Moreover, it is likely that such an exclusion leads to a systematic bias in the sample. Therefore, it was decided to conduct both pooled and annual analyses. Furthermore, both general-to-specific elimination of insignificant variables and specific-to-general addition of potentially significant variables were used in separate model construction approaches.

A pooled sample, in which all observations across the whole time-period are included no matter from which year they stem, assumes that no differences between certain time-periods exist. In other words, whether country A achieved its respective saving ratio in year X does not matter. What matters is that it achieved it with the respective values of its explanatory variables. However, the (true) impact, i.e. the coefficients, of these variables might differ significantly over time and between time periods, particularly with such strong world-wide economic events as, for example, the oil-crisis years as part of the sample period. The use of annual time-dummies helps somewhat in capturing time-specific sub-period influences. However, it will not allow for the development of individual coefficients over time. Therefore, on the one hand, the explanatory quality of fixed-effects models must be considered generally weaker than that of annual models. On the other hand, they are still much preferable over simple averaged models, in which the observations for the individual variables have been averaged over the whole period, since this causes the complete loss of the time dimension in the

[85] Loayza et al. (2000), for example, lose every twentieth observation in their sample by limiting its coverage to those countries with at least five consecutive annual observations.

model. With fixed-effects models at least the respective relationship of the individual variables at a given time is taken into consideration by the regression analysis even though the final coefficient is fixed for the whole period.

The removal criterion for the general-to-specific elimination of variables is a joint-hypothesis F-Test of the variable's coefficient. A maximum probability of the F-statistic of 0.1 was allowed for the variable to remain in the model.[86] Variables were removed from the model in individual steps, i.e. one at a time. The additional use of a specific-to-general method of equation construction was made necessary since the general-to-specific model will require the countries to have observations for all the variables, no matter whether they turn out to be significant or not. The general-to-specific model will, therefore, almost always have a smaller sample size than the specific-to-general model, which only requires observations for all significant variables. Additionally, the specific-to-general method has the advantage of showing the incremental impact of individual variables, which is particularly important in order to separately capture the impact of the three main explanatory dimensions of non-policy, external and peer-group effects.[87] In order to combine the advantages of both approaches a general-to-specific elimination is generally followed by a specific-to-general model of those variable which have proven significant in the former removal process.

[86] A more stringent criterion for the removal of individual explanatory variables has been proposed by Edward Leamer (1985). In his attempt to try to identify robust empirical relations in the economic growth literature he developed the 'extreme-bounds test', which in essence amounts to saying that if one finds a single regression for which the sign of an individual coefficient changes or becomes insignificant, then the variable is not (absolutely) robust and should be dropped. For a critical assessment of Leamer's extreme-bounds test see Xavier X. Sala-i-Martin (1997, p.178-9), who argues that the test is too strong for almost any variable to pass it. The Joint-Hypothesis-Test, on the other hand, determines whether an equation with the variable in question is significantly different from the equation without that variable.

[87] The case in favour of the general-to-specific method is generally associated with David Hendry. See for example chapters 6 and 9 in Hendry (1993) or Hendry (1986). However, the potential disadvantage of the general-to-specific method of unnecessarily reducing the sample size and the advantage of the specific-to-general approach of showing incremental effects of the inclusion of individual variables is not taken into account by Hendry.

A restriction of the sample to countries which in some way are similar to Singapore has been resisted in order to prevent the comparison of like with like. Rather than excluding countries with potentially different influences and developments, the study tries to control for those factors which seem significant in explaining the variance among the sample, which should result in a much more illuminating benchmark for Singapore's performance. Instead of just comparing Singapore with its own kind, the country is compared to all kinds with the statistical techniques putting a value on the impact of all significant differences. Additionally, a number of independent variables seem to be sensitive to selection bias, particularly the relationship between age distribution and saving.[88] Moreover, a restriction to 'comparable' countries will bias the overall outcome of the analysis, by - so to say - already incorporating odds for the extra-ordinarity of Singapore's saving performance. If the study, for example, had only taken other successful countries the potential range of these odds would have been pre-determined by sample selection. This, however, also requires that the regional dummies are generally only added in the final specific-to-general stage.

The possible existence and impact of a number of potential statistical pitfalls, such as multi-collinearity, heteroskedasticity or simultaneity, will be investigated in the sensitivity analysis in order to highlight their likely effect on Singapore's benchmark savings.

The statistical software package employed for all statistical computations was SPSS version 10.07.

[88] See for example: Collins (1991, p.364)

I.2.3. Data Sources and Potential Problems

The main source of data is the World Bank's World Development Indicators (WDI) CD-Rom (2001 edition), which offers the by far widest international coverage of any publicly available database with observations for 208 countries including Singapore and observations going back to 1960.[89] Nevertheless, for our purposes the source had to be extended with data for Taiwan, which is not recognised by the World Bank, as well as with institutional and geographic variables, and with respect to the sensitivity analysis with estimates for initial income distributions, purchasing-power-parity income estimates and the terms-of trade.[90] Furthermore, Singapore's data was further supported with data from Singapore's own official data sources.

The Taiwanese data was taken from various issues of the Statistical Databook, published by the country's Council for Economic Planning and Development. In order to obtain observations for Taiwan's urbanisation and literacy rate this source was further supported by various issues of the country's Statistical Yearbook, published by the Republic of China. Since the

[89] An alternative source, which was specifically designed for investigations of saving behaviour across the world, is the World Bank's saving database, which has been created by the Bank's own research project into this subject and is described in Loayza et al. (1998). This particular data source was not used, because it only offers data until 1994/5 and thus excludes with the second-half of the 1990s one of the main periods of interest in Singapore's case. Moreover, the saving definition used in this research project adds Net Transfers from Abroad to the country's GNP in order to obtain Gross National Saving, although GNP includes already at least Current Transfers (in contrast to GDP). Loayza et al. (2000, p. 168, footnote 9), which use this database, make a point that the additional inclusion of capital transfers makes only very little difference, so that this particular treatment becomes even more questionable. A query emailed to the research team about this surprising treatment has gone unanswered. The saving data, furthermore, includes an imputation for capital gains. While this might be desirable, the outcome of any analysis of the thus derived dataset will be rather sensitive to the assumptions underlying the imputation. It is questionable whether this added sensitivity is worth taking on board. Moreover, it should be assumed that the main potential advantage of using this particular dataset, namely that the research team claims to have vetted the data for any internal inconsistencies, should by now have found its way into the five years later edition of the Bank's main database, the World Development Indicators. The research team worked from the 1995 release while this exercise uses the 2001 edition. Between the two editions there are substantial differences in individual series, which must be hoped are the resulting improvements.

[90] The institutional and geographical variables and their sources were already described in section I.2.1.2., which also mentions the main articles containing the detailed calculations and assumptions behind these variables. A further explanation of the variables is therefore not included here.

country does not directly report Net-FDI, the observations were calculated based on the Balance-of-Payments statistics of Direct Investment in Taiwan and Abroad published in the Statistical Databook.

The data about the initial income distributions in the early 1960s is taken from two sources. Perotti (1996) offers income shares of the second and third quintile for sixty-eight countries with observations closest to 1960.[91] Chenery and Syrquin (1975) use the closest available observation to 1965 and have altogether fifty-three countries in their sample, of which eight are additional to the Perotti dataset. This way the income shares of the second and third quintile were obtained for seventy-six countries, largely from before or very close to the beginning of the period of observation.[92] For those countries which are listed in both data sources the values are either identical or very close, so that the combination of the two sources is not likely to introduce inconsistency into the sample.

Unfortunately, the same can not be said for a potential combination of Maddison's (2001) and the WDI's purchasing-power-parity estimates of per-capita income.[93] Estimates for some countries and years vary widely between the two sources. Since the WDI CD-Rom does not offer PPP estimates before the early 1970s and a combination of the two sources is not possible, the Maddison (2001) estimates were employed. Maddison (2001) offers per-capita estimates denominated in 1990 international Geary-Khamis dollars for 122 countries, including Singapore. However, the dataset offers observations for 1999 only for a minority of countries, nor does it cover countries from the former Soviet Union, so that potential differences in the outcome of the analysis might be due to differences in coverage.

[91] One such country is Dahomey, which is later incorporated into Nigeria. Therefore, Perotti's estimate for Dahomey was used as Nigeria's income share.

[92] Unfortunately, neither dataset includes an observation for Singapore. If the variable proves to be significant in the regression analysis, an estimated value for Singapore would be necessary in order to obtain a benchmark saving value.

[93] A further common source of PPP-estimates are the Penn World Tables. However, the publication of Maddison's latest estimates now surpasses the Penn World Tables both in terms of the number of countries as well as the length of time covered.

The terms-of-trade are taken from data published by the World Bank's research project on international growth available online.[94] The estimates are based in 1995 and cover the terms-of-trade developments of goods and services for a large sample of countries between 1960 and 1999. However, many of the countries covered do not have complete series for the whole period. Unfortunately, due to differing measuring concepts a combination with other data sources in order to fill the gap is not possible. Therefore, our dataset does no offer observations for Taiwan, for example, although the country offers a series of import and export prices in the country's own publications. Moreover, it was not possible to extend the coverage for Singapore for which the World Bank dataset only offers observations for 1975-95. Particularly, differences in the base year, which affects the weights of the individual products used to compile the series, and the width of coverage, especially the potential exclusion of services, make correcting for the differences between individual sources impossible. This also highlights a general problem of terms-of-trade estimates, namely that the weights set for the base year are not likely to be the 'true' weights for the whole period, particularly if the respective economy undergoes structural changes and thus changes in consumption patterns.

The data for Singapore obtained from the WDI was extended and substituted in a few instances. The WDI's observations for Singapore's Net-Export ratio stop in 1996, so that for 1997-99 the country's resource balance was taken from Singapore's Yearbook of Statistics (2000), published by the Department of Statistics. The observations for Singapore's midyear total population were obtained from the Department of Statistics' online data-resource, in order to

[94] The latest version dated June 11th, 2001 was downloaded from: http://www.worldbank.org/research/growth/GDNdata.htm. The WDI does not include terms-of-trade estimates, but offers the related concept of the Capacity-To-Import - however, without any observations for Singapore, so that the use of the WDI for this variable was not possible.

work with population estimates, which include non-residents.[95] The WDI with substantially lower estimates seems to disregard the sizeable non-resident share of Singapore's population. Unfortunately, no such option of substitution was possible for EcoAcRat, because Singapore publishes only data on age distribution for residents. Therefore, the WDI's figures for total (resident) population and its age distribution were used to calculate EcoAcRat for Singapore. The share of the economically active population is probably lower among the resident than among the total population due to the most likely higher proportion of people in working age among the non-resident population. Consequently, the benchmark savings for Singapore derived with this very likely lower than actual figure for the share of the economically active population will be a conservative estimate. In other words, if the share of the economically active population proves to be a significant and positive factor in the regression analysis, the resulting benchmark savings will be lower than if the demographic effect of the non-resident population was also taken into consideration.

The Gross Domestic Saving Ratio for Singapore was also taken from official Singaporean statistics.[96] The series are largely identical with the exception of the early 1960s, for which the WDI offers highly negative and the official statistics low positive savings. While this difference does not affect the dependent variable (GDSrat), because no regressions are estimated before 1965, it does substantially alter the inertia variable (IniGDS). According to the WDI Singapore dissaved an average of 48.3% of GDP during 1962-64, while the official sources publish a positive Gross Domestic Saving ratio of 5 percent of GDP. In 1964 alone, according to the WDI, Singapore experienced negative savings of seventy-four percent of GDP. Where this difference comes from is not clear. However, while lower savings and possibly even

[95] The exact online address is: http://www.singstat.gov.sg. The version used was last updated March 2002. The series refers to total population only excluding foreigners staying for less than one year.

[96] The exact sources are: for 1960-94 from Singapore Dept. of Statistics (1996) table A.8 pp. 65-67 and for 1995-2000 Dept. of Statistics: Yearbook of Statistics 2001 (as available online at www.singstat.gov.sg; May 2002)

negative savings could be expected for this very difficult period in Singapore's economic history, this degree of dissaving seems to be unreasonable, particularly because the WDI still reports positive capital formation for the same years with an average of 18.2 percent. Furthermore, the Singapore government has no apparent reason to over-state savings for those years. As a matter of fact, a substantially negative saving figure would support the government's overall view of this time period, which stresses the crisis aspects of those years. Therefore, the official figures are used for the country's saving performance, including the calculation of Singapore's initial saving ratio.

Combining these sources and removing any annual observations per country for which no GDS value is reported, leaves a maximum sample size of 4,644 annual observations from over 160 countries spanning thirty-five years from 1965-99, not counting Singapore's. However, only a minority of the represented countries offers a complete set for all variables for all years. Missing data was excluded in a listwise fashion, i.e. only those countries with observations for all the variables tested in the respective equation and for the respective time period were included. Using restrictive variables, for which only a limited number of observations are available such as institutional proxies, can reduce the sample size to around 1500 observations for the full period or just above 60 observations for individual years. Net-FDI, is a particular case, because it is not available from the beginning of the period. Net-FDI does not become available until the early 1970s and for Singapore only from 1972 onwards. Therefore, any model including Net-FDI as an independent variable does not only reduce the sample size but also restricts the time-period covered.[97] Yet, overall the sample size still compares favourably with any dataset tested in cross-country saving analyses.[98]

[97] According to Lim and Pang (1991, p. 55), Singapore experienced growth in FDI as early as the late 1960s, particularly between 1966 and 1973: "During this period, manufacturing foreign investments rose from less than S$150million ($52million) to S$683million ($235million), and the export manufacturing, petroleum refining and financial services sectors expanded rapidly, thanks to the boom in world trade. " Therefore, if FDI proves to affect savings positively, as we expect, then the study is likely to produce a conservative saving

I.3. Literature Review

The question of high-savings in Singapore, and all of East Asia, has attracted a fair share of interest. This stems from the fact that over the last three decades saving rates have experienced a marked divergence which has been particularly dramatic within the developing world: saving rates have risen steadily in East Asia, stagnated in Latin America, and generally fallen in sub-Saharan Africa.[99] These regional disparities have been closely matched by diverging growth experiences: across world regions, higher saving rates tend to be correlated with higher income growth.[100] A substantial number of studies have therefore used cross-country regression analyses to explain the variance either in international growth experiences or in saving performances. However, almost none of these investigations have tried to derive a benchmark value for any of the countries in their sample. These studies are purely interested in finding the reasons for the countries' respective economic performance, not in establishing what performance could have been expected given the countries' respective circumstances. Therefore, the literature review for this chapter is quite limited.[101]

Using regression analysis to obtain benchmark saving values for specific countries has not often been undertaken. Denizer and Wolf (1998) use this

benchmark for Singapore in the early years due to the exclusion of FDI from the list of independent variables.

[98] In comparison, Loayza et al. (2000), which uses the WB's saving research database and claims to have one of the largest samples of any investigation so far, work with an initial data set spanning the years 1966-95 and counting 1,254 observations. After removing a number of these observations for different statistical reasons to do with their panel-data approach, the sample is further reduced to 872 observations from 69 countries. Edwards (1997) examines only a sample of 50 countries and Mason et al. (1995) a sample of 61 countries.

[99] Particularly comparisons between East Asia and Latin America have been common. See for example: Taylor (1998), Singh (1997), Birdsall and Jaspersen (1997), Dayal-Gulati and Thimann (1997) to name just a few. Also see Meier (1995, pp.33-61) for a summary of the stylized facts of comparative economic development in the LDCs post WW-II, offering a concise overview of East Asia, Latin America, Sub-Sahara, and Chinese economic development with references to all the main generalisations and many of the remaining questions.

[100] Loayza et al. (2000, p. 165)

[101] See Haque et al. (1999) and Loayza et al. (2000) for recent reviews of the literature regarding cross-country regression analyses of saving ratios. Also see Section II.4. for a summary of studies which deal explicitly with Singapore's saving behaviour.

method to model savings for twenty-five transition economies in Eastern and Central Europe as an attempt to estimate forced savings before the transition to a free-market economy. Yashiro and Oishi (1997) built a simultaneous equations model for the Japanese economy to forecast savings largely depending on changes in the country's demographic composition. Besanger et al. (2000) apply an economic modelling exercise to five Asian countries, among them Singapore, largely to predict the country's optimal future saving path.[102]

Denizer and Wolf (1998), however, still mix policy-induced and non-policy induced variables, so that the explanatory power of their benchmark is somewhat dubious in nature. Their models with R-squareds between 0.55 and 0.63 and 131 observations taken from an unspecified set of market economies of, in their view, comparable development levels show that individual ex-communist countries were far from their predicted equilibrium, free-market saving rates. The models include as explanatory variables, which the authors refer to as fundamentals, the dependency ratio, urbanisation ratio, GDP growth, M2 to GDP ratio, inflation, changes in terms of trade, per capita GDP and a dummy for military conflict. The study, however, is plagued by a number of problems, foremost by the lack of a specification of the 'control group', i.e. the set of countries on which the initial regression is run. Furthermore, the restriction of the control group to

[102] Two related examples of an attempt at benchmarking using econometric techniques are Ostry (1997) and Kim and Roemer (1981). Ostry (1997) models Current Account Balances for five Asian economies, including Singapore. He finds that expectations of future income growth appear to be a significant determinant, economically and statistically, of current account behaviour in the sample of countries and that the CA deficits in the ASEAN region have primarily reflected high levels of investment rather than excessive private consumption. Kim and Roemer (1981) use the original Chenery and Syrquin (1975) equations, without re-estimating them, to determine expected values for the South Korean economy. In terms of saving they find that South Korea (p. 130) "performed substantially below the norm in accumulating both saving and investment in 1953-55 and 1960-62, but then had shot up well above the norm by 1972-74." Based on this development they conclude (p. 131) that "Korea's performance in saving, investing, industrializing, and exporting cannot be explained by cross-country averages, even allowing for its rapid growth during the 1960s and early 1970s. Thus, government policies appear, from this evidence, to have been successful, not only in stimulating growth at a rate matched only by two non-petroleum-exporting Third World countries, but also in achieving levels of investment, saving, industrial output, and exports well above the average for a country of its income class." Chenery and Syrquin themselves have not really used their analysis to build benchmarks. Their studies remain one step

'comparable' countries also limits the power of the analysis. A world sample, in this case excluding all the former planned economies, would have been preferable particularly because the inclusion of a per-capita income variable already controls for different levels of development. Additionally, it must be noted that the time period for the regression is not specified and many of the variables are not significant.

Yahiro and Oishi's (1997) simultaneous equations model for the Japanese economy also struggles with a number of methodological problems .The equation model still exhibits autocorrelation of its residuals visible through low DW statistics, which can be due to either misspecification of the model or a missing lag structure or both. Moreover, the model uses the OLS technique with most likely non-stationary variables, which creates the problem of spurious regressions results. At the analytical level, the general problem of using past data to forecast future data, i.e. the underlying assumption that elasticities and thus preferences of the population remain unchanged in average, can be viewed critically. Overall, even if one disregards this potential analytical pitfall the methodological problems already render results far from robust.

A related literature, of which Besanger et al. (2000) is the example which specifically refers to Singapore, tries to construct a macro-economic model of the respective economies based on utility theory and resulting production functions in order to predict future, socially optimal levels of savings allowing for a variety of factors such as changing demographic structures, labour productivity and consumption demands.[103] Besanger et al. (2000) have applied this technique to five Asian countries, among them Singapore, largely to forecast the country's future saving path. The years of their resulting predictions of optimal savings, for which we now have actual data,

removed. Therefore, Section I.4.1. offers a replication of their approach with our dataset and explicit benchmarking purpose.

[103] For a description of the exact economic modelling exercise see Guest and McDonald (1998 as well as 1999).

1996-99, would argue that Singapore saved in excess of the country's optimal level of just above 30% of GDP.[104] Our study does not follow this literature because of the inherent conceptual differences between socially optimal savings and to-be-expected savings. It is far from reasonable to equate optimal achievements with those which are actually to be expected. Furthermore, the necessary assumptions on the rate of time preferences, rate of technological progress, wealth to consumption ratios, planning horizons, interest rates, depreciation rates, elasticity of output to capital, elasticity of substitution between capital and labour etc. and, even more, the development of these factors over time make the results very sensitive. Moreover, such an analysis will not allow for a separation of policy and non-policy induced circumstances. Therefore, this technique can not be used to determine what could have been expected of Singapore given her circumstances.[105]

The by far largest part of the cross-national saving literature is content with trying to find the significant explanatory variables without an attempt to use the resulting models to derive benchmark values. Some are also more concerned with the direction of causality between saving and growth rather than modelling saving performance let alone establish benchmark values, e.g. Carroll and Weill (1994) and Attanasio et al. (2000). Yet, since the first step of any benchmarking process is still to built such a cross-country model it is nevertheless opportune to review at least the more recent efforts of this literature as well. However, it must be noted that the different objectives will also result in differing models. A benchmarking exercise does not attempt to explain what the analytical underpinnings of a country's saving behaviour are. Furthermore, the separation of policy and non-policy influenced factors,

[104] Using forecast figures as benchmarks is problematic, because of the underlying assumption that there have not been any significant structural or functional changes in the economic environment between the period used as the basis for the forecasting exercise and the period of the benchmark comparison.

[105] In a theoretically related exercise Masson and Tyron (1990) estimate a consumption function using regression analysis in order to derive a set of elasticities, which are in turn inserted into a macro-economic model (MultiMode) developed by the IMF to forecast the different effects of aging on the economic situation of seven industrialised countries, including their saving behaviour.

which is necessary for a meaningful benchmark, is of no importance to the cross-country regression literature. Therefore, cross-sectional analyses always mix policy and non-policy influenced variables, which makes it impossible to use these models to determine what could have been expected of a certain country given its circumstances. Consequently, the value of the coefficients and thus their elasticities can not be directly compared. A detailed comparison of the potentially differing values of coefficients in different studies is therefore not particularly valuable for the purposes of this investigation and thus the overview will limit itself to a discussion of independent variables which have been found to be of importance in several cross-national studies.[106]

Loayza et al. (2000) offer a summary of the recent empirical cross-country studies and conclude that only a few saving determinants appear to be consistently significant across different studies and with their estimated signs according to theory. These factors are the terms of trade, domestic and foreign borrowing constraints, fiscal policy variables, and pension system variables. Regarding other determinants for which consumption theories either differ regarding their signs or point toward ambiguous signs, as in the case of income growth and interest rates, the empirical studies differ widely. They also differ in reported significance levels of variables for which theories tend to agree on expected signs, such as income level, inflation, and demographic ratios. Loayza et al.'s (2000) own exercise, which uses the World Bank's saving database to model private saving, largely supports these conclusions from the earlier literature, which all used smaller samples. In addition, they find that saving inertia, as measured by the lagged private saving rate, has a positive and significant coefficient revealing a large degree of persistence.

[106] For a detailed review of the elasticities of factors influencing savings see section II.4. in the next chapter which deals with explaining Singapore's saving behaviour in a time-series analysis.

Masson and Tyron (1990) in their attempt to fit a consumption function to a pooled sample of seven industrial countries from 1967-87 use a lagged real wealth to consumption ratio as one of their independent variables.[107] Wealth is defined as the sum of the discounted present value of future (non-interest) disposable income plus the real value of financial wealth held in form of domestic outside money, government bonds and net claims on foreigners. Naturally, the estimation of future income streams is highly speculative and thus the results from any such exercise must be considered very sensitive to the underlying present-value assumptions.

Mason (1987) concentrates on the effect of demographics. He concludes that the available evidence supports the proposition that a higher dependency ratio leads to lower saving, particularly among countries with moderate to high rates of income growth. At the mean rate of growth observed over the last two decades for the seventy countries analyzed, a decline from a high- to a low-childbearing regime generated an increase in the net national saving rate of about five percentage points - nearly a 50 percent increase.[108]

Collins (1991) runs regressions on five-yearly averages (1960-64, 65-69, 79-74,75-80 and 80-84) with the GNS-ratio as the dependent variable, and young dependency, per-capita income levels and real growth as independent variables. She also includes two interaction variables: growth • young dependency and growth•per-capita-income. Her main finding is the potential importance of these interaction variables, because according to her study, most factors that influence saving behaviour will have both level effects and 'growth-tilt' effects. These effects need not have the same sign. According to Collins (1991) econometric estimates of the determinants of savings are therefore mis-specified if the interactive effects are omitted.[109] She finds that even though exclusion of these effects causes only a modest reduction in

[107] The other independent variables are real long-term interest rates, real after-tax domestic product, dependency ratio and country dummies as well as a time dummy for the period after 1980.

[108] Mason (1987, p. 549)

[109] Collins (1991, p. 362)

overall fit, it does severely bias the parameter estimates.[110] Overall, her models can explain between 38 and 56 percent of the variation in the sample. But the variables change their significance depending on the inclusion of the interaction variables. The real per-capita income level is the only one that is consistently significant.

Edwards (1997) tries to model ten year averages (1983-92) of the private and public saving ratios for a group of 50 nations. Looking at his beta-coefficients indicates that growth is the most important variable in explaining cross-country differences in private savings. His sensitivity analysis neither finds the degree of urbanization significant nor the structure of the economy, measured by the share of manufacturing, mining, and agriculture in GDP. On the other hand, the dependency ratio has a significant impact, while the current account is only significant for public savings. In order to avoid a potential problem of simultaneity, however, he uses instruments derived by averaging the observations of his independent variables for the period 1970-82. The potential explanatory power of this exercise is questionable unless we assume rather long-term effects of his set of independent variables on a country's saving performance.[111]

Daval-Gulat and Thimann (1997) compare econometrically the private saving ratios of five Asian and 9 Latin American countries in a fixed-effects model for 1970-95. Interestingly, they make a distinction between policy and non-policy influences in the description of their variables. Unfortunately, this distinction is not carried through in their econometric analysis. As the main policy variables they list fiscal policy and government saving, social security arrangements, financial market development, and macroeconomic stability. The non-policy factors most likely to affect saving, in their view, are growth, demographics, and external factors. These may be influenced by economic

[110] Collins (1991, p. 364)

[111] Edwards (1997) set of independent variables includes: the current account balance, the dependency ratio, real interest rates, growth, degree of monetisation, private credit, government savings, social security, income distribution.

policy, but are not themselves policy variables. Growth, they argue, affects savings through demographics following the life-cycle hypothesis and should thus be included in the non-policy set. However, while the effect of growth on saving might not be policy induced, growth itself can be - at least partly - policy influenced by such factors as education, macro-economic stability and the institutional environment. Therefore, the grouping of growth as non-policy by Daval-Gulat and Thimann must be considered somewhat questionable.

Masson et al. (1998) also examine a set of possible determinants of private saving behaviour using cross-sectional and time-series data for twenty-one industrial as well as forty developing countries. In particular they find that demographics and growth are important determinants of private saving rates, and that interest rates and terms of trade have positive, but less robust effects. Furthermore, their results indicate that private saving is partially offset by public saving and (for developing countries) by foreign saving. Increases in per capita gross domestic product seem to increase saving at low income levels (relative to the United States) but decrease it at higher ones.

I.4. Findings

The investigation takes its point of origin from the Chenery-Syrquin models, then continues to separately probe the predictive power of strictly non-policy circumstances before combining them with factors, which are at least partially policy influenced.[112]

I.4.1. Chenery-Syrquin Models

Both Chenery-Syrquin (1975, 1989) publications used a fixed-effects linear regression model applied to a world sample with 1432 and 2954 valid observations for their respective periods of 1950-75 and 1950-83. The (main) regression equation is the same for both publications as well as for any of the dependent variables investigated:

$$\alpha + \beta_1 \cdot \ln Y + \beta_2 \cdot \ln Y^2 + \gamma_1 \cdot \ln N + \gamma_2 \cdot \ln N^2 + \delta \cdot F + \varepsilon \cdot T_{(1\text{-}4)}$$

Where
α = Constant
$\beta, \gamma, \delta, \varepsilon$ = Coefficients to be estimated by regression analysis
Y = per capita GNP in 1964 and 1980 constant US dollars respectively
N = population in millions
F = imports less exports of goods and non-factor services as a share of GDP
T = time dummies, which for the two publications were defined as:

T_1 = 1 for 1950-54	T_1 = 1 if t >= 1960
T_2 = 1 for 1955-59	T_2 = 1 if t >= 1967
T_3 = 1 for 1960-64	T_3 = 1 if t >= 1973
T_4 = 1 for 1965-69	T_4 = 1 if t >= 1979

In this study the above equation was replicated for the time period of 1965-99 using annual time dummies as well as three different per-capita income variables. The former alteration became necessary due to the extended time period in this study and the latter because it is questionable whether converting a current income series using one year's exchange rate for all of

[112] Due to the large number of regression analyses required by the benchmarking methodology the following findings only present the essential statistical results. For a full presentation see the appendix at the end of the thesis, which offers a complete disclosure of both the data used and the statistical output.

the years in the observation period results in a meaningful testable series. Moreover, since Chenery and Syrquin's studies several purchasing-power-parity estimates have become available. Therefore, per-capita income in current USdollars, in USdollars adjusted for different inflationary developments between different countries using the World-Bank's Atlas exchange rates and Angus Maddison's (2001) per-capita PPP estimates were used in separate regression models. GDP instead of GNP was used as the basis of the income variable in order to keep consistency within the equation since the dependent variable as well as Net-Exports are 'denominated' as a percent of GDP and not GNP.

The immediate outcome of these models was to point to a near perfect multi-collinearity between the logged and their respective quadratic terms.[113] As a matter of fact, the correlation between lnN and lnN^2 as well as lnY and lnY^2 for all the income variables was above 0.994. Therefore, dropping the quadratic terms can only improve the model by removing the multi-collinearity problem in the regression while at the same time the remaining variable still has the same variance over time as the eliminated variable and will thus model the relationship with the dependent variable just as well. Consequently the quadratic terms were removed from the original equation.

In a next step any insignificant annual time-dummies were removed using Joint-Hypothesis-Testing. Table I.4.1. offers the results of the thus derived regression models.

Using the obtained equations to calculate predicted annual saving ratios for Singapore results in average predicted savings for the whole period of around 24 percent of GDP, which is one third less than Singapore's actual average GDS-ratio of 36 percent. Therefore, if Chenery Syrquin had indeed applied their methodology to obtain benchmark values for Singapore, they

[113] For clarification purposes, the quadratic terms refer to the square of the natural log of Y or N respectively, i.e. not the natural log of the square of Y or N, since this would have resulted in a perfectly linear combination with $\ln(Y^2) = 2*\ln Y$.

would have considered the country somewhat of an outperformer in regards to gross domestic savings. However, they would have also not been surprised to find above world-average saving rates in Singapore.

Table: I.4.1.: Fixed-Effects Estimation Models

	1965-99		1965-98
Constant	5.599 (4.2)	7.291 (5.3)	-5.792 (-3.6)
Net-Export Ratio	0.724 (87.1)	0.724 (83.5)	0.798 (70.4)
LnGDPpc (current US$)	2.529 (27.4)		
LnGDPpc (Atlas)		2.488 (26.1)	
LnGDPpc (PPP)			3.48 (28.1)
LnN	-0.219 (-3.5)	-0.308 (-4.7)	-0.133 (-1.7)
T1965	1.796 (2.1)	2.029 (2.2)	Not significant
T1966	1.422 (1.7)	1.598 (1.8)	
T1967	1.639 (2.0)	1.726 (2.0)	
T1968	1.580 (1.9)	1.449 (1.7)	
T1969	1.610 (1.9)	1.696 (2.0)	
T1970	2.633 (3.3)	2.524 (3.1)	
T1971	2.883 (3.6)	2.779 (3.4)	
T1972	2.368 (3.0)	2.455 (3.0)	
T1973	2.724 (3.5)	2.837 (3.5)	1.562 (2.0)
T1974	3.907 (5.0)	4.082 (5.1)	3.088 (4.1)
T1975	3.420 (4.5)	3.620 (4.6)	3.322 (4.4)
T1976	3.557 (4.7)	3.800 (4.9)	3.436 (4.6)
T1977	3.220 (4.4)	3.606 (4.8)	3.691 (5.0)
T1978	3.041 (4.1)	3.482 (4.6)	3.661 (5.0)
T1979	2.296 (3.1)	2.460 (3.3)	2.815 (3.8)
T1980	2.582 (3.7)	2.574 (3.5)	3.125 (4.3)
T1981	1.764 (2.6)	1.775 (2.4)	2.694 (3.8)
T1982	Not significant		1.518 (2.1)
No. of Observations	4,497	4,167	3,275
Adj. R-Squared:	0.748	0.744	0.727
Predicted Avr. Saving Rate for Singapore	24.08%	24.20%	23.36%

T-Ratios in parentheses. The model using Maddison's PPP estimates can not be extended into 1999 since Maddison's dataset only offers few 1999 PPP estimates. Time-dummies for the period after 1982 were included but did not prove significant and were thus removed from the model.

With the increased availability of data and statistical computing power since their pioneering investigations, the simple Chenery-Syrquin equation and their fixed-effects methodology are not quite satisfactory anymore. A number of potentially important explanatory variables beg for inclusion. Moreover, annual modelling as well as a - at least initially - separated

investigation of non-policy variables as well as annual modelling promises a more revealing benchmarking process.

I.4.2. Non-Policy Models

This section tries to establish what kind of saving performance could have been expected of post-independence Singapore given her situation at time of independence, her geographic location and her population's demographic development over time. Due to the very limited availability of variables describing institutional quality across nations in the early 1960s, this aspect of Singapore's inheritance at time of independence will be investigated via proxy variables in a separate step at the end of this section. Initially fixed effects models will be employed before a more detailed annual analysis is undertaken.

In order to maximise the sample size the fixed-effects model has been built in a specific-to-general approach starting with the description of the initial situation in 1965, which also includes the most likely strongest explanatory variable: the average GDS-Ratio for 1962-64. Demographic and geographic variables were included in consecutive steps. Finally, regional dummies and then the demographic-geographic variable capturing the exposure to malaria in a given country were added. Table I.4.2.a. offers the results.

The immediate result from this exercise is that Singapore's saving performance remains extraordinary given the country's initial situation, demographic and geographic profile. Unless we allow for peer-group effects via regional-dummies the saving rate, which could be expected of Singapore, would have been below the actual world average. What is of further interest, however, is that given the country's demographics, particularly her high urbanisation ratio the country must have had a strong potential to increase her saving performance beyond the initial, 'inherited' saving rate.

Furthermore, if we accept peer group effects which might have driven Singapore's savings it could have been expected of Singapore to achieve above average saving rates similar to her successful regional neighbours.

Table I.4.2.a.: Initial Situation, Demographics and Geographics

	1965-99					
	1	**2**	**3**	**4**	**5**	**6**
Const	5.579	5.404	-4.849	-8.188	6.627	5.439
IniGds	0.68	0.708	0.648	0.667	0.621	0.641
IniGDP		-7.99E-04	-2.69E-03	-2.60E-03	-1.21E-03	-9.25E-04
Urb			0.106	0.067	0.069	0.077
ToTPop			1.00E-08	6.68E-09	not sig.	not sig.
EcoAcRat			0.126	0.227	not sig.	not sig.
Airdist				-2.44E-04	not sig.	not sig.
Tropicar				2.25	2.96	not sig.
Landlock				-4.00	-5.83	-4.85
Pop100km				not sig.	-4.59	-4.62
Asia					10.1	10.8
Sahara					-4.03	-5.56
LA					-1.98	not sig.
Island					not sig.	not sig.
MalFal66						5.38
N	2,820	2,716	2,716	2,424	2,424	2,322
adj. R-sqr.	0.332	0.340	0.375	0.410	0.445	0.456
Predicted Avr. Saving Rate for Singapore	8.96%	8.57%	16.14%	16.69%	24.48%	22.11%

[not-sig = removed based on joint-hypothesis testing and equation re-estimated without this variable;]

From a statistical point-of-view, it is striking how strong the explanatory power of the initial GDS-ratio is. This inertia effect is the by-far strongest variable in any of the above equations, with consistently high beta-coefficients never below 0.5 and always the highest of all beta-coefficients. The somewhat surprising negative sign for the initial level of per-capita GDP appears to support the view that this variable is rather an indicator for a country's stage of development than its saving potential. It seems to measure whether the country is a mature economy with high income but low savings or a developing economy with high investments/savings but comparatively low income. It is also of interest to note how the ratio of the economically active population, the total size of the population as well as the distance from the nearest commercial centre all lose their significance once regional

dummies are included. This seems to suggest that these regional dummies capture the demographic and distance effects. Similarly, the inclusion of the country's exposure to malaria makes the regional dummy for Latin-American countries and the degree of exposure of the country to tropical climates lose their significance. This seems to suggest that the effect of both these variables on a country's saving performance might be driven by the economic impact of malaria. However, the positive sign of the malaria variable, while the Latin American dummy had a negative sign and the tropics variable a positive sign, makes this conclusion rather precipitate. In general, these results concerning the loss of significance upon inclusion of other variables should not be over-interpreted due to the good but not excellent R-Squareds, which hint at the likelihood that still missing variables might yet again change the significance of the variables included so far. It must also be noted that some equations suffer from a mild degree of multi-collinearity with the tolerance indicator for some variables only slightly above 0.3.

In order to test the sensitivity of these findings a number of variables were individually replaced, the terms-of-trade as well as annual time-dummies added. While the significance of some variables changed due to these alterations, the overall finding of substantially higher actual than expected savings for Singapore given the country's strictly non-policy circumstances could not be revised. Thus, while the model is yet not completely robust from a statistical point-of-view, its main analytical conclusion remains unaltered.

In the above equations initial per-capita GDP was modelled using the 1962-64 average measured in current US dollars. Replacing that measure with Maddison's purchasing-power-parity estimate for 1964 in Model 4 leads to a considerable reduction in sample size (2,161 observations instead of 2,424). The variable remains significant only as long as regional dummies are not included. Replacing the proportion of those aged above 15 and below 65 as a share of total population (EcoAcRat) with the share of the labour force within

the total population (LaborRat) leads to only a small drop in sample size (2,389) and the variable is able to sustain its significance even after regional dummies are added. However, the resulting predicted average savings for Singapore of 26 percent is not too different from the expected value derived from Model 5 above. Adding the Terms-of-Trade proves to be significant but reduces the sample size to 2105 observations. The predicted savings of 27.7 percent for the period for which there are terms-of-trade observations for Singapore (1975-95) is also still substantially below the country's actual saving rates for those years (41.1 percent), but above world averages and Singapore's initial saving rates. The inclusion of annual time dummies yields significant dummies for the years 1973, 74 and the whole period after 1980. The predicted savings of 26.9 percent is again not substantially different. However, the continuous significance of the time dummies for the second half of the period is a strong indication that the model is lacking explanatory strength over that period, which is most likely due to the loss of modelling power over time of the initial GDS-ratio.

One of the main effects which has not been modelled so far is that of a country's institutional quality on its saving performance. Therefore the three proxy variables for institutional quality discussed in section I.2.1.2. were tested in fixed-effects regression models, which also included the main variables of the above models, i.e. initial GDS-ratio, initial GDP per capita, urbanisation ratio, ratio of the economically active population and the distance from the nearest commercial centre. Regional as well as Time-Dummies were omitted in order to avoid a possible masking of the impact of the institutional variables.

The inclusion of the institutional variables leads to a substantial fall in sample size, so that direct comparisons with earlier models are somewhat hindered, because differences can be due both to the impact of the respective institutional variable and/or the exclusion of observations from the sample. However, none of the models can alter the main conclusion derived from table I.4.2.a. Given Singapore's non-policy situation the country managed to

save more than what could have been expected of her. But similar to the earlier findings given the country's institutional arrangements, it could have been expected of Singapore to raise her savings beyond the nation's initial level to around or even slightly above world average levels.

Table I.4.2.b.: Inclusion of Institutional Proxy Variables

	1965-99			
	7	**8**	**9**	**10**
Const	-12.448	-10.856	-3.283	-15.286
Ini_Gds	-3.73E-03	-9.23E-03	-2.05E-03	-2.09E-03
Ini_GDP	0.481	0.59	0.52	0.308
Urb	Not sig	0.072	0.138	not sig.
EcoAcRat	0.432	0.361	0.126	0.712
Airdist	-2.51E-04	-4.13E-04	-1.75E-04	not sig.
HumCap	0.316			
SocCap		0.754		
Mortality			0.299	
IniInc				-30.691
N	1,757	1,693	1,455	1,594
adj. R-sqr.	0.300	0.380	0.367	0.272
Predicted Avr. Saving Rate for Singapore	18.05%	18.86%	20.07%	24.09%

[not-sig = removed based on joint-hypothesis testing and equation re-estimated without this variable]

Statistically speaking it is surprising to find that the initial saving-rate and the initial GDP-level switch signs once the institutional proxies are included. Moreover, the positive sign of the mortality variable is surprising. Combined with the not so outstanding r-squareds, these issues might indicate that the models are still far from complete and thus not yet very robust. Testing the sensitivities of these models is somewhat difficult because the inclusion of further variables will lead to an even more drastic reduction in sample size. Therefore, only two further variables were tested for their explanatory power. The income share of the third and fourth quintile of the country's income distribution (IniInc), which is available for 76 countries for the early 1960s, was tested as well as a compound living-standard measure for 1965, similar to the Human-Development-Index (IniHDI*), combining per-capita income, life-expectancy and educational attainment.[114] IniHDI* offers the

[114] Unfortunately, no estimate for Singapore's income distribution is available for the early 1960s. Therefore, as a proxy, Hong Kong's income share of the third and fourth quintile was used to calculate the benchmark value.

largest sample size of any of the models which include an institutional proxy with 1997 observations but did not prove significant, although it is highly correlated with both the measure for Social Capability and Human Capital Stock with correlation coefficients above 0.8. The subsequent loss of significance would therefore support the view that the other institutional variables might take their explanatory ability from the sampling rather than from their own statistical variance. The income-equality variable, however, resulted in an interesting model, which is shown as number ten above. The negative sign of the equality variable seems to support the traditional view that a more egalitarian income distribution lowers a nation's savings.

What remains to be investigated is the detailed behaviour of both the statistical qualities of the models as well as the resulting benchmark saving rate for Singapore over time in annual models. In order to do so while still keeping the sample size at a level which allows for a qualified benchmark the institutional variables are not used to build the annual models. Instead a two step procedure was used in which first a set of variables describing the initial situation as well as the demographic and geographic profile is reduced in a general-to-specific procedure to include only those variables still significant and then in a second step regional dummies are added, which are subsequently reduced to only those which add significantly to the model. The initial situation was described by the countries' average saving ratio for the years 1962-64 and their respective average per-capita income for the same years (measured in current US dollars). The demographic development is captured by the proportion of the population aged between 15 and 64 and the urbanisation rate. Describing the geographic profile of a country, the Gallup-Sachs-Mellinger variables were used again: the countries' distance from the nearest international economic centre, the proportion of the population living within 100 kilometres from the coast, the proportion of the country with tropical climates as well as a dummy, describing whether the country is landlocked. Regional dummies for Latin American and Sub-Saharan countries were employed together with the Asian dummy.

Table I.4.2.c.: Annual Non-Policy Models

	Cst	Initial GDS	Initial GDP	Urb	Eco Ac Rat	Tropic	Pop 100 Km	Land lock	Airdist	Asia	Sa-hara	N	Adj. R-Sqrd	Pre-dicted	Actual
1965	1.02	0.98										72	0.87	5.92	9.86
1966	0.22	1.03										72	0.85	5.36	13.71
1967	0.74	1.05	-1.95E-03									72	0.83	5.07	13.75
1968	1.02	1.05	-1.91E-03									72	0.80	5.38	18.35
1969	2.05	1.04	-2.17E-03									72	0.77	6.23	18.03
1969	1.82	1.02	-1.93E-03							4.76		72	0.77	10.79	18.03
1970	3.33	0.99	-2.15E-03									72	0.71	7.26	18.35
1970	3.08	0.97	-2.19E-03							5.04		72	0.72	11.94	18.35
1971	2.49	0.95										71	0.71	7.23	18.92
1971	2.19	0.94								5.49		71	0.72	12.37	18.92
1972	3.54	0.94										71	0.65	8.20	24.58
1973	5.06	0.95										71	0.55	9.77	29.29
1974	3.84	1.09										71	0.53	9.25	29.07
1975	2.22	0.99										71	0.54	7.13	29.41
1976	3.58	0.97										71	0.48	8.40	32.64
1977	4.22	0.89										71	0.45	8.67	33.51
1977	8.54	0.78									-7.12	71	0.48	12.42	33.51
1978	4.56	0.68					5.97					71	0.45	13.90	33.99
1978	9.93	0.62					0.04			8.29	-6.47	71	0.50	21.36	33.99
1979	3.36	0.95										69	0.48	8.10	36.32
1979	7.77	0.84									-7.28	69	0.51	11.93	36.32
1980	2.19	0.97										69	0.48	7.02	38.08
1980	6.45	0.86									-7.06	69	0.50	10.73	38.08
1981	-2.68	0.75		0.14								69	0.49	15.35	41.29
1981	3.48	0.73		0.07							-6.92	69	0.51	13.82	41.29
1982	-2.83	0.57	-4.31E-03	0.23								70	0.36	21.06	44.04
1983	2.57	0.75										70	0.31	6.32	46.55
1983	6.62	0.61								10.27	-7.47	70	0.35	19.94	46.55
1984	-0.73	0.56		0.15								69	0.32	17.16	46.29
1984	-0.21	0.59		0.11						13.00		69	0.35	26.23	46.29
1985	8.95	0.51						-8.27				69	0.29	11.49	40.62
1985	7.72	0.50						-6.98		13.22		69	0.34	23.43	40.62
1986	-42.84	0.56	-5.28E-03		0.92							69	0.31	22.61	38.19
1986	-24.01	0.54	-3.62E-03		0.55					11.27		69	0.34	27.61	38.19
1987	-58.68	0.40			1.12	7.51						68	0.29	30.78	38.12
1987	-34.53	0.43			0.69	5.30				13.04		68	0.33	35.04	38.12
1988	-54.04	0.49	-5.43E-03		1.15							68	0.31	28.47	41.29
1989	-55.38	0.49	-4.46E-03		1.16							68	0.36	28.87	43.36
1990	-54.27	0.54	-6.94E-03		1.14							68	0.41	28.37	43.59
1991	-66.00	0.34	-1.61E-02		1.71		-14.1	-9.59	-1.42E-03			67	0.50	31.12	45.54
1992	-67.28	0.35	-5.80E-03		1.38							67	0.44	31.77	46.39
1992	-50.90	0.34	-4.57E-03		1.07					10.22		67	0.46	36.32	46.39
1993	-61.29	0.41	-4.35E-03		1.24							67	0.41	38.22	45.77
1993	-41.12	0.40	-2.90E-03		0.86					12.83		67	0.45	34.29	45.77
1994	-47.85	0.27			0.99	6.87		-11.86				67	0.42	31.03	48.50
1994	-22.20	0.31			0.51	4.68		-12.84		12.82		67	0.45	35.50	48.50
1995	-27.32	0.26			0.72			-7.87				67	0.34	25.00	50.03
1995	-6.89	0.29			0.18			-8.82		13.54		67	0.39	31.85	50.03
1996	9.82			0.19				-11.00				67	0.23	28.42	50.67
1996	10.29			0.16				-10.59		11.97		67	0.27	37.76	50.67
1997	-35.63	0.33			0.80							67	0.34	23.09	52.23
1997	-19.72	0.37			0.50					11.40		67	0.37	29.12	52.23
1998	-30.26				0.80			-8.51				66	0.34	26.58	52.43
1998	-8.69				0.42			10.04		14.01		66	0.41	34.91	52.43
1999	-41.09				0.99			-5.78				63	0.47	28.78	51.73
1999	-26.60				0.73			-6.92		9.54		63	0.51	34.60	51.73

[light grey background describes the fact that the variable was not significant anymore once regional dummies were added]

Table I.4.2.c. shows the results from this investigation. If the individual variable does not have a coefficient associated with it in the table, the variable was not able to remain in the model. Some years can have two models if one or more of the regional dummies significantly improved the first-step equation. The last two columns offer the predicted benchmark saving rate for Singapore next to the country's actual saving rate.

Analytically, two immediate findings result from the investigation: Firstly, it should not be surprising to see Singapore achieve at least world average saving rates by the mid-1980s given her exogenous circumstances, particularly her favourable demographic development. Allowing for peer-group effects captured by the Asian Dummy variable raises the expected savings even above world average levels. Secondly, Singapore was able to consistently go beyond this benchmark. Thus, while a substantial improvement in Singapore's saving behaviour beyond her initial situation and eventually beyond world averages should not be surprising, the actually achieved saving ratios remain beyond expectable levels given the country's strictly non-policy environment as is the speed and degree of the transformation before 1980.

Statistically, three findings stand out. Firstly, it must be noted how long the period of significance of the saving inertia actually lasts. Not until after a period of over 30 years is the effect of the initial saving rate overcome in the world sample. Secondly, some variables which were still significant within the fixed-effects models lose their statistical powers, particularly the geographic variables become very erratic. Only the landlocked dummy was strong enough to appear consistently at least in the later half of the period. Chenery-Syrquin's measure for the size of the economy, i.e. its total population, was never able to survive the general-to-specific removal process. Thirdly, the fact that the adjusted r-squared falls in line with the loss of explanatory power of the inertia variable points to the fact that a number of important influences do not seem to be captured yet in the model. The

behaviour of individual variables also suggests that the model is not yet fully robust.

I.4.3. Mixed Models

International cross-sectional analyses, which try to explain savings, often include such purely policy induced variables as the government's budget balance or the countries respective pension systems and such strongly policy induced variables as inflation or interest rates. This study avoids these explanatory factors because it does not attempt to explain cross-country saving behaviour instead it tries to determine exactly how much can be attributed to policy by controlling only for non-policy induced variables. However, there are a number of factors which are often targeted by government policy but can not be brought about by their own doing, i.e. they depend to a substantial degree on exogenous forces. For Singapore, two of the main ingredients to the country's economic development plan are such factors: her export performance and net-foreign-direct-investments. Both of these were clearly targeted by Singapore's economic policies, but by their nature depend largely on the actions of third parties outside of government control. Even if such actions could be induced by such means as tax regimes, these facilitating policies are certainly not created to improve saving ratios.

This section will try to control for the country's net-export and FDI performance together with the already introduced strictly non-policy factors. Additionally, per-capita income will be tested as a potential explanatory factor because it is such a fundamental variable and can also be considered not to be fully within the government's realm of influence. Initially, fixed effects models are estimated, whose findings are then further investigated in annual models.

Table I.4.3.: Fixed-Effects Models

	1965-99							
Cst	21.471	3.124	0.720	2.102	9.566	5.115	17.356	13.829
NetExRat	0.796	0.775	0.788	0.851	0.83	0.769	0.751	0.758
Urb		5.39E-02	5.21E-02	4.35E-02	7.39E-02	3.03E-02	5.44E-02	6.01E-02
EcoAcRat		0.271	0.324	0.315	0.159	0.233	not sig.	0.109
GDPpcAt			-1.05E-04	-1.45E-04	-1.13E-04	not sig.	not sig.	not sig.
Pop100Km				1.797	not sig.	2.486	not sig.	not sig.
Landlock				not sig.	not sig.	not sig.	-0.932	not sig.
Airdist				-2.23E-04	not sig.	-1.46E-04	1.86E-04	1.50E-04
Tropicar				-0.658	not sig.	-2.384	-1.639	-1.114
IniGDS						0.185	0.161	0.156
IniGDP						-2.40E-03	-1.62E-03	-1.86E-03
NetFDI								
Asia					7.315		6.988	6.136
LA					-2.291		-2.270	-2.470
Sahara					-2.532		-3.201	-3.211
Time-Dum.								Yes
N	4,587	4,386	4,021	3,513	3,513	2,314	2,314	2,314
Adj. R-sqr.	0.686	0.705	0.714	0.766	0.784	0.778	0.793	0.803
Predicted Avr. Sav.	20.56	25.61	25.65	25.12	32.92	21.88	28.33	29.13

	1972-99 [115]		
Cst	10.824	19.498	16.427
NetExRat	0.809	0.782	0.791
Urb	not sig.	2.74E-02	7.51E-02
EcoAcRat	0.165	not sig.	not sig.
GDPpcAt	not sig.	not sig.	not sig.
Pop100Km	3.284	not sig.	not sig.
Landlock	not sig.	-1.370	not sig.
Airdist	not sig.	2.51E-04	2.19E-04
Tropicar	-4.308	-2.749	-1.961
IniGDS	0.126	9.77E-02	7.44E-02
IniGDP	-2.16E-03	-1.27E-03	-1.74E-03
NetFDI	0.690	0.636	0.700
Asia		8.520	8.270
LA		-1.970	-3.060
Sahara		-3.370	-3.660
Time-Dum.			Yes
N	1,754	1,754	1,754
Adj. R-sqr.	0.767	0.787	0.801
Predicted Avr. Sav.	28.11	36.04	39.56

[Among the annual time-dummies only those for 1973 to 1982 and 1999 remained significant. All others were removed]

[115] Since NET-FDI is only available for Singapore from 1972 onwards, the fixed effects model was only estimated for the period 1972-99. The average actual saving rate for Singapore for that period was 41.2 percent.

In order to maximise the sample size and to make the respective effects of the individual variables stand out more, the battery of independent variables was added in a specific-to-general fashion starting with the variable with the largest sample size. Using the joint-hypothesis F-test, the resulting regression equation was then reduced to include only those variable which add to the model in a statistically significant way. The Net-FDI ratio was added last, because the variable offers observations only from the 1970s onwards. Table I.4.3. presents the results.

Similar to the earlier analyses, given the country's resource balance, demographics and geographics, as well as her initial situation, above world average savings should have been expected based on the fixed-effects models. However, once all explanatory dimensions are included Singapore's expected average savings is very close to the country's actual saving rates.

In order to further probe this finding, annual models were estimated following the same combined specific-to-general and general-to-specific approach. Annual models with the resource balance, the urbanisation ratio and the economically active proportion of the population predict saving ratios for Singapore above world average, but below actual. The transition to saving rates beyond the initial levels was also to be expected. Statistically it is striking that the urbanisation ratio loses its significance in the late 1970s, while the economically active proportion of the population does not become significant until the 1980s. Adding geography and per-capita income variables does not alter these findings. Moreover, income is rarely significant and the several geographic variables exhibit a very erratic significance with no clear pattern. Adding the inertia variable and the initial income levels, alters the results somewhat.[116] The early years until the first half of the 1970s have much lower predicted saving rates than without modelling the initial situation. Particularly, the inertia variable lowers the expected saving rates, which is also at least partly due to the fact that the urbanisation ratio loses its

significance in those years and is thus removed from the equation. However, from the mid-1980s onwards, particularly once the economically active proportion of the population becomes statistically significant, benchmark savings rises to levels substantially above world average. In other words, the model would still predict a strong transition from Singapore's early saving rates to levels above world average. Consequently, for the whole period this yields an average benchmark saving rate of slightly above world levels. Adding regional dummies does not materially alter this finding, although the Asian dummy proves significant in all but six years. The average saving rate is increased somewhat but still remains substantially below the actual level. The transition to higher savings is predicted to be somewhat faster than without the regional dummies but still not as fast as if the initial situation remained outside of the model. Adding Net-FDI, however, does increase the expected saving rate substantially, even if the inertia variable is included in the equation.[117] The model even predicts savings above the actual levels for individual years. Overall the average benchmark savings for 1972-99 is 34.5 percent of GDP compared to an actual of 41.2 percent. If regional dummies are included, this average predicted saving level rises further to 37.5 percent.[118]

The effect of the additional inclusion of institutional proxies was also tested, but did not substantially alter the benchmark values for Singapore's saving. If anything, the modelling of an institutional dimension reduces the expected savings for Singapore. In fixed-effects models based on those described above but yet without regional dummies or NetFDI, the separate inclusion of

[116] GDP per capita had to be removed from the model once the initial GDP level was included due to a strong correlation between the two variables.

[117] It is noteworthy, that this positive and significant impact of FDI on savings is in contrast with parts of the FDI-literature. For a summary see for example Kentor (1998) who argues that FDI dependence can have a long-run negative impact. Similarly to dependency theory he argues that an economy controlled by foreign interests would not develop organically (p. 1025): "It would grow in a disarticulated manner. The natural linkages that would evolve from locally controlled capital would not occur. Profits would be exported. The interests of the ruling elite would be allied with those of owners of the foreign capital. Income inequality would grow. The economy would stagnate."

[118] It must be noted, however, that once Net-FDI and regional dummies are included the restricting influence of the inertia variable only rarely proves to be significant and is thus removed from many annual models.

all five institutional variables resulted in expected saving levels for Singapore of 18-25 percent of GDP for 1965-99, which is slightly below the earlier models without the institutional variables.[119] Once regional dummies and Net-FDI are also included in the equation the benchmark saving rate rises to levels significantly above world average. The models using IniHDI*, HumCap, SocCap or IniInc result in average expected savings of between 25 and 31 percent for 1972-99, which is again slightly lower than the models without institutional proxies presented in table I.4.3. Statistically, it can be noted that the inclusion of institutional variables in some cases results in the loss of significance for the urbanisation ratio. Also, the mortality variable is only significant in a few models. Generally, the composite living standard measure, IniHDI*, yields the strongest models.

Overall, the findings from the mixed models support the earlier results, namely that Singapore saved more than could have been expected of the country given her strictly non-policy circumstances. However, once all three explanatory dimensions (non-policy, external and peer-group) are jointly controlled for Singapore's actual savings are very close to expected levels. It should not be surprising that Singapore was able to raise her saving rate substantially beyond her saving performance at time of independence and by the mid-1980s to above world average levels. Furthermore, rather than the world-record saving rates of the 1990s, which usually attract the most attention, the annual analysis points to the first half of the 1970s and if we allow for saving inertia also the late 1960s as Singapore's most sustained period of extraordinary savings.

[119] The independent variables included in detail were: NetExRat, Urb, EcoAcRat, Airdist, Tropicar, IniGDS, and IniGDP. The institutional proxies tested were: SocCap, HumCap, Mortality, IniHDI* and IniInc. Time-dummies were not used. The institutional variables were tested one at a time. The regression equation was reduced in a general-to-specific way as described in the methodology section. In a second and third step regional dummies (Asia, LA, Sahara) and NetFDI were added and the resulting equation reduced again by way of joint-hypothesis testing. The use of the institutional proxies resulted in a substantial reduction of the sample sizes, ranging from 1125 – 1992 observations. The models offered decent to good explanatory powers with adjusted R-Squareds of between 0.57 and 0.81.

I.4.4. Non-Policy and Mixed Models without removal of variables

So far only the results from models, from which any insignificant variables have been removed, were discussed. However, one can argue that in order to calculate a benchmark for Singapore all potentially important variables should be included in the models even though they might not be statistically significant for the world sample in a certain given year. This would allow the benchmark process to continuously control for all factors and thus result in a more consistent benchmark over time instead of being forced to use different models for different years. Moreover, since the equations will not change from year to year, the stepwise revision of Singapore's deceptive extraordinarity will become more visible. Statistically, the difference to the regression models with only significant variables should not be too substantial since the removal of the variables was based on a joint-hypothesis F-test, which determines whether the full equation is significantly different with or without the variable. The benchmark results, however, are likely to differ somewhat more. Therefore, the following section functions largely as a narrative device, which nicely brings the findings so far obtained to a concluding point.

Based on the experience from the earlier models, the following five equations were adopted:

Model 1: Net-Export-Ratio, Urbanisation Rate and Economically Active Population
Model 2: same as Model 1 plus Net-FDI for the years after 1971
Model 3: same as Model 2 plus Asian regional dummy
Model 4: same as Model 2 plus Initial-GDS ratio and Initial per-capita GDP
Model 5: same as Model 4 plus Asian regional dummy

Table I.4.4. summarises the outcome from these models. The last column gives the average over- or under-saving by Singapore. A positive (negative) number indicates that in average Singapore saved more (less) than what the model would predict, controlling for the country's circumstances. Graph I.4.4.a. shows the respective over-/(under-) saving for each year for models 1, 2, 4 and 5, contrasting the results with a comparison merely based on

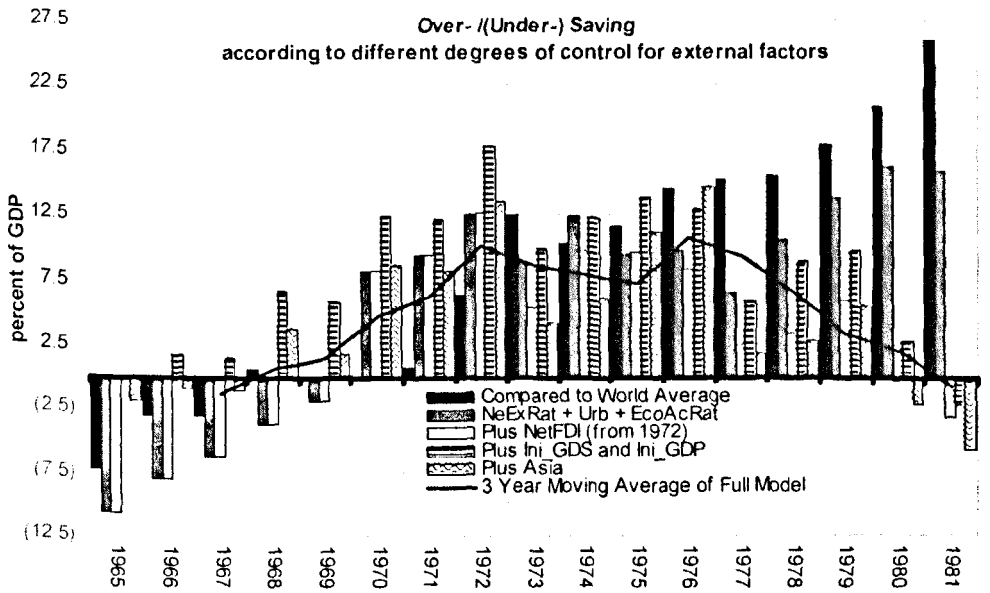
averages. The detailed coefficients and their t-ratios for each year are available in the appendix.[120]

Table I.4.4.: Annual Mixed Models without removal of insignificant variables - Summary Statistics[121]

	Sample Size		Adj. R. Sqrd.		Average Benchmark	
	min-max	avr.	min-max	Avr.	Saving	Over/Under
NetExRat + Urb + EcoAcRat	90 - 160	125.31	0.55-0.82	0.73	26.16	9.97
+ Net-FDI	84 - 150	114.89	0.61-0.81	0.73	31.14	4.99
+ Asia	84 - 150	114.89	0.61-0.82	0.74	37.93	-1.81
+ Net-FDI + IniGDS + IniGDP	65 - 80	72.77	0.62-0.90	0.78	29.75	6.38
+ Asia	65 - 80	72.77	0.64-0.90	0.79	34.76	1.37

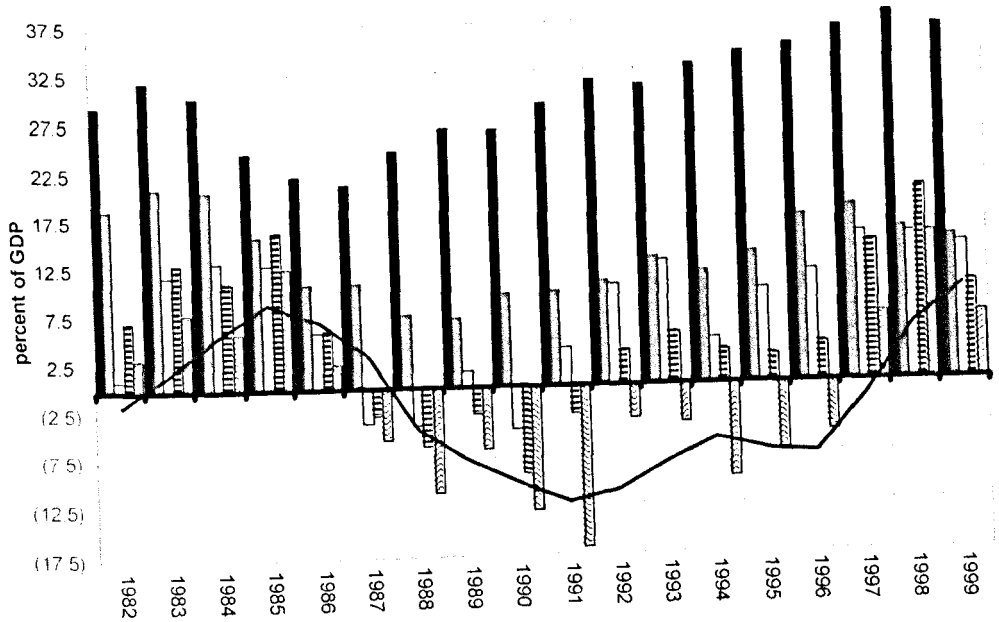
Net-FDI was only included from 1972 onwards due to limited data availability.

Graph I.4.4.a.: Annual Mixed Models without removal of insignificant variables



[120] Geographic variables were not tested due to their erratic and largely insignificant performance in the earlier annual models. Institutional proxy variables were also not used since they will cause a substantial reduction of the sample size to a level which will make the findings extremely sensitive to the variations within the sample instead of the variance of the explanatory variables. Both of these types of variables as well as others which have not been employed so far will be tested via an extensive sensitivity analysis in the following section, which will also include a Two-Stage-Least-Square procedure in order to control for the potentially endogenous nature of the Net-Export variable.

[121] Statistically it must be noted that in the early part of the period, when EcoAcRat does not prove significant, the variable attracts a small negative coefficient going against standard theory of the variable's expected impact. This, however, should affect Singapore's benchmarks in a conservative manner and rather lead to understated expected savings for the country.



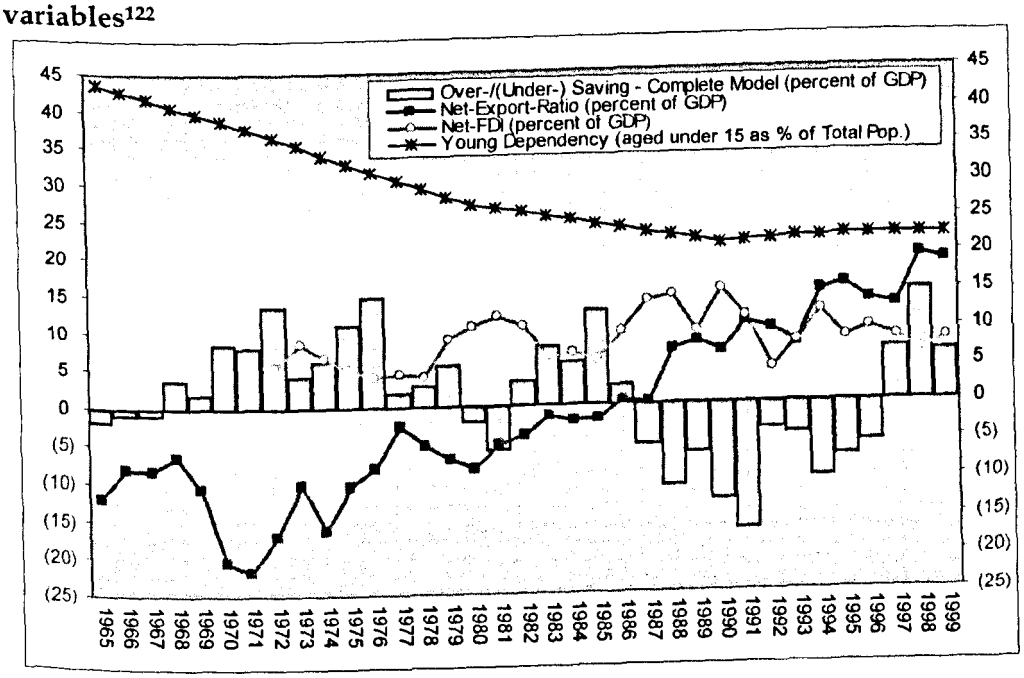
Full Model refers to Model 5 described above.

Very similar to the earlier findings, these models confirm that Singapore saved in average between 5 and 10 percent of GDP more than would be expected of a country with similar circumstances given a world sample. If one controls, however, for Singapore being part of a very successful peer group of neighbouring countries this 'over-saving' is almost completely neutralised. Therefore, the transition from the country's low saving performance at time of independence should not be surprising, even if we allow for the country's initial situation in the early 1960s affecting the subsequent years. Particularly, the country's favourable demographic development, export and FDI success makes savings far above world average levels by the late 1970s the norm for Singapore. The transition to these above average saving rates, however, took place much faster and more strongly than what could have been expected of the country, particularly if her weak starting position is taken into account. Moreover, the world record saving rates in the 1990s - at least until the Asian crisis - become much less extraordinary.

In terms of policy impact, it must be concluded that Singapore's savings must have been positively affected by the country's policies resulting in

higher savings beyond what could have been expected of the country given her circumstances. This policy effect, however, is comparatively small in relation to strictly non-policy and external factors. Furthermore, the policy impact can be econometrically explained by Singapore's place within a particular peer group of neighbouring countries. In other words Singapore over-saved in average somewhere between 5 and 10 percent of GDP, which, however, is in line with the saving behaviour of her regional 'control group'. Singapore's saving performance within an Asian perspective, therefore, is far from extraordinary. Even outside of this Asian perspective, the country's saving is far less spectacular than a pure comparison of GDS-ratios would indicate once a number of important non-policy and external circumstances are controlled for. However, independent of one's view on the Asian peer group factor, policies must have certainly increased the speed and strength of the transition in the late 1960s and early 1970s away from the country's initial saving behaviour.

Graph I.4.4.b.: Annual Mixed Models without removal of insignificant variables[122]



[122] The graph shows the young dependency rate instead of EcoAcRat, because it is the driving force behind the development of the share of the economically active population.

Graph I.4.4.b. visually shows the development over time of the main influential variables of the regression models - except for those variables with fixed values such as those describing the initial situation. It becomes clear how extraordinary Singapore's early saving performance was given the country's highly negative resource balance and the still high yet falling dependency ratio. On the other hand, the ten years after Singapore's recession in 1985/6 are far from extraordinary given her very successful external position by that time both in respect to the country's net-exports as well as Net-FDI and the by then very low dependency rate.

I.4.5. Sensitivity Analysis

Any statistical analysis is prone to be sensitive to a number of issues, such as excluded variables, the theoretical underpinnings of those variables included as well as the interpretation of the models' statistical robustness.

The statistical diagnostics appear decent to good, with continuously high adjusted R-Squareds, particularly for the models incorporating all three explanatory dimensions, and largely significant coefficients. Statistically, the models are potentially most sensitive to changes in the sample, both in respect to size and composition. However, every effort was made to maximise the available sample within the given dataset in order to reduce this sensitivity to its lowest possible level.

Most of the significant variables, especially NetExRat and IniGDS, behave in a robust fashion. They either have stable coefficients over time or show a clear and explicable time-trend, e.g. falling influence of IniGDS. Of the generally significant variables, only FDI shows a certain degree of volatility among its coefficients over time. Yet, given the very volatile nature of FDI-flows in general, any other result for annual regressions over a period of 35 years would be dubious. While the significance levels of some variables have

behaved differently between annual and fixed-effects models, the overall findings have remained robust. Nevertheless, these findings need to be tested for their potential sensitivity to additional influences which have not been modelled yet and to differing measurement techniques and different sources for already included variables. Additionally, the impact of a potential problem of simultaneity between the saving ratio and the resource balance needs to be investigated. Furthermore, it might be helpful to probe the Asian Dummy's effect in order to get a better understanding of what it captures.

As the following sensitivity analysis will show, no matter how the models are changed the three fundamental conclusions remain: Firstly, it could have been expected of Singapore to achieve world average saving levels based on the country's strictly non-policy circumstances. Secondly, above world average levels could have been expected if we also control for the country's very successful external situation. Finally, if we further allow for potential peer-group mechanisms by placing Singapore within a group of successful Asian countries, the actual saving performance was very close to what could have been expected.

I.4.5.1. Additional Influences

Table I.2.1.5. above listed a number of variables not always tested for in the main regression analyses of this study but for which exist support in the literature. In order to investigate how these additional variables might affect the earlier results, they were added individually to five basic fixed-effects models.

Model 1: Urb., EcoAcRat, Airdistance, IniGDS and IniGDP (1965-99)
Model 2: same as Model 1 plus NetExRat (1965-99)
Model 3: same as Model 2 plus Asia (1965-99)
Model 4: same as Model 2 plus NetFDI (1972-99)
Model 5: same as Model 4 plus Asian regional dummy (1972-99)

The first stage combines the three non-policy dimensions: demography, geography and initial situation. In separate consecutive steps NetExRat, NetFDI and Asia are added in a specific-to-general mode. Each resulting model is reduced to only its significant contributors using joint-hypothesis testing.

Table I.4.5.1. Average predicted Savings – Additional Variables[123]

	Model 1	Model 2	Model 3	Model 4	Model 5	N	Adj. R^2
Basic	15.1	23.3	27.7	31.1	37.2	2424-1807	0.4-0.8
+ Agri [124]	16.8 [125]	25.1	29.8	30.4 [126]	36.6	2214-1686	0.5-0.8
+ IniInc [127]	21.8 [128]	22.3	26.7 [129]	30.7	36.9 [130]	1594-1222	0.3-0.6
+ NetFuel [131]	25.0	28.5	33.6	29.2	36.4 [132]	965-919	0.5-0.7
+ ToT [133]	18.0	26.4	30.4	31.8	38.6	2105-1649	0.4-0.8
+ GDPpc	Never sig						
+ GDPPPP	21.3 [134]	22.7	26.9	30.3 [135]	36.3 [136]	2112-1566	0.4-0.7
+ GDPpcAt	Never sig						
+ Growth	15.8	23.4	27.6	31.2	37.3	2412-1806	0.4-0.8
+ GroPPP	20.5 [137]	23.1	26.7	29.1	34.2	2112-1566	0.4-0.7
+ GroAt	15.3	24.0	28.7	31.5	38.6	2310-1751	0.4-0.8
+ NER*Asia	n/a	n/a	29.0	n/a	37.6	2419-1807	0.8-0.8
+ Urb*EcoAcRat [138]	8.5	23.5	28.0	31.2	37.5	2424-1807	0.4-0.8
+ EcoAcRat*Growth	Invalid model						

[123] The number of observations and the adjusted R-Squared listed refer to models 1 and 5 respectively. For those models, for which model 1 is not significant, the figures for model 2 are given. If model 2 is also not significant model 3 is shown.

[124] These models do not include the urbanisation ratio due to strong multi-collinearity between Agri and Urb.

[125] EcoAcRat did not prove significant in this model and was removed from the equation.

[126] EcoAcRat did not prove significant in this model and was removed from the equation.

[127] Neither of these models includes the urbanisation ratio because it did not prove to be significant after the inclusion of IniInc.

[128] AirDist did not prove significant in this model and was removed from the equation.

[129] AirDist did not prove significant in this model and was removed from the equation.

[130] IniGDP did not prove significant in this model and was removed from the equation.

[131] The models only refer to 1980-1999, since no observations for NetFuel from before 1980 were available. Singapore's average saving rate for this time period was 45.41%.

[132] Urb did not prove significant in this model and was removed from the equation.

[133] Since no observations for ToT from before 1975 or after 1995 were available for Singapore, the average expected saving ratios refer to the period 1975-95. The country's average saving rate for this time period was 41.25%. The fixed-effects model on the world sample was nevertheless estimated for the whole time-period.

[134] EcoAcRat did not prove significant in this model and was removed from the equation.

[135] Urb did not prove significant in this model and was removed from the equation.

[136] EcoAcRat and AirDist did not prove significant in this model and were removed from the equation.

[137] AirDist did not prove significant in this model and was removed from the equation.

Table I.4.5.1. summarises the predicted average savings for Singapore for each of the resulting models. Singapore's actual average savings ratios for 1965-99 and 1972-99 were respectively 36.13 and 41.32 percent. World average levels were around 18 percent. Overall, these fixed effects models suggest that the expected values for Singapore's saving ratios obtained in the analyses above and the three main derived conclusions are robust. Only the non-policy model using the interaction variable between the urbanisation ratio and the share of the economically active population would not have predicted savings similar to those obtained in the regressions tested in the main part of the chapter. This would indicate that the above results might indeed be affected by a multi-collinearity problem between these two variables.

The Agri variable, which intends to capture the country's economic structure and exposure to a sector with an arguably low savings potential, is highly negatively correlated with the degree of urbanisation. Therefore, its inclusion requires the removal of the urbanisation ratio in order to prevent a high degree of multi-collinearity from affecting the model. Unfortunately, the inclusion also causes the share of the economically active population to lose its significance in some of the equations. In the remaining equations EcoAcRat attracts a negative sign if Agri is included. Given the somewhat questionable theoretical support of the Agri variable in terms of its effect on savings, the impact the variable has on the statistical performance of the other demographic measures seems to indicate that it might actually capture demographic effects rather than those stemming from a sub-optimal economic structure.

The inclusion of IniInc, a measure of the income distribution, results in a rather weak model with a substantially lower sample size. It attracts a negative coefficient, which would support the traditional view that a more

[138] These models do not include the urbanisation ratio and the share of the economically active population separately.

equal society saves less. Again the urbanisation ratio loses its significance and in some models AirDist and IniGDP do so as well.

Net-Fuel-Exports, which were included to see whether the regression results are possibly driven by the high-saving ratios of oil-exporting nations, leads to an even stronger reduction in sample size because no observations were available from the period before 1980 and the country coverage was also limited. Its main effects on the regression equation are to give a negative coefficient to the urbanisation ratio, to slightly lower the Net-Export coefficient but raise the parameter for the share of the economically active population.[139]

The inclusion of the terms-of-trade yields a theoretically supported and statistically significant model at decent sample sizes. However, it does not alter the main findings. Mathematically, the positive coefficient of the terms-of-trade variable is offset by a negative constant. Therefore, while the terms-of-trade are indeed an additional aspect of the external situation of the country, which is not modelled with the other variables, its impact on the benchmarking is limited.

In terms of income variables, only the per-capita income figure measured in purchasing-power-parities is able to attract statistical significance in the equations.[140] But again, it is not able to alter the benchmark for Singapore, except if per-capita income was included among the non-policy variables, i.e. model 1. In this case, the relatively high per-capita income of Singapore would result in a higher benchmark for Singapore's savings, which other models only reach once the external dimension is incorporated as well.

[139] In respect to Singapore, it must be noted that the country started with high net-fuel imports but due to the very successful built-up of a refining industry was able to almost balance its fuel imports and exports, i.e. the value added in the refining industry almost made up for the country's fuel consumption. The Net-Fuel balance for 1990-99, for example, stood at only -1.2% of GDP. The equivalent figure for the 1980s was -11.7%. The inclusion of a Net-Fuel variable in the benchmarking exercise would therefore lower the expected savings of Singapore's early but not its later years.

[140] GDPpcPPP remains significant even if the initial level of per-capita income is measured in purchasing-power-parities, i.e. if IniGDP is exchanged with IniPPP.

As theory would predict, growth enters the equation significantly no matter what the measurement concept. However, only very slight differences in the benchmarking results exist which cannot contradict the central findings. Furthermore, the inclusion of growth does not remove any of the other variables from the equation, which means that the variance of the growth variable is an additional factor in modelling savings and thus suggests that the other dimensions do not model growth.

Adding an interaction variable between Net-Exports and the Asian Dummy alters the benchmarks for Singapore only very slightly.[141] The same is largely true for the interactive variable between the Urbanisation ratio and the share of the economically active population, particularly for the equations including the external situation. Therefore, even if a potential multi-collinearity problem between these two variables might have affected the regression results those benchmarks for Singapore, which also take account of her external situation, remain almost identical. The non-policy model, however, would predict a lower saving rate for Singapore. This result together with the not completely robust behaviour of these two demographic variables in the other parts of the sensitivity analysis points to a possible weakness of the main models.

The combination between growth and the share of the economically active population, as propagated by Collins (1992), leads to a near perfect multi-collinearity between growth and the new interaction variable.[142] This is easily explained, because the combined variable's variance is predominantly driven by the growth variable due to the small cross-sectional and time-series

[141] The interaction variable receives a negative coefficient while the separate parts retain their positive signs. This result is very difficult to interpret. One possible explanation could be that if the fast industrialising Asian countries ran trade deficits, they were largely due to the import of investment goods, which would increase the saving rate. For a discussion of the relationship between net-exports, investment and the saving rate see the excurse at the end of the chapter (section I.6.).

[142] The correlation coefficients between the interaction variable and the respective growth variable (current US$, PPP, or Atlas method) are above 0.99.

variance of the share of the economically active population. Collins' (1992) finding of a growth-tilt effect must, therefore, be considered questionable, because it must be assumed that her models basically included the growth variable twice.[143]

In summary, an inclusion of additional variables beyond those controlled for in the main models is not likely to be able to disprove the central findings. However, the frequent loss of significance of the urbanisation ratio and the fact of its potential multi-collinearity problem with the share of the economically active population indicates that these variables might not be too robust.

I.4.5.2. Differing Variables

Variables from different sources or with different measurement concepts are tested following the same algorithm as the preceding section on additional explanatory dimensions. However, the central findings remain intact.

The main point about the total trade variable is that it enters significantly alongside the Net-Export-Ratio which can be interpreted as an indication against Levine and Renelt's (1992) argument that - at least in growth regressions - the export share or any other trade statistic basically captures the degree of openness of the economy. As a matter of fact, the inclusion of Trade does not substantially alter the coefficient of the Net-Export-Ratio. Moreover, its beta-coefficient is the second strongest in any of the five models - after Net-Exports. Therefore, the resource balance does not appear

[143] Collins (1992) used an interaction variable between the young-dependency rate and growth. The young dependency rate has a slightly higher variance than the share of the economically active population. However, the correlation coefficients between the interaction variable using young dependency and the respective growth variable (current US$, PPP, or Atlas method) are still all above 0.96 in our sample.

to capture the policy choice regarding the degree of openness of the economy.

Table I.4.5.2. Average predicted Savings - Differing Variables[144]

	Model 1	Model 2	Model 3	Model 4	Model 5	N	Adj. R^2
Basic	15.1	23.2	27.7	31.1	37.2	2424-1807	0.4-0.8
+ Trade [145]	23.3	41.6	42.3	58.9	55.2	2419-1807	0.4-0.8
+ Beri72	Not sig.	Not sig.	22.8 [146]	28.5 [147]	30.1 [148]	818-624	0.7-0.7
+ IniHDI* [149]	16.0	24.7	28.9 [150]	32.6 [151]	39.1 [152]	1997-1490	0.4-0.8
+ IniLife + IniLit70 [153]	8.4 [154]	22.8 [155]	28.5 [156]	30.4 [157]	41.4 [158]	1997-1490	0.4-0.8
+ IniPPP [159]	20.2 [160]	23.2	27.5	29.9	35.7	2265-1668	0.4-0.7
+ LaborRat [161]	Not sig.	22.2	27.6	28.6	35.9 [162]	2384-1779	0.8-0.8
+ Asia2 [163]	n/a	n/a	27.3	n/a	36.8 [164]	2419-1807	0.8-0.8
+ Island	17.3	25.5	28.9	34.5	42.7 [165]	2424-1807	0.4-0.8

[144] The number of observations and the adjusted R-Squared listed refers to models 1 and 5 respectively. For those models, for which model 1 is not significant, the figures for model 2 are given. If model 2 is also not significant model 3 is shown.

[145] All of these models end in 1996, since no observations for imports and exports as percent of GDP was available after 1996. The country's average saving rate for the respective time periods, 1965-96 and 1972-96, were 34.63% and 39.89%.

[146] IniGDP did not prove significant in this model and was removed from the equation.

[147] Urb did not prove significant in this model and was removed from the equation.

[148] EcoAcRat did not prove significant in this model and was removed from the equation.

[149] These models do not include IniGDP.

[150] EcoAcRat did not prove significant in this model and was removed from the equation.

[151] Urb and IniGDS did not prove significant in this model and were removed from the equation.

[152] EcoAcRat and IniGDS did not prove significant in this model and were removed from the equation.

[153] In order to be consistent with the measurements combined into IniHDI*, this equation uses IniGDPat instead of IniGDP.

[154] IniLife did not prove significant in this model and was removed from the equation.

[155] IniLife did not prove significant in this model and was removed from the equation.

[156] EcoAcRat and IniLife did not prove significant in this model and were removed from the equation.

[157] Urb and IniLife did not prove significant in this model and were removed from the equation.

[158] EcoAcRat, AirDist and IniLit70 did not prove significant in this model and were removed from the equation.

[159] These models do not include IniGDP.

[160] AirDist did not prove significant in this model and was removed from the equation.

[161] These models do not include EcoAcRat.

[162] IniGDP did not prove significant in this model and was removed from the equation.

[163] These models do not include Asia.

[164] AirDist did not prove significant in this model and was removed from the equation.

[165] EcoAcRat did not prove significant in this model and was removed from the equation.

Given Singapore's small market, low natural resource endowment and geographic location it is arguable whether its high degree of openness does actually constitute a policy choice for this particular country - especially after the failed merger with Malaysia. If we assume that Singapore had no choice but to remain open to the world economy and consequently include total trade as a non-policy variable, the benchmarking process would argue that Singapore 'should' have saved even more than it actually did. This finding does not only not disprove the central findings of the main section of this chapter, it actually gives them a conservative character.

The Beri72 estimates behave similarly to the earlier variables used as proxies for the initial institutional quality, somewhat reducing the level of expected savings. However, it does not prove significant unless the external situation is modelled as well. Moreover, its inclusion substantially reduces the sample size and significantly alters the consistency of the sample, so that a direct comparison between models with and without proxies for institutional quality is problematic.

The living standard measure of IniHDI*, which can be interpreted as a variant on the institutional proxy variables, enters significantly as well but is correlated with almost all of the other independent variables already included in the model.[166] This problem might also explain that it attracts a negative sign unless the external situation is modelled. Overall this seems to suggest that its inclusion might not be too robust. Therefore, the three components were also tested as separate independent variables, which results in the life expectancy variable struggling for significance in the models and the loss of significance of one of the two demographic variables once the external situation is modelled as well.[167] Overall, the initial literacy

[166] Its correlation coefficients are above 0.5 with all of the other independent variables, except for Airdist.

[167] Samwick (2000, p. 267) points out the ambiguity of effects of changes in life-expectancy, which can explain the insignificance in saving regressions: Higher life expectancy generally means a greater fraction of life spent retired, and, as a result, it should increase saving for lifecycle reasons. However, if differences in life expectancy are driven primarily by differences

rate has a similar effect as SocCap or HumCap: the higher the educational standards among the population the higher is the savings ratio.[168] Apart from model 1 the benchmarking results are largely the same as in the other equations. The expected savings derived from model 1 are negatively affected by a surprisingly high, negative coefficient for the initial per-capita income, which is cut almost in half once the external position is included. Overall, the inclusion of living standard measures does not seem to result in robust cross-country models for savings.

Exchanging IniGDP with IniPPP does not alter the benchmarks much. Only the non-policy model offers a substantially higher expected saving figure for Singapore, which is due to the loss of significance of the distance variable. The share of the labour force instead of the share of the population in working age also does not alter the findings. However, it is not significant until the external situation is modelled. Changing the composition of the Asian Dummy variable by excluding China and instead incorporating the Philippines does not change the benchmarks either. However, the additional inclusion of a small island dummy does increase the expected savings, particularly once Net-FDI flows are also controlled for. This effect is on top of the Asian dummy, so that it can be argued that Singapore's savings 'should' have benefited from both an Asian as well as a small, ex-British Colony peer-group effect given a world sample.

A further alternative testing set-up would include Singapore in the actual sample together with a country dummy for Singapore. This would allow us to see whether even after controlling for the country's circumstances Singapore's savings were still indeed extraordinary which would show statistically through a significant country dummy. On the other hand, the

in mortality before retirement, then it might be the length of the working years that increases with life expectancy and the saving rate may fall.

[168] The bivariant correlation coefficients between IniLit70 and SocCap or HumCap are above 0.82. SocCap and HumCap have a correlation coefficient of 0.7. Therefore, it can be assumed that they capture very similar effects even though HumCap and SocCap claim to incorporate more aspects than merely literacy rates.

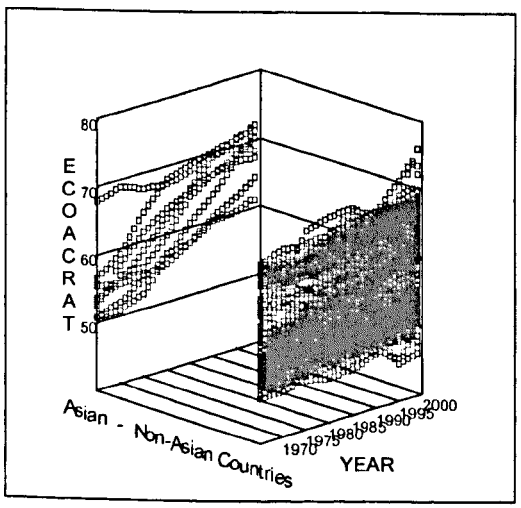
inclusion of Singapore in the sample prohibts the calculation of a savings benchmark since this would in essence allow Singapore's actual saving performance to predict its own expected value. Therefore, this alteranative route will only be a check on how well the regression does actually capture all relevant aspects of Singapore's environment. Adding Singapore to the sample and running model 5 above does yield a significant country dummy for Singapore, which indicates that these fixed effects models might indeed not yet fully capture Singapore's position.[169]

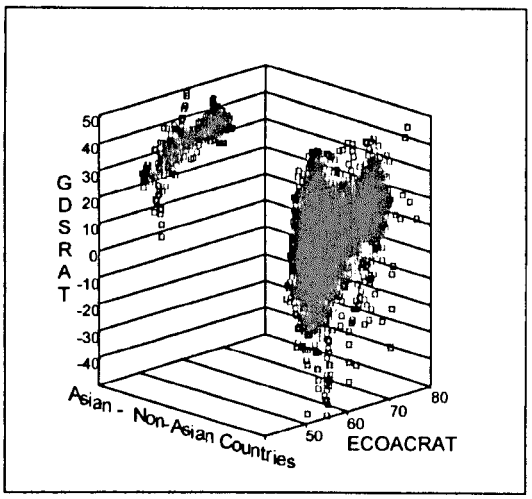
I.4.5.3. Probing of Asian Dummy

The sensitivity analysis has brought already some insights into what the Asian Dummy variable might actually be capturing. As argued above, it does not appear to model growth, since growth variables enter the regression equation significantly without altering the significance of the other independent variables, including the Asian Dummy. On the other hand, the repeated loss of significance of the share of the economically active population once Asia is part of the regression, suggests that the Asian Dummy does incorporate demographic effects shared among the eight countries. Comparing separate scatter plots for Asian countries and the remaining countries shows that Asian countries have indeed a shared and distinct demographic development.

[169] A further variation would be the inclusion of country dummies. However, this would necessitate the removal of other country constant variables since they would be perfectly collinear. Particularly the removal of IniGDS and IniGDP would be both analytically and statistically regrettable. The existing regressions already capture country specific effects and they do so more explicitly and analytically revealing than a mere country dummy will be able to. The inclusion of country dummys is therefore suboptimal. The significance of the other country constant variables indicates that indeed they will most likely prove significant, but do not have the interpretive powers.

Graph I.4.5.3. 3-D Scatterplot of EcoAcRat in Split Samples [170]





The graphs clearly show how the Asian countries exhibit a distinct pattern over time of a strongly rising share of the economically active population not shared in the same way by the wider sample. Moreover, the range of their achieved saving rates at any given share of their countries' economically active population is much narrower than in the remaining sample and in average at substantially higher levels. Statistically, the latter two facts should result in a more significant and higher coefficient of EcoAcRat in a regression analysis for the Asian countries than for the remaining sample. In the complete sample, however, the one average coefficient will leave a substantial amount of variance stemming from the Asian countries unmodelled. While it can not be determined with ultimate certainty, it is however very likely that the Asian dummy variable picks up exactly that difference to the countries not included in the dummy variable.

In order to support this visual analysis and to investigate further effects, which could possibly drive the significance of the Asian dummy variable, single, fixed-effects regressions of all the independent variables on the Gross-Domestic Saving ratios were run using the two split samples, in order to pin-

[170] Similar graphs for Net-FDI are not able to make a distinct pattern clearly visible due to the

point substantial differences in the 'explanatory' powers of the individual dimensions between the two samples. Table I.4.5.3.a. offers the R-squareds of the five strongest variables in the Asian sample and their respective results in the non-Asian and complete samples.

Table I.4.5.3.a. R-Squareds of Split Sample, Single Regressions

	Asian Sample	Remaining Sample	Total Sample
EcoAcRat	34.8%	9.5%	11.8%
NetExRat	24.7%	69.4%	68.6%
NetFDI (1972-99)	14.7%	0.2%	0.2%
Mortality [171]	12.1%	4.7%	5.3%
IniGDS	9.9%	35.8%	33.3%

While the share of the economically active population can 'explain' almost 35 percent of the variance in the GDS-ratios among Asian countries, it is only able to model a little under ten percent among the remaining sample. This supports the view that the significance of the additional inclusion of the Asian Dummy in the saving regressions is indeed driven by demographic effects among the Asian countries, which the coefficient of the EcoAcRat variable averaged across the world sample is only able to model partially.

Similarly, it appears that the significance of NetFDI is almost purely driven by Asian countries. On the other hand, the Net-Export-Ratio is extra-ordinarily strong among the non-Asian countries. The saving-inertia also seems to affect the saving performance of non-Asian countries more than those of the eight countries included in the Asian peer group variable.

It is also important to note that none of the geographical variables in either sample are able to model more than five percent of the variance in the GDS-ratios. Therefore, in terms of this study, the thesis stemming from findings in

much wider range of the observations.

[171] Observations are only available for three of the eight countries, namely Hong Kong, Indonesia and Malaysia. Thus the results for the distinct behaviour of the mortality variable might be driven by a selection within the Asian sub-sample, rather than a different selection between Asian and Non-Asian samples.

growth regressions that the significance of regional dummies is potentially driven by geographic effects can be rejected.

A further investigation of differences in the means and standard deviations of the variables as well as the values of the coefficients in the respective samples further supports this view. Table I.4.5.3.b. reviews these summary statistics for the five strongest independent variables and the dependent GDS-ratios. The unstandardised as well as the standardised beta-coefficients, which the respective variable attracts in a single regression on the GDS-ratio, are shown.

Table I.4.5.3.b. Descriptives

	Mean		Std Dev.		Coefficient		Beta-Coef.	
	Asia	Rest	Asia	Rest	Asia	Rest	Asia	Rest
GDSrat	30.3	16.0	7.2	15.35				
EcoAcRat	62.1	57.1	6.1	6.3	0.697	0.730	0.590	0.308
NetExRat	1.4	-6.4	5.6	16.4	0.638	0.783	0.497	0.833
NetFDI	1.2	1.7	1.9	4.2	1.031	0.153	0.383	0.045
Mortality	67.5	263.9	72.8	496.9	-0.039	0.004	-0.360	-0.216
IniGDS	18.2	16.3	8.4	12.5	0.272	0.684	0.315	0.598

What stands out is the substantially larger beta-coefficient of EcoAcRat among the Asian sample, which shows again that its explanatory power is much stronger among the eight Asian countries than among the remaining sample. The unstandardised coefficients are, however, not too different, so that both sub-groups seem to have derived similar saving effects for the changes in their demographic structure, i.e. the average elasticity of the share of the economically active population in respect to saving ratios have been very close between both samples. This in turn could be interpreted as a sign that policy choices, which would try to improve the elasticity, have in average not affected the saving performances and can thus not explain the significance of the Asian dummy. If policy choices trying to take advantage of the demographic transition among the eight Asian countries had positively affected savings, we would expect to see a higher coefficient among the Asian subgroup. But in fact, the high saving Asian countries were

only able to derive the same if not slightly lower benefits from the fall of the dependency ratios as the other countries.

On the other hand, Net-Foreign Direct Investment has much more positively affected savings among the eight Asian countries than in the remaining sample. This in turn could be interpreted as a sign that policy differences as regards FDI are partially captured by the Asian dummy variable. Similarly, the lower impact of the inertia variable among the Asian peer group countries indicates that they have been able to change saving behaviour much more and possibly faster than the other countries, which would again argue for the potential influence of policy. The impact of NetExRat also seems to have been stronger among the Non-Asian sample. However, since the coefficients are closer together the statistical difference is not likely to be as substantial.

Similar investigations into the other explanatory variables reveal that in general independent variables describing the initial situation have lower modelling power among the non-Asian sample. The group of Asian countries combined into the dummy variable have clearly overcome their initial situations more strongly and possibly faster than the countries in the remaining sample. None of the growth variables is particularly strong in either sample, with neither of them able to 'explain' more than 2% of the variance in GDS-ratios except for growth of per-capita income measured in PPPs, which is able to model 9.4 percent of the variance among the eight Asian countries but only 1.2 percent among the remaining sample.

In summary, this investigation into the Asian dummy variable has shown that its significance is most likely driven by a more pronounced demographic transition among the eight Asian countries, by a stronger saving response to foreign-direct-investment and less impact of the initial saving ratio and possibly of the resource balance. The Net-FDI and saving inertia differences are probably policy influenced.

I.4.5.4. Potential Endogeneity of Net-Export-Ratio (Reverse Causation)

A further complication is introduced by the possibility of simultaneity among the variables, well known in almost any econometric model working with macro-data.[172] If the causation in the relationship between two variables runs in both directions it implies that the regressor and the disturbance term are correlated. Hence the estimation by OLS would yield biased and inconsistent estimates of the structural parameters. The least square estimator will overstate the true parameter value, even in large samples.[173]

With respect to this study, the countries' savings could potentially determine the net-export performance through a reduction of the imports of consumption goods, i.e. the causation would run from savings to net-exports and not the other way as implied in the regression models.[174] Alternatively, the causation could be bi-directional, i.e. both factors are jointly determined. If either was the case the coefficient for the resource balance in the regressions would be positively biased, which would result in an overstated savings benchmark for Singapore.

The Two-Stage-Least-Squares technique allows and controls for joint endogeneity, by calculating a fictitious but exogenous data series in place of the potentially endogenous explanatory variable using independent instruments which are able to describe the exogenous components of the

[172] As early as 1963 Ando and Modigliani (1963, p. 67) have pointed out that the least-squared method applied to saving equations can lead to biased estimates when one or more of the independent variables are related to the dependent variable by other simultaneous relations.

[173] A positive disturbance shock, e.g. an increase in the error term of the regression, will increase both the endogenous explanatory variable, e.g. NetExRat, and the dependent variable, e.g. GDSratio. Consequently, there is a tendency for positive disturbances to be associated with relatively higher values of the endogenous variable, and for negative disturbances to be associated with relatively lower values of the endogenous variable. This has the effect of rotating the OLS regression line anticlockwise increasing its slope and thus overestimating the 'true' slope parameter leading to a positive inconsistency.

[174] Other cross-country saving regressions potentially suffer from the problem of simultaneity even more, because they tend to include such policy induced variables as interest rates and growth, which are very likely to be endogenous (see Loayza et all, 2000, pp. 169-170).

endogenous variable. However, often it is extremely difficult to find such truly independent instruments, which are nevertheless able to realistically model the exogenous components of the explanatory variable. Therefore, so-called internal instruments, which are based on lagged values of the explanatory variable, are generally used to control for endogeneity. This requires the relaxation of the assumption that the explanatory variables are strictly exogenous. In turn, the assumption is that the variables are 'weakly exogenous,' which in our case means that unforeseen changes to the saving rate do not influence previous realizations of the saving determinants, i.e. the current year's saving ratio will have no effect on the previous year's net-export-ratio. Statistically, the problem of correlation of the errors with the explanatory variables due to reverse causality is thus resolved.[175] Yet, as Andres Solimano points out in his comment to Edwards (1997, p. 160), the causality problem remains at the analytical level. Fortunately, since the benchmarking exercise of this study does not intend to explain saving behaviour, it does not need to worry about the direction of causality beyond the statistical level. In other words, as long as the coefficients of the regression are statistically unbiased and consistent, the calculated benchmark will be so as well, no matter what the underlying processes are. This study only controls for these processes. It does not intend to explain them.

Consequently, the basic fixed-effects models used so far in this sensitivity analysis were also used as the basis for a two-stage-least-squares approach using in the first stage the lagged value as an instrument for the net-export-ratio while the other explanatory variables serve as their own instruments. The coefficients obtained in the first stage regression were used to calculate the expected net-export-ratio of Singapore given the country's lagged ratios. These expected net-export-ratios were then inserted into the equation obtained from the second stage regression in order to derive the benchmark for Singapore controlling for potential endogeneity given a world sample.

[175] See Loayza et al. (2000, pp. 169-170) for a discussion of internal instruments and endogeneity in saving regressions.

Table I.4.5.4. Average predicted Savings - Two-Stage-Least-Squares [176]

	Model 1	Model 2	Model 3	Model 4	Model 5	N	Adj. R^2
Basic (OLS)	n/a	23.3	27.7	31.1	37.2	2419-1807	0.8-0.8
Basic (2SLS)	n/a	22.7	27.1	29.6	35.7	2416-1805	0.8-0.8

The average benchmark saving ratios are slightly lower than those resulting from the OLS procedure, but not enough to contradict the main findings. Thus, even if endogeneity is affecting the regression analysis and thus the benchmark savings for Singapore, it does not appear to do so to a degree which would reverse the central findings of this study.

I.4.5.5. Other Potential Sources of Sensitivity

Four further potential sources of sensitivity exist: over-identification of the regression equation, data-errors, heteroskedasticity and multi-collinearity among the independent variables.

Over-Identification

Gross Domestic Saving is derived as a residual from the basic national accounting identity:

$$(1)\ Y = I + C + G + NX$$

rearranged as

$$(2)\ GDS = I + NX = Y - C - G$$

where
Y = Gross Domestic Production
I = Investment
C = Private Consumption
G = Government Final Consumption
NX = Net-Exports
GDS = Gross Domestic Saving

[176] The number of observations and the adjusted R-Squared listed refers to models 2 and 5 respectively. Models 2 and 3 of the 2SLS approach refer only to 1966-99 because of the loss of the first observation due to the lagged variable. Model 1 does not include NetExRat and was therefore not re-estimated using 2SLS.

Since those models, which incorporate the external situation of the countries, already include net-exports it must be ascertained that the other independent variables do not simply model investment. If they did the equation would be considered over-identified and the regressions would practically only test whether the basic accounting identity holds across a large sample. Assuming that the accounting identity holds in the world sample, an over-identified equation would necessarily yield an expected savings for Singapore not too different from the actually achieved savings. Therefore, the results of an over-identified regression would lead us to wrongly conclude that Singapore's savings were less than extraordinary.

In order to test whether the independent variables replicate investment they were regressed in two fixed-effects models on Gross-Fixed-Capital Formation as a percent of GDP (GFCrat). The first model uses IniGDS, IniGDP, AirDist, Urb, EcoAcRat and Asia as independent variables and is only able to model 14 percent of the variance of GFCrat between 1965-99. The additional inclusion of NetFDI raises the explanatory power to 17 percent, but also reduces the sample period to 1972-99. The low R-Squareds must be interpreted as a sign that these variables do not imitate the investment behaviour of the respective countries and that therefore the saving regressions are not in danger of being over-identified.

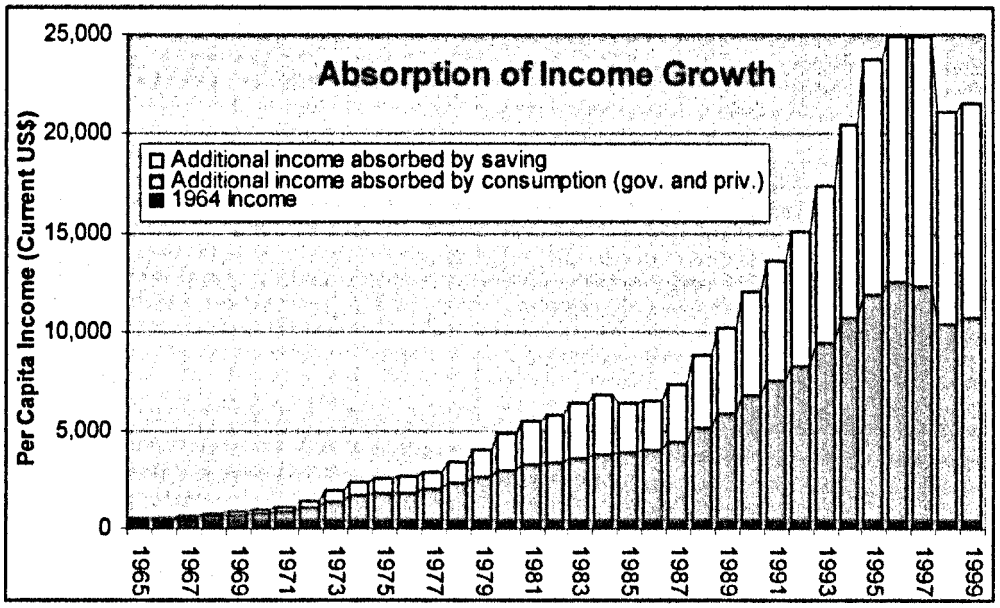
Data Errors

Data errors in such a large sample can not be fully ruled out. However, as discussed in section I.2.3. only internationally respected sources, which are regularly made use of in the literature, were employed. Nevertheless, one particular potential error must be examined, namely whether Singapore's sustained high saving ratios can be trusted in the first place. How can a nation, some might ask, in average save over one third of its income every year over a period of thirty five years? To some such a strong sustained

saving performance and thus continued repression of consumption might look impossible, causing doubts about the quality of our dependent variable.

However, as graph I.4.5.5.b. shows, if we can believe Singapore's income figures her savings do appear credible, because the country was able to combine rising consumption levels with rising savings due to the outstanding growth performance of the economy. Given this development Singapore's high saving ratios do not appear unreasonable.

Graph I.4.5.5.a. Income, Consumption and Saving in Singapore [177]



Heteroskedasticity

A heteroskedastic equation violates one of the basic assumptions underlying the OLS procedure, namely that the variance of the disturbance terms must be constant. On the assumption that the model is not mis-specficed, the OLS estimators retain the properties of unbiasedness and consistency even if the disturbances are heteroskedastic. However, the estimators are no longer efficient and thus normal formulae for calculating variances of estimators

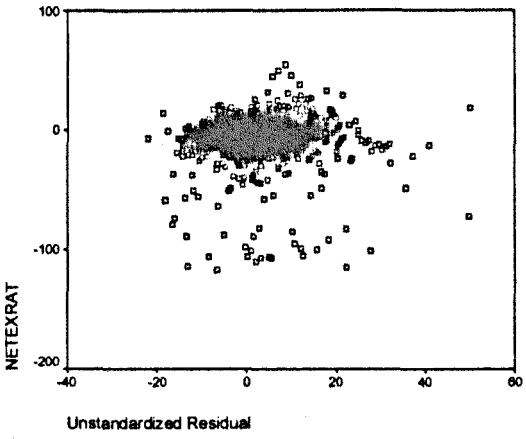
[177] World Development Indicators CD-Rom (2001 edition). Additional income absorbed by saving is derived as the increase in per-capita income less the increase in government and private consumption.

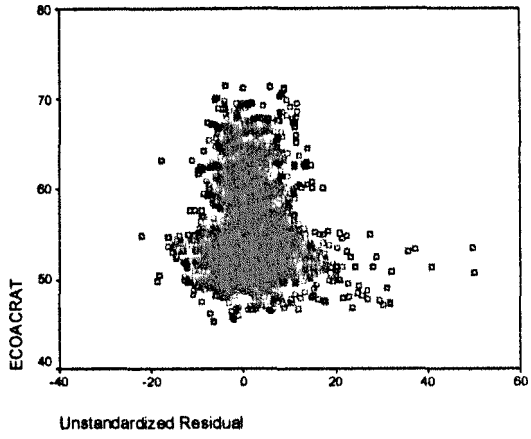
and consequently their respective significance levels are biased and inconsistent. In turn this means that better estimators might exist, which manifests itself in wide confidence intervals. Therefore, heteroskedasticity can affect the model building process by leading us wrongly to remove variables due to their low significance. The sensitivity of the results to this aspect of heteroskedasticity is best tested in our case by not removing variables and comparing the benchmark results to those obtained after a selection process. Since the full models above (model five in section I.4.4.) do no yield substantially different benchmark savings for Singapore, the results do not appear to be sensitive to a likely selection bias introduced through a potential problem of heteroskedasticity. But even for those variables which remain in the equation more correct estimators could theoretically be found if the equation is plagued by heteroskedasticity. Therefore, the residual plots were examined as well, plotting the residuals against each independent variable. The plots for 1985 are shown in graph I.4.5.5.b. The plots for the other years look very similar.[178] No trace of heteroskedasticity was found.[179]

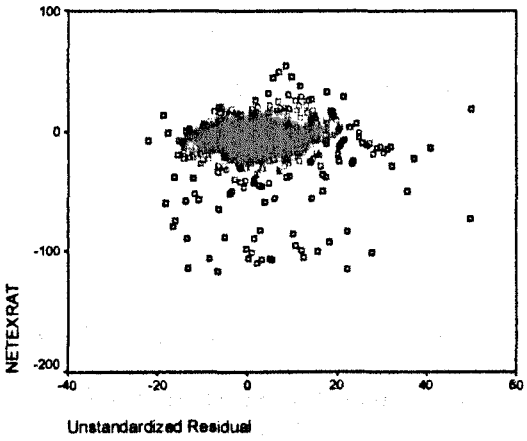
[178] More formal testing for heteroskedasticity, e.g. a Goldfeld-Quandt, Breusch-Pagan or White tests, was not undertaken because no assumptions could be made about the likely form of heteroskedasticity, nor did it seem appropriate given the residuals' behaviour. Since no basis for the assumption of heteroskedasticity and its likely source and form could be found alternative estimation procedures such as Wheigted Least Squares were not employed.

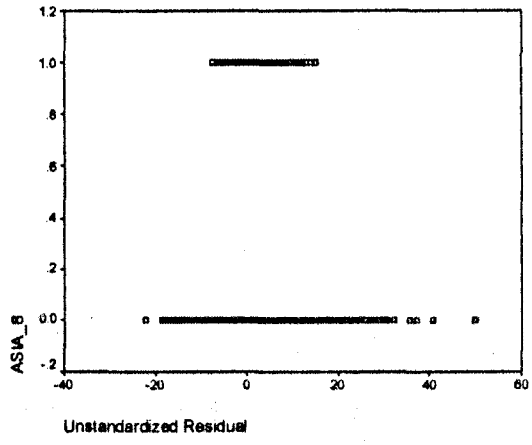
[179] Only the Asian Dummy variable exhibits a different variance between its two sub-samples. However, this only shows that indeed the Asian dummy is working. Using the 'binary' variable as a weight for a WLS procedure is not possible since a division by zero is mathematically not defined.

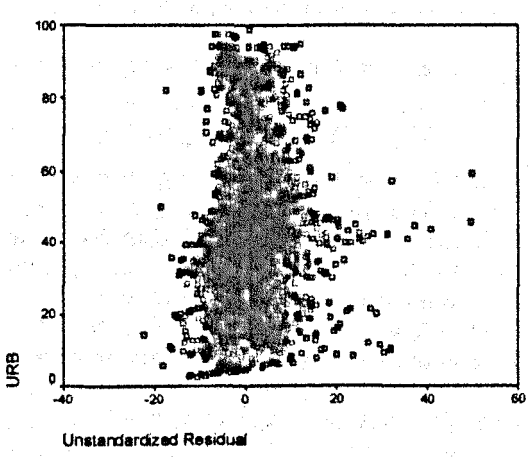
Graph I.4.5.5.b. Examplorary Residualplots for 1985

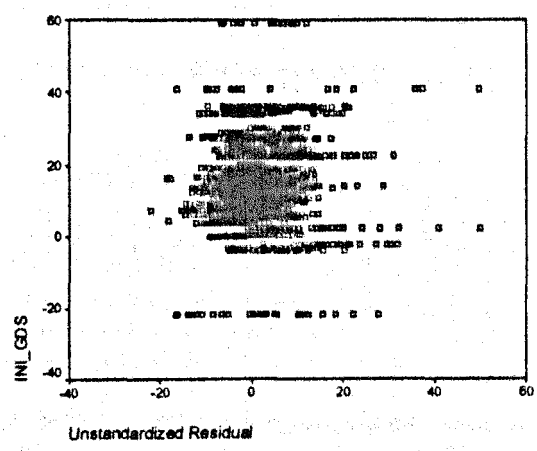












Multi-Collinearity

Multi-collinearity, the event that the explanatory variables which are assumed to be independent of each other are actually correlated, is an often disregarded source of sensitivity.[180] Collinear relationships between the explanatory variables make it difficult to disentangle the effects of the individual variables and to assess their relative importance. Technically, this results in large standard errors, which are a sign that the estimated parameters lack precision. In turn large standard errors mean low t-ratios, which makes it difficult to clearly determine whether the affected variables are significant. The problem of the determination of significance is resolved in this study through the use of joint-hypothesis testing, which is not based on individual coefficients' t-ratios. Therefore, multi-collinearity unless it is perfect should not affect the outcome of the model-building procedure. However, its effect on the precision of the estimators remains, which in turn can affect the quality of the benchmark calculated based on these imprecise coefficients.[181]

What makes it difficult to deal with multi-collinearity is that a clear threshold beyond which multi-collinearity will affect the model does not exist.[182] It is a matter of degrees. Following the statistical literature, perfect or near perfect relationships between two variables have already been omitted in any of the models discussed above.[183] However, even less than perfect pairwise

[180] Loayza et al. (2000), for example, control for simultaneity and country heterogeneity but the potential problem of multi-collinearity does not even get mentioned. However, their explanatory variables include those, which this study finds potentially affected by multi-collineraity, namely urbanisation and dependency. They also include young and old dependency as two separate variables, which is very likely to result in serious multi-collinearity as well. Collins (1991) finding about the growth-tilt effect is also probably driven by the collinear relationship between growth and the interaction variable of growth and dependency ratio.

[181] Statistically, coefficients affected by multi-collinearity are still 'blue' unless their collinear relationship is perfect. Thus, OLS will still result in the best available parameter, even though it is imprecise and may be far away from the true parameter. In other words, no other estimator will be better, even though the one calculated by OLS might not be very good, statistically speaking: uninformative.

[182] See Kennedy (1998, pp. 186-193) for a summary of the discussion surrounding multi-collinearity.

[183] The correlation matrix does not indicate any relationship of this nature among the variables used, except for (not surprisingly) the initial per-capita value and the later annual

correlations can still impact the regression results and moreover a combination of several variables can together have a collinear effect even though in pairwise comparison they do not. Thus, it is necessary to not only determine potential collinear effects between any given pair of variables, but also within the whole equation.[184] For this purpose the use of so-called condition indices, which evaluate the degree of multi-collinearity within the whole regression system, has been advocated in persuasive fashion by Belsley et al. (1980).[185] While a clear critical threshold does not exist, Kennedy (1998) argues that as a rule of thumb a condition index greater than 30 indicates strong collinearity.[186]

Calculating the condition indices for the equations, on which the findings of this study are based, does indeed reveal multi-collinearity beyond the threshold set by Kennedy (1998). Looking at the individual variables with tolerance values of below 0.5 in these systems points to a potentially collinear relationship between the degree of urbanisation and the share of the economically active population, which although not perfect could potentially impact the quality of the estimated parameters particularly in combination with correlations with yet other independent variables.[187] As a matter of fact,

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per-capita observations. Therefore, the use of both variables in the same equation was avoided. Some degree of collinearity, but far less than perfect, exists between value-added in agriculture as a percent of GDP and per-capita income as well as the degree of urbanisation.

[184] Two statistics, which measure the collinear quality of individual variables, are the VIF and tolerance measures. The VIFs, or variance inflation factors, are the diagonal elements of the inverse of the correlation matrix. They are given by $(1-R^2_i)$-1 where R^2_i is the R^2 from regressing the ith independent variable on all the other independent variables. As a rule of thumb, according to Peter Kennedy (1998, p. 190), a VIF_i of larger then 10 indicates harmful collinearity. The tolerance statistic is defined as 1 – the squared multiple correlation of that variable with the other independent variables. Its values range between 0 and 1. When the value is close to zero, the variable is almost a linear combination of the other independent variables. In other words, the tolerance statistic measures that part of the variance of the independent variable, which is indeed independent from the other independent variables. Therefore, if the tolerance is close to one all of the variable's variance is used to explain the dependent variable and we can safely assume that multi-collinearity does not exist.

[185] Belsley et al. (1980, chapter three)

[186] Kennedy Peter (1998, p. 190)

[187] The bi-variate correlation of the two variables for the full pooled sample is 0.675, which means that either variable can 'explain' about 46% of the other variable's variance in a single regression model, which is far from a perfect collinear relationship. VIFs for the two variables also never get close to 10, which indicates that the multi-collinearity problem does not simply arise through the pairwise correlation of the two variables.

once either of the variables is removed from the respective equation the condition index falls to levels substantially below the threshold.

However, due to the strong and separate theoretical support for both variables it would be beneficial to still be able to capture the impact of both dimensions but without the potentially damaging collinear effect. Therefore, an interactive variable between Urb and EcoAcRat was tested to allow at least for their joint effect. Since both variables are predicted to have the same sign such a combination does not bear the risk of neutralisation of the variables through their joint inclusion. Nevertheless, the interaction variable is still slightly different from a separate inclusion, because the effect of the two factors is 'averaged' across the two dimensions, which will affect the values for countries which have a high observation for one dimension but a low figure for the other. This will alter the variance of the interaction variable as compared to the separate inclusion of the two factors. Thus a potential loss of significance of the interactive variable can be due both to the avoided collinear effect and/or a different variance structure.

Table I.4.5.1. above already include fixed-effects models using the interactive variable, which indeed score well below any threshold of the multi-collinearity measures. While the findings in respect to Singapore's benchmark savings for the models including the external situation are not significantly different from those which use the two variables separately, the non-policy model results in substantially lower expected savings. Therefore, a potentially harmful effect of multi-collinearity for at least one part of the findings can not be fully ruled out.

I.4.6. Post Sensitivity Models

As the analysis above indicates, the results appear largely robust when tested for potential sources of sensitivity one by one in fixed-effects models.

However, in order to investigate how the findings behave if some of the influences, which have shown a potential impact on the results, are combined and if they are tested in a purely cross-sectional environment annual regression models were re-estimated.

Annual non-policy models, which include all three dimensions, i.e. the interaction variable of Urb and EcoAcRat for demography, IniGDS, IniPPP and IniLit70 for the inherited situation as well as Pop100km, Airdist, Tropicar and Landlock for geography, and remove insignificant variables using joint-hypothesis testing result in average expected savings for the whole period of 20.3 percent.[188] The development over time with low expected savings in the early parts of the period and above world average savings in the latter half is also similar to earlier findings, namely that it could have been expected of Singapore to achieve world average saving levels once the impact of the initial saving performance has been overcome and that the country was able to improve its inherited saving ratio faster and more strongly than the world sample would predict. Statistically, the geography variables as well as IniPPP struggle for significance. The interactive demography variable is only able to remain in the model once the impact of the initial saving ratio has waned.

Adding the external situation, i.e. NetExRat and from 1972 onwards also NetFDI, but without the geography or IniPPP variables due to their weak performance in the non-policy models, yields average predicted savings for Singapore of 24.9 percent.[189] The further inclusion of the interactive variables between the Asian dummy and the share of the economically active population on the one hand and Net-FDI on the other, raises the expected savings further to 31.3 percent.[190] If statistically insignificant variables are not removed and allowed to remain in the model, the resulting benchmark saving of 37.0 percent lies even slightly above Singapore's actual average

[188] The resulting annual over-/(under) saving is shown as the second column in graphs I.4.6.
[189] The resulting annual over-/(under) saving is shown as the third column in graphs I.4.6.
[190] The resulting annual over-/(under) saving is shown as the fourth column in graphs I.4.6.

saving of 36.2 percent. However, allowing insignificant variables to remain in the equation results in very volatile annual benchmarks due to the very volatile, but constantly insignificant coefficient for the interactive variable between Net-FDI and Asia.

Applying the two-stage least squares method in order to account for a potential endogeneity of the resource balance with the help of its own lagged observations as instruments, yields expected savings of 30.8 percent if the models are reduced to only significant independent variables and 33.6 percent if all variables are allowed to remain in the annual equations.[191] Again the development over time tells the same story, with Singapore's savings during the late 1980s and early 1990s being far from extraordinary even though the actual saving ratios were moving towards fifty percent. On the other hand, the early savings stand out when Singapore reached world average saving levels much faster than her circumstances would predict.[192]

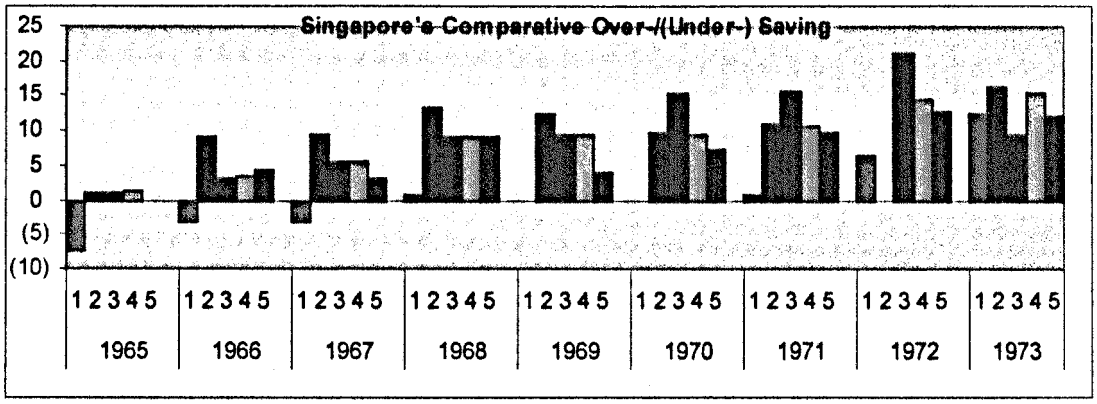
Graphs I.4.6. show the annual over-(under) saving of Singapore based on these models with increasing levels of control for the countries' circumstances from left to right. The first column for each year represents the difference between the world average saving rate and Singapore's. The second column controls for Singapore's non-policy environment and the third column additionally controls for the countries' external situation. Finally, the fourth column adds peer group effects and thus models all dimensions. Its annual results are shown in a lighter colour. The fifth column

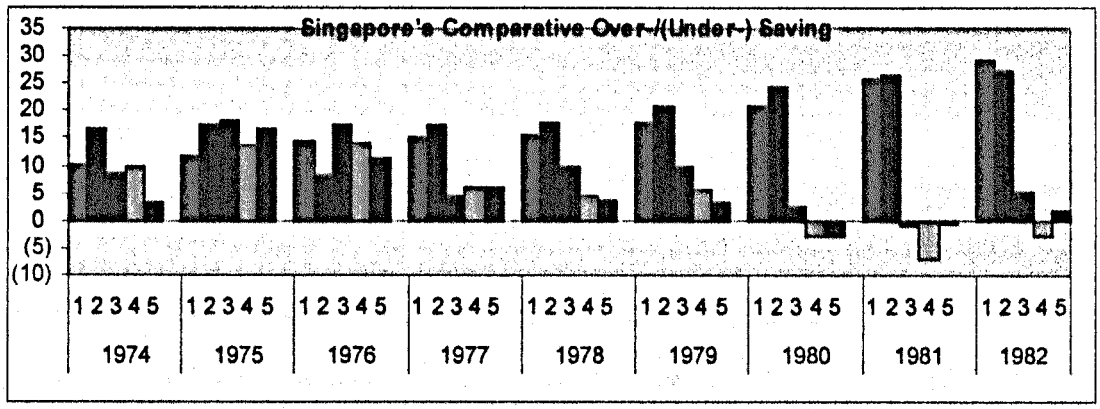
[191] In the 2SLS method the removal of insignificant variables was based on t-ratios, since the joint-hypothesis F-test was not available for 2SLS in the software package. The variables, which proved significant at least for parts of the period, were: Urb*EcoAcRat, IniGDS, IniPPP, IniLit70, NetExRat, NetFDI, EcoAsia. These variables also formed the equation of the model without removal. The resulting annual over-/(under) saving is shown as the fifth column in graphs I.4.6.

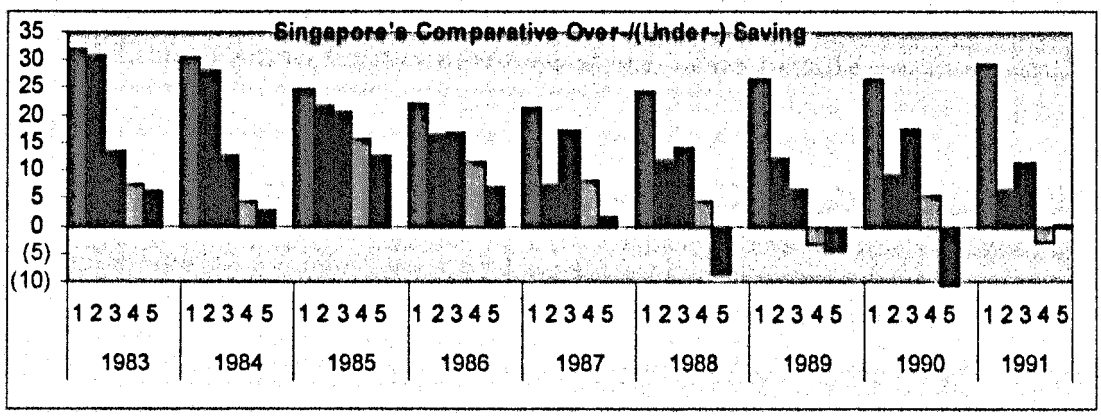
[192] Including Singapore in the sample and a Singapore country dummy among the independent variables, yields a significant country dummy for only 7 years (1968, 1972 only if FDI is also included, 1975, 1976, 1990, 1995 and 1997). Contrary to the finding of the sensitivity analysis, once the models are run on an annual basis and thus the coefficients are allowed to pick-up year specific effects the models seem to adequately capture Singapore's situation. Moreover, the finding that Singapore exceeded expectations in the early years and if anything was below its saving benchmark in the later years is supported by the fact that the country dummies attract positive coefficients for 1968, 1972, 1975 and 1976, while it has negative coefficients for 1990, 1995, 1997.

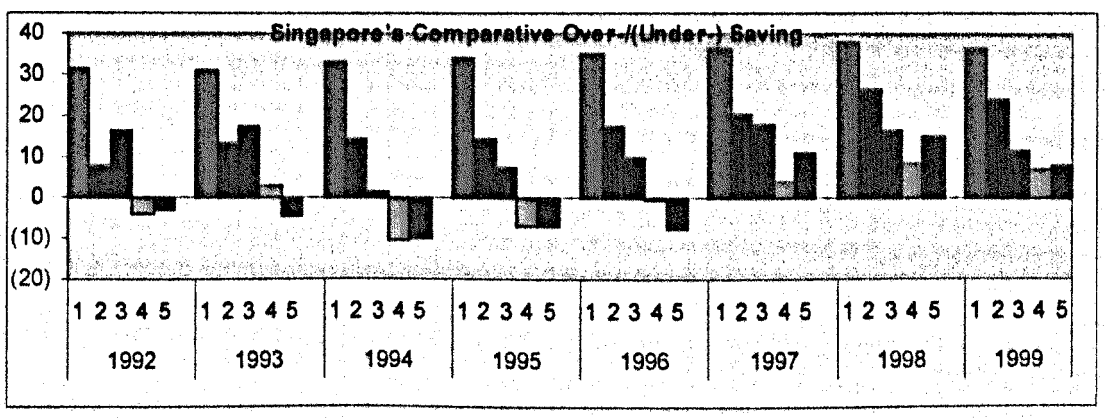
uses 2SLS instead of OLS. It becomes nicely visible how the status of extra-ordinarity is removed step by step from Singapore's saving performance.

Graphs I.4.6.: Annual Comparative Over-/(Under-) Saving









Statistically, the models perform very well with high adjusted r-squareds similar to those in the earlier equations. The potential multi-collinearity problem between the urbanisation ratio and the share of the economically active population has been resolved with very low condition indices for all of these regressions. A possible endogeneity of the resource balance does also not appear to alter the benchmarking results significantly.

In summary, while not all individual regression models are fully robust, the central findings of the benchmarking exercise appear very robust to a wide variety of potential sources of sensitivity.

I.5. Conclusion

Controlling for those explanatory variables exogenous to a country's saving policies, which prove to be significant in modelling variation in GDS-ratios across a world sample, renders Singapore's gross domestic saving performance significantly less spectacular. Furthermore, the research suggests that the key to understanding Singapore's saving behaviour must lie in the turnaround achieved during the first decade of the country's independence. Therefore, looking merely at the country's more recent saving performance will not be able to answer how Singapore was able to achieve its world-record saving ratios.

This study therefore removes Singapore's saving performance from its pedestal as an outlier in economic history, with the reputation of being hardly transferable and possibly not even desirable. Instead, the results of the benchmarking exercise clearly show the transferability of at least the saving aspects of Singapore's economic history. Moreover, this approach also highlights those circumstances, which are not directly related to saving policies but must be taken into consideration if transferability is assessed, particularly the demographic structure and external position. The cross-

country saving analysis furthermore gives an indication to what degree these pre-requisites are likely to affect a country's saving.

The exercise lends further support to the view of a favourable starting position as proposed by Huff (1994) and Peebles and Wilson (2002) and thus goes against Singapore's - or rather the PAP's - own folklore, which describes Singapore in the 1960s as a backward fishing village.[193] This, however, does not lessen the achievement of the Singapore government and its people. Simply having the chance does not mean that one is able to realise this opportunity. They did.

In terms of policy impact, the study shows that Singapore's savings must have been positively affected by the country's policies resulting in higher savings beyond what could have been expected of the country given her circumstances. This policy effect, however, is comparatively small in relation to strictly non-policy and external factors, which are the strongest factors in the country's transition from low to high savings. Not more than one third can be attributed to policy even in conservative estimates. Furthermore, the policy impact can be econometrically explained by Singapore's place within a particular peer group of neighbouring countries. In other words Singapore over-saved in average somewhere between five and ten percent of GDP per year, which, however, is in line with the saving behaviour of her regional 'control group'. Singapore's saving performance within an Asian perspective, therefore, is far from extraordinary and even within a world sample the country's saving is far less spectacular than a pure comparison of GDS-ratios would indicate.

[193] Huff (1994, p.1) summarises: "Post independence economic development in Singapore ... began from a strong foundation and with very substantial advantages." See also: Huff (1995, 1422-23), Rodrick (1996), Peebles and Wilson (2002, pp. 24-26)

1.6. An Excurse: The Current Account Balance in Saving Regressions

The literature dealing with cross-country saving behaviour often uses the Current-Account (CA) Balance as an explanatory variable at least for some of their equations, for example Agrawal (2001), Loayaza et al. (2000), Edwards (1997), Masson et al. (1995 and 1998) Corbo and Schmidt-Hebbel (1991). With the CA Balance the authors try to capture foreign borrowing constraints, arguing that a CA deficit, which due to its mere existence must have been financed through the Capital Account, is an indication that the country is not facing a foreign borrowing constraint. Therefore, the question arises whether foreign borrowing complements or substitutes domestic saving. The evidence points towards a substituting but not fully off-setting relationship with current account deficits showing negative coefficients in the saving regressions, i.e. the larger the deficit the lower the saving rate.[194] However, while this argument appears intuitive in respect to the direction it is being propagated, i.e. a deficit being an indication for the absence of borrowing constraints, it is questionable whether in turn a CA surplus actually means that the country is facing such constraints. The economic history during the period under investigation of such successful exporting nations like Japan, Germany or even the recent Singapore do not seem to indicate that they have been facing foreign borrowing constraints. If anything, their strong financial position suggests that successful exporting countries do not require foreign borrowings.[195]

[194] See Dayal-Gulat and Thimann (1997, p.136) for a summary of the results of the CA balance in saving regressions. They also point out that the inclusion of the CA balance in regression which already incorporate public saving will result in an over-identified regression system.

[195] A further weakness of the interpretation of the CA balance as a proxy for borrowing constraints is pointed out by De Brouwer (1999, p.49), particularly with respect to East Asia. A country might experience an increase in its CA deficit, yet not an improvement in its economy's borrowing constraints, if the corresponding increase in foreign capital is absorbed by the country's reserves. If the standard CA account interpretation was followed, it would appear as if foreign borrowing has improved while actually the real economy remains constrained.

However, if the CA variable does not pick-up borrowing constraints what is it modelling? A look at the basic national accounting identity might be helpful. For simplicity sake the following equations do not include Net-Factor-Income from abroad and thus restrict themselves to the Net-Export-Ratio instead of the Current Account Balance and the corresponding figure for income, GDP instead of GNP.

$$(1)\ Y = I + C + G + NX$$

where
Y = Gross Domestic Production
I = Investment
C = Private Consumption
G = Government Final Consumption
NX = Net-Exports

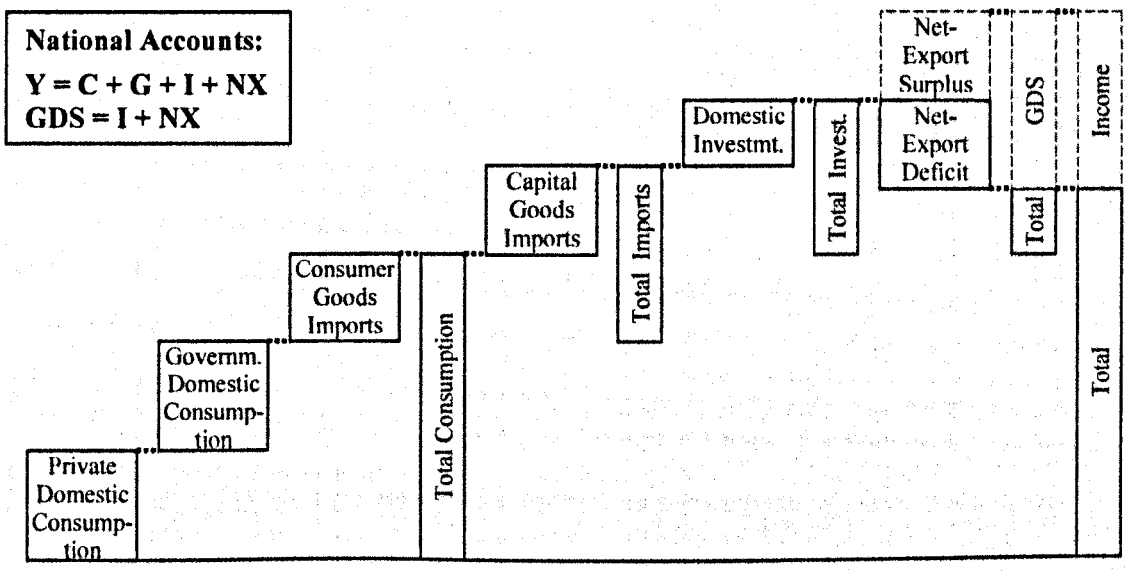
Gross Domestic Saving is then derived as a residual:

$$(2)\ GDS = I + NX = Y - C - G$$

where
GDS = Gross Domestic Saving

The same relationship is visually explained in somewhat more detail in Graph I.6. As the graph indicates the less than perfect trade-off between the domestic saving rate and the CA balance found in earlier studies can potentially be explained by the capital goods imports, simply because if the current account deteriorates due to an increase in imports of capital goods the saving ratio does not fall.

Graph I.6.: The Resource Balance and Domestic Savings



Rather than modelling the absence of foreign borrowing constraints, the current account balance (or the resource balance) stands for an opportunity for the country to increase its saving rate without having to reduce the citizen's or the government's consumption. The more positive the Resource Balance the higher can be the saving ratio without affecting the absolute level of consumption. Therefore, an increase in savings (and thus investment) can be financed by absorbing an increase in the resource balance, instead of a reduction in the people's consumption. The more negative the resource balance, on the other hand, the more difficult the nation will find it to finance domestic investment with purely domestic savings, since this would require a reduction in the levels of consumption.[196] The off-setting financial transaction in the capital account will only increase the country's savings by the proportion of capital goods financed with it. This circumstance explains the positive (negative) relationship found in the studies between the CA balance (CA deficit) and the saving rates, as well as the less then perfect off-setting relationship.

This discussion leads straight to the question of how a country can possibly restrict her citizens' consumption in order to either allocate most of the net-export gains to saving/investment purposes or lower consumption in the first place to keep imports down. This question as it relates to Singapore's economic history will be addressed via a time-series analysis in the ensuing chapter.

[196] Alan Taylor (1998, p. 20), for example, argues similarly in terms of the effect of exports on growth when contrasting East Asian NICs with Latin America. He argues, in line with the export-led growth literature, that exports permitted long-run capital imports, both financial (foreign saving) and physical (foreign investment goods), which underlie the accumulation response that massively differentiates East Asia from Latin America.

Chapter Two

Saving Behaviour in Singapore

1965-97

Table of Contents

II. What drove Singapore's saving performance?

In the context of saving performance, Singapore can be compared to a child with a good athletic built growing up in a family environment of sports enthusiasts. The odds that the child will become a successful sports person are in its favour. This is what Chapter One has established. Nevertheless, the odds themselves do not bring the Olympic medals. What did the child do, how did it train, what did its competitors do etc. - these are the metaphorical questions which this chapter intends to address.

Past attempts at explaining Singapore's saving behaviour have not been satisfactory - largely on methodological grounds. Therefore, no clear picture has yet emerged. A detailed time-series analysis for 1965-97 of all main saving aggregates, namely voluntary private, compulsory private and public national savings, will try to fill this gap, testing for all main influences argued for by the relevant theories, particularly income, demographics, borrowing constraints and the role of the government, including the role of Singapore's Central Provident Fund. The individual saving aggregates are then combined to form the country's Gross National Savings in a novel additive procedure, which is able to avoid a number of statistical pitfalls and offers a more differentiated insight into Singapore's spectacular saving transition since the country's independence.

The final models are able to 'explain' over ninety percent of Singapore's evolution from a low saving to one of the highest saving nations of the world, which in turn is fundamental to understanding the country's overall economic development. Not surprisingly, this change cannot be attributed to a single factor. In fact, contrary to parts of the past literature, all four main influences can be shown to have had a significant impact on the country's savings. Income, particularly its dynamic, i.e. transitory, component is the single strongest factor, followed by the CPF, whose dynamic effects were offset by lower voluntary and public savings but its long-term effects more than compensated. Falling dependency is shown to have had opposite

effects, positively adding to voluntary savings particularly during the early years but reducing public savings for the whole period. The lowering of borrowing constraints over time has led to more consumption and thus lower savings among the private sector, which was however compensated by a positive impact on public savings. Full Ricardian Equivalence has not been present, so that public saving has had a positive net effect on the country's gross national savings.

Since voluntary savings was the driving force behind the early saving transition and voluntary saving in the early years was itself largely driven by the rising labour force ratio, the favourable demographic environment must be considered to having been central to Singapore's saving 'take-off', supporting the favourable initial situation hypothesis proposed in the first chapter. Moreover, the fact that the positive effect of the CPF was largely due to positive net-contributions to the fund, shows how important this demographic change was even outside of voluntary savings. Singapore, therefore, used the chance to exploit this demographic dividend very well, by both kick-starting a changed voluntary saving pattern and by using the demographic window for the creation of a CPF 'hump-saving'.

Further investigation of some still outstanding questions would require the access to household data, which are currently not being made publicly available by the Singapore Department of Statistics.

The chapter is split into six sections. The first will give an overview of relevant theories on saving behaviour, which motivates sections two and three taking a closer look at Singapore's demographic development and the country's institutional framework. The fourth part will summarise the existing literature, followed in section five by a battery of econometric tests on Singapore's saving aggregates with the objective to determine the main influences on the country's saving behaviour from 1965 to 1997.[197] Finally, the sixth section will conclude.

[197] The period of investigation ends in 1997 because the inclusion of the Asian Crisis years with their additional strong volatility can substantially affect the results of the time series analysis for the period

II.1. The Theory

In the second half of the twentieth century two main theories have dominated the discussions about saving behaviour: the Life-Cycle Hypothesis of Saving (LCH) and the related Permanent-Income-Hypothesis (PIH). Additionally, demographic dependency effects, which are partly included in the LCH, have been put forward as a separate factor. With the rise of New Institutional Economics these theories were amended by institutional considerations, particularly the effects of financial market liberalisation and borrowing constraints, but also government sponsored or controlled saving schemes.

The LCH argues that individuals smooth consumption over their lifespan in order to allow during their earning span for the accumulation of assets, which in turn are to be consumed during their retirement. The thus modelled forward-looking individuals create what is called 'hump-saving', which is passed on from generation to generation. The main implications of the LCH are that the aggregate saving rate depends on the growth of the economy, both in respect to population and productivity growth, and on transitory deviations from the households' income expectations. Consequently, just as saving has a salutary impact on capital accumulation and thereby on growth, prosperity influences saving through a 'growth dividend' on the saving rate.[198] This interdependence of growth and saving is at the root of theories of self-generating growth.

Similar but not identical with the LCH, the PIH postulates that saving depends largely on short-term deviations from the consumer's expected permanent income. However, it differs in the predicted effects of productivity growth, which it argues

before the crisis and thus potentially yield misleading results. In other words, if the Asian Crisis is part of the period under observation the danger exists that the statistical OLS algorithm, which tries to minimise the unmodelled variance along the whole time period, is unduly driven by the strong volatility of – in Singapore's case - the 1998 crisis year and the strong rebound in the following years.

[198] Lahiri (1989), p. 229

will lower the saving ratio since the income effects of higher productivity are presumed to be permanent.

Dependency theory, on the other hand, focuses on the impact of population growth. It proposes that a country's aggregate saving rate is lower, ceteris paribus, to the extent that it has more dependents in its population. Since children and the retired population contribute to consumption but not to production, a high ratio of dependents to the working age population might be expected to impose a constraint on a society's potential for savings.

II.1.1. The Life-Cycle Hypothesis

The Life Cycle Hypothesis of Saving (LCH) was developed by Franco Modigliani and his collaborator Richard Brumberg in the 1950s initially as an attempt to explain certain empirical findings, which did not fit the Keynesian consumption function. In terms of the history of economic thought, the LCH can thus be considered an attempt to expand and match to empirical findings Keynes' fundamental psychological law "that men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income."[199] In particular, Modigliani and Brumberg were interested in finding reasons for why saving ratios stay the same in long-run time series although incomes rise, why the long-run marginal propensity to save appears to be lower then the short-run, and why consumption fluctuates less than (disposable) income.[200]

[199] Keynes (1936), p. 96

[200] Simon Kuznets (1946) was among the first to point to this incompatibility of Keynes' psychological law with the actual historic developments of saving ratios and income in the United States since the 19th century.

The Hypothesis

As an answer to the questions arising from these empirical observations, the LCH states that consumers in making their consumption and saving decisions do not concentrate exclusively on this year's disposable income. Instead, the LCH proposes that the rate of consumption in any given period is a facet of a plan which extends over the balance of the individual's life, while income accruing within the current period is but one element which contributes to the shaping of such a plan.[201] The other major variables are income expectations and initial assets, with the latter depending again on previous income and income expectations.[202]

Correspondingly, the aggregate LCH consumption function is a linear and homogeneous function of current income, currently expected income and the weighted sum of the net worth of each age group at the beginning of the year:[203]

[Equation II.1.1.a.] $$C_t = a_1 * Y_t + a_2 * Y_t^e + a_3 * A_{t-1}$$

Where:

C_t: Consumption in period t

a_1, a_2, a_3: coefficients dependent on preferences as to the distribution of consumption over life (and to bequests), on the rate of return on assets, on the age structure of population and on the previous history of income.

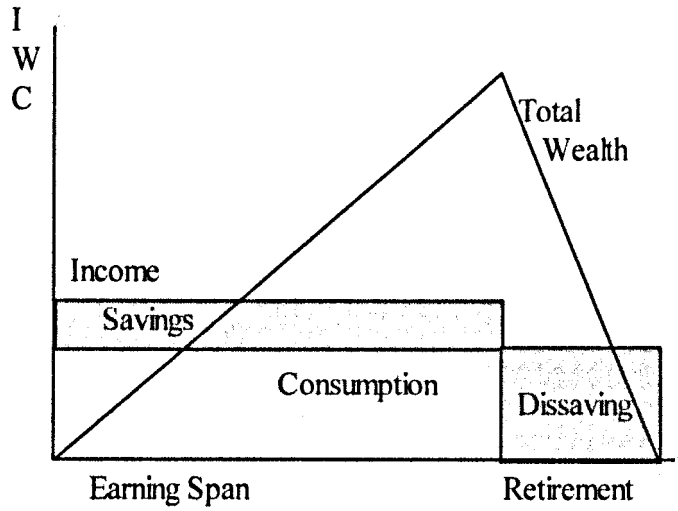
Y_t: Income in year t defined as personal income less dividends plus corporate income minus direct personal and corporate taxes or equivalently as disposable income plus corporate savings. Corporate savings are included in income due to the consideration that they will result, at least in the long-run, in an increase in private net worth by way of its effect on the market value of corporate equity.[204]

Y_t^e: Expected future income discounted to a present value for period t

A_{t-1}: Net-worth at the end of the period preceding t, i.e. past accumulated wealth

[201] Modigliani and Brumberg (1954), p. 392
[202] Modigliani and Brumberg (1979), p. 137
[203] Modigliani and Brumberg (1979), p. 135
[204] Modigliani (1966), p. 184

Figure II.1.1.: The Life-Cycle Hypothesis of Saving



Its Predictions

Based on a number of assumptions and a ceteris paribus approach to relaxing them, the LCH derives a set of predictions about saving behaviour.[205] The main implications are that the aggregate saving rate depends on the growth of the economy and on transitory deviations from the households' income expectations.

The LCH model with its constant income assumption shows that aggregate saving will only be positive if that assumption is being contradicted, i.e. if there is growth. In the long-run the proportion of aggregate income saved depends not on the level of income as such but, rather, on the rate of growth of income.[206] The aggregate saving rate will be higher the higher the long run growth rate of the economy. It will be zero for zero growth since the dissaving of the retired will just offset the accumulation by the active population. Until the economy has reached its steady

[205] Modigliani (1963, p.59) and Modigliani (1986, p.264) offer a summary of the assumptions and continue to discuss ways of their relaxation. In its most restrictive model, which would also include equation II.1.1.a., the LCH comes with five main assumptions: 1) Income is constant until retirement, zero thereafter; 2) The rate of return is constant or zero; 3) Consumption is constant; 4) There are no bequests and 5) Households are rational, profit-maximising and make their decisions in perfect markets. For a summary of the LCH predictions see also Modigliani (1986) pp. 264-8.

growth path the saving ratio will be positively correlated with growth. Once on the steady growth path it will be constant and wealth, i.e. total accumulated saving, will also remain constant in the aggregate, though it is continuously being transferred from dissavers to savers in exchange for current resources.[207] If income fluctuates cyclically around its growth trend, the saving ratio will fluctuate pro-cyclically.[208]

In a growing economy the accumulation of aggregate saving is due to two effects: the Neisser effect referring to population growth and the Bentzel effect in respect to productivity growth. The Neisser effect states that if the economy's population is growing, younger households in their accumulation phase account for a larger share of population and consequently retired dissavers for a smaller share. This results automatically in a higher saving ratio as compared to an economy with no or lower growth. The Bentzel effect argues that productivity growth (defined as growth of per capita income) implies that younger cohorts have larger life time resources than older ones and will thus save more in order to sustain their higher living standard during their retirement. Consequently, saving during their earning span will be higher then the past saving of the currently dissaving retired cohorts. The saving of each generation of workers in a growing economy, therefore, exceeds the dissaving of the concurrent retirees.

The LCH uses these arguments to demonstrate that differences in national saving rates are not due to cultural elements, e.g. a differential degree of thrift between citizens of different nations. Instead, the LCH claims that differences in saving ratios can be explained through the countries' respective growth experiences and life-cycle stages.

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[206] Modigliani and Brumberg (1979), p. 143

[207] Modigliani (1966), p.163; Through this mechanism, called hump saving or hump wealth, an economy can accumulate a very substantial stock of wealth relative to income even if no wealth is passed on by bequests.

[208] Modigliani (1966), p.161

The main parameter that controls the saving rate for a given level of growth is the prevailing length of retirement. The LCH offers a very simple formula for a stationary economy, in which the amount of annual consumption over the whole life span is given by: [209]

[equation II.1.1.b.]	**C = R / (R + E) * Y**
or	**C / Y = R / (R+E)**
or	**S/Y = 1 – [R / (R+E)]**

where
C = annual consumption
R = number of retirement years
E = number of earning years
Y = average annual income
S = savings = Y - C

The higher the number of earning years versus retirement years the lower will be the consumption ratio and consequently the higher will be the national saving rate, since there will be more people saving than dissaving.[210]

The LCH states that saving is independent of the absolute level of per capita income and instead depends on changes in the age structure of the population and on expectations of future income and thus growth. Changes to a household's income, however, can be of a short-term or of a long-term nature. Long-term changes affect the expectations of future income (or in Friedman's terminology permanent income) and lead to the effects discussed in the previous section. Short-term fluctuations of income around basic income expectations are called transitory and considered to be generally unexpected. According to the LCH (and the PIH) a household, whose current income unexpectedly rises above the previously 'accustomed' level (where the term 'accustomed' refers to the average expected income to which the household was adjusted), will save a proportion of its income larger than it was saving before the change and also larger then is presently saved by the permanent inhabitants of

[209] Modigliani (1986), figure 1 on p. 265

[210] This relationship runs counter an intuitive look at individual household behaviour which would argue that the greater E compared to R the lower will be the saving rate since there is less need to support a

the income bracket into which the household now enters.[211] The statement, of course, holds in reverse for a fall in income. In other words, consumption is considered to be sticky and to not change due to a short-term increase or decline in income. Therefore, the fraction saved out of the transitory component of income is predicted to be very close to unity.[212]

Criticism and Limitations

In general, the LCH has come under attack mostly on two fronts. Firstly, households do not behave as rational and forward-looking as assumed. Secondly, there are other variables influencing consumption and saving decisions beyond those proposed by the LCH. Consequently, the direction of causality from growth to saving and the resulting virtuous circle have been questioned. [213]

The first criticism receives its support form cross-sectional studies. Upon disaggregation of national saving into the behaviour of individual households they show a largely different saving behaviour compared to the one put forward by the LCH. As Deaton (1992) points out life-cycle saving, when it occurs, takes place in middle or late middle age, not long prior to retirement. Whether there is saving among the young, or dissaving among the old, is something that varies from data set to data set, and has been the subject of a good deal of controversy.[214] The notion of hump saving is questioned. The marginal propensity to consume - at least in some subsections of the population - is also often found to be higher than a forward-

retiree in the years of his retirement and thus the forward looking household will save less during its earning years.

[211] Modigliani and Brumberg (1954), p.406

[212] Modigliani and Brumberg (1979), p. 145

[213] For a summarised recent assessment see the introduction to Deaton and Paxson (1999). Mayer (1972) offers a summary of early tests of the LCH along with other wealth theories. He concludes that the strict LCH model must be rejected, yet a broad understanding of its mechanisms could still apply. On the other hand, Deaton (1992, p.44) surveying and re-assessing more recent work offers the conclusion that while "there seems little doubt that growth and saving are indeed linked, it cannot be established that life-cycle saving is the cause.".

[214] Deaton (1992), p. 53

looking consumer would suggest.[215] Consequently, the relationship between income and consumption is closer than the LCH would predict.[216]

Table II.1.1.: Influencing Factors of Saving Behaviour beyond LCH [217]

- Liquidity/borrowing constraints on the side of the consumer
- Need or desire for precautionary saving (i.e. for emergencies and not purely for retirement)
- Degree of financial development and deepening in the financial sector
- (Real) Interest rates and demand for investment, which in turn can influence interest rates[218]
- Land and housing prices[219]
- Cultural factors (e.g. differing degrees of risk aversion, role of extended family and importance of bequests)
- Social security and tax system[220]
- Type of income, i.e. whether from employment or property and entrepreneurship[221]
- Relative level of income (i.e. low or high income family) as well as degree of income inequality in society[222]
- Initial stock of wealth[223]
- Price stability and unanticipated inflation[224]
- Terms-of-trade developments[225]
- Degree of export orientation[226]
- Access to foreign savings

[215] Blinder (1981) and Hall and Mishkin (1982)

[216] However, as David Miles (1996 and 1999) points out saving estimates in cross-sectional household studies usually do not account for the depletion of pension assets, i.e. they do not trace how the 'hump-saving' moves from the older to the younger generation. If the depletion of pension assets is included the saving rate among the old is also falling among micro-data. Thus, the criticisms based on the observation that older generations do not dissave as much as the lifecycle hypothesis would predict might be due to weaknesses in the national account measures. Miles (1999) continues to show in an over-lapping general equilibrium generation model how such a model based on the lifecycle hypothesis can be successfully reconciled with micro-data. Similarly, Deaton and Paxson (1999) find that once the object of investigation is the individual and not the household anymore, the life-cycle hypothesis appears to hold up better for their study of households in Taiwan and Thailand. However, the necessary data can only be imputed from already less than abundant household information. Therefore, the revision of the revision depends significantly on the assumptions made to derive individual information from the household surveys.

[217] Kopits and Gotur (1980) in their introduction offer a very good and concise explanation of most of these potential influencing factors of the saving ratio. For a recent summary of the determinants of Private Saving Rates used in Panel Studies see also Loayza et al. (2000)

[218] See Deaton (1992), pp. 60-65 for a summary of the literature on interest rates and saving behaviour, as well as Balassa (1989 a/b) with a special focus on the developing world.

[219] See for example: Hayashi (1986)

[220] See for example: Hayashi (1986), Hubbard (1995)

[221] See for example: Houthakker (1965), Williamson (1968)

[222] See for example: Feldstein (1977), Hubbard (1995)

[223] See for example: Hayashi (1989) or Scott (1990), who shows that the inclusion of liquid assets helps explain long-run consumption behaviour in the UK (1969-88). However, in the dynamic short-run regression model liquid assets did not prove significant.

[224] See for example: Williamson (1968), Lahiri (1989), Gupta (1987)

[225] See for example: Lahiri (1989)

[226] See Lahiri (1989) for a summary of the findings about the influence of a country's export orientation.

The second criticism about neglected other influencing factors stems from the fact that even if one accepted the LCH, there still remain unexplained components in many tests, which result in the search for additional explanatory variables. Table II.1.1. lists the most often cited other influencing factors.

II.1.2. The Permanent Income Hypothesis

Milton Friedman published his Permanent Income Hypothesis in 1957 at a similar time as Modigliani and Brumberg advanced their life-cycle hypothesis.[227] Not only in time but also in content are the two theories highly related, particularly in regards to the importance of transitory income. Modigliani himself summarised the PIH in his Nobel lecture. Once we accept, he argued, that

> "the representative consumer will choose to consume at a reasonably stable rate, close to his anticipated average life consumption, we can reach one conclusion fundamental for an understanding of individual saving behavior, namely that the size of saving over short periods of time, like a year, will be swayed by the extent to which current income departs from average life resources. (...) The notion that saving largely reflects transitory income has a number of implications which have been made familiar by the contributions of Friedman."[228]

The permanent-income hypothesis (PIH) focuses on the household's differentiation between permanent and transitory income, where perceived changes in the former affect consumption more than changes in the latter. Both theories, therefore, conclude that the size of saving over short periods of time, say a year, will be swayed by the extent to which current income departs from the household's forward-looking assumptions, which in the case of the PIH is defined as permanent income and for the LCH as (expected) average life-time resources.

[227] Friedman (1957)
[228] Modigliani (1986), p. 263

The main difference between the LCH and the PIH lies in the definition of permanent versus expected income, which manifests itself in a differing view of the impact of productivity changes. The PIH would predict falling saving ratios in case of productivity increases, with the argument that the efficiency improvements will lead to increases in permanent income and thus to more consumption.[229] Productivity increases within the LCH, on the other hand, would result in a temporarily reduced saving ratio only if the productivity increase would fall short of the (expected) steady growth path of the economy.

II.1.3. Demographic Dependency Theory

Dependency theory, which proposes that a country's aggregate saving rate is lower, ceteris paribus, to the extent that it has more dependents in its population, developed in two stages. It was first voiced in 1958 in an article by Ansley Coale and Edgar Hoover. But not until Leff (1969) published an article solely dealing with the inverse relationship between dependents and the saving ratio was it brought into mainstream economic theory.[230] Several studies have been undertaken since, however, with controversial results.[231]

[229] Friedman (1957), p. 234

[230] See Higgins and Williamson (1997) for a recent review of the history of dependency theory and its applicability to Asia, that part of the world where its founders, Ansley Coale and Edgar Hoover (1958), thought it mattered most. Rossi (1989) also offers an overview of the development of dependency theory starting from Leff (1969) and the controversy his article has stirred up. For a recent summary of the literature on demographics and development see Birdsall et al. (2001).

[231] See Rossi (1989) for a summary of dependency studies. In her article she also argues for the inclusion of liquidity constraints into the model, in order to reconcile the different outcomes of the individual studies. Liquidity constraints reduce the possibility of intertemporal substitution. Consequently, differences in the applicability of dependency theory between countries might be due to differences in liquidity constraints in these countries, very similar to a common criticism of the LCH.

Theory behind Dependency Theory

Leff's conclusion about the inverse relationship followed from the observation that a rapidly growing population due to sustained high fertility and falling mortality includes a large number of young people, who tend to consume more than they produce. In the absence of an offsetting increase in the income of adults or a decrease in their consumption, the effect will be a reduction in aggregate saving.

Beyond its effect on household saving dependency theory would also argue for a reduction of corporate and public saving in case of rising dependency ratios. As early as 1969, Leff argued for an automatic reduction of corporate saving if private saving should fall, since shareholders will withdraw profits from companies if their private funds are not sufficient for their financial needs.[232] Bilsborrow (1980) also points out that dependency rates can potentially influence corporate saving by forcing households to spent their income mostly on food and other subsistence requirements, while lowering their expenditure on manufactured and luxury items, which would carry a higher profit margin. This effect can result in reduced corporate profits and thus lower corporate saving.[233]

Additionally, dependency burdens may also reduce government saving. As Leff (1980) argues, government tax revenues may be lower in countries where high dependency burdens limit the tax base of supernumerary income. At the same time, government expenditure on education and health may be proportionately higher because of the political pressures which derive from such demographic conditions.[234]

Likewise many of the other unmodelled influences in the LCH, listed in table II.1.1., can be seen as also limiting the explanatory power of a pure dependency explanation.

[232] Leff (1969), p. 888

[233] Bilsborow (1980), endnote 16, p. 199

[234] Leff (1980), p. 207

On a more general level going beyond saving behaviour, a relationship between development and demographic transition has been fundamental to both development theory and economic history. The classic statement of the theory of demographic transition in Notestein (1953), although based on predecessors, formed a dominant paradigm until the early 1970s. Crafts (2001, p. 302-3) summarises:

> The approach was that of a stage theory of development in which societies pass from a low population growth phase in which both birth and death rates are high through a phase of rapid population growth in which modernization causes mortality and then, after a lag, fertility to decline to a mature phase in which both birth and death rates are low and population growth is once again modest. Widely interpreted to imply that 'development is the best contraceptive', this vision, based on impressions of historical European experience, contained both good news and bad news. While eventually economic development would solve the population problem because modernization changes the economics of childbearing, in the short term it would inevitably exacerbate demographic pressure.
>
> While the prediction that demographic transition will accompany economic development is not invalidated by (...) historical experience but what has disappeared is any pretence that the precise point at which fertility will fall is predictable (Kirk, 1996). Thus, Bongaarts and Watkins (1996) find that for today's developing countries fertility seems generally unresponsive when the Human Development Index (HDI) is below 0.4 but past 0.6 nearly all countries are in transition which seems also to have been the case in the European fertility transition using the estimates of HDI in Crafts (1997).[235]

[235] With France being a notable outlier, which started her transition at an estimated HDI of below 0.3

Dependency Theory and the LCH

In his Nobel lecture Modigliani not only embraced the PIH but also dependency theory, pointing to the fact that as predicted by the LCH consumption differs with age, "largely reflecting variations in family size, as one might expect if the consumer smoothes consumption per *equivalent adult.*"[236] However, the strict LCH does not include dependency considerations in its model, which assumes a constant consumption level and a straight line accumulation of wealth over the entire life span. On first view dependency theory and the LCH should be contradictory, because the LCH states that population growth through the Neisser effect will increase saving rather then lower it. This contradiction is due to the fact that the LCH describes a world restricted to only active adults and retired dependents, i.e. the LCH recognises old age, but not childhood.[237] Or as Deaton (1992) puts it: "Workers spring from the womb, tools in hand, and immediately begin accumulating wealth for their retirement."[238] Yet, on a second look, the combination of the two theories, might be able to adequately reflect the differing impact of population growth along the total life-span. Faster population growth, e.g. a baby boomer generation, will temporarily increase the ratio of children to workers. Yet, as the children reach adulthood, they eventually will also increase the ratio of workers to the retired population. The net effect of population growth on saving can therefore initially be negative, but over time become positive until the 'baby boomers' reach retirement, when their negative effect on the saving ratio can be felt again.

The relationship between the LCH and dependency theory is further complicated, by the effect of income changes. Leff pointed to the overall problem of causation

[236] Modigliani (1986), p.270

[237] This, however, did not stop Modigliani (1986, p.270) from claiming dependency theory findings as support for or even part of the LCH: "It is also worth noting that available evidence supports the LCH prediction that the amount of net worth accumulated up to any given age in relation to life resources is a decreasing function of the number of children and that saving tends to falls with the number of children present in the household and to rise with the number of children no longer present."

[238] Deaton (1992), p. 48

possibly invalidating dependency theory. He asks whether it can really be "assumed that dependency rates are exogenous factors which influence savings rates, or, might not both variables be endogenous, determined perhaps by per capita income?"[239] A potential income effect on fertility rates argues that rising per capita income might lead households to reduce the number of children, as they start focusing more on 'quality than quantity' and as access to birth control and modern contraception methods improves. Thus, with rising incomes, saving will rise as predicted by the LCH and at the same time dependency rates will fall leading to a further increase of the saving ratio. In this circumstance, the LCH and dependency theory will 'work together'.

However, in other combinations of income and dependency developments, the theories' combined prediction is not so clear. For example a rising dependency burden with a rising income, would result in a falling saving ratio according to the dependency theory. However, the LCH would only predict the same development if actual per capita income growth falls short of expected per capita income growth. It is open to argumentation and future experience as societies around the world grow older, which of the two effects has/will prevail.

Dependency Theory and International Capital Flows

A very important aspect of dependency theory, is its interaction with investment and international flows of capital. An increasing dependency burden through its reduction of aggregate saving will also tend to reduce resources available for investment. While at the same time a high young dependency rate would tend to increase investment demand. In an economy, which is not well integrated into international flows of capital, the corresponding disequilibrium will have to be balanced through interest rate adjustments, reducing investment demand and

[239] Leff (1969), p. 890

possibly raising aggregate saving.[240] The lower investment rate will further keep the saving rate low through its negative income effect and thus the country might be stuck in a low development state. An economy open to capital flows, on the other hand, can be able to mitigate the disequilibrium without reducing the investment demand through capital inflows. It might thus be able to use the increased young dependency burden as a take-off scenario.

As Higgins and Williamson (1997) argue, for a financially open economy, a shift in the population age distribution toward younger ages should produce a tendency toward current account deficits: saving falls due to the increased dependency burden, even as investment rises in response to higher labour force growth. As the age distribution shifts towards the centre, saving supply should increase, even as investment demand slackens, pushing the current account into surplus. In their study for 16 Asian countries between 1950 and 1992 they are able to show that in average this shift from negative to positive saving effect takes place when the population reaches a demographic centre of gravity at age 39. Up to that point a current account deficit is necessary to finance the overhang of investment demand over domestic aggregate saving.[241] In respect to Singapore, they are able to estimate that "due to dependency rate effects alone, the share of the current account balance in GDP would have switched from -1.7 percent in 1965-69 to 6.8 percent in 1990-92, for a total rise of 8.5 percentage points. Over the same period, the CAB share actually rose by 16.9 percentage points, so that the falling dependency rate accounted for about half of the rising CAB."[242]

[240] Apart from rising interest rates, the disequilibrium might be temporarily balanced through inflation, i.e. through monetised government investments. Inflation, however, is nothing but a tax in disguise and thus it will eventually reduce (real) disposable income further and put even more pressure on the saving rate.

[241] Higgins and Williamson (1997), p.275; In Williamson and Taylor (1994) this thinking is also applied to the capital flows from Great Britain to the New World in the late nineteenth century. In counterfactual scenarios the authors argue that a large part of the capital flows can be explained by push/pull factors stemming from differing dependency burdens.

[242] Higgins and Williamson (1997), p.279

II.1.4. Institutional Factors

Rules that govern the financial market and their likely effect on savings have attracted a substantial amount of interest. Roughly, the discussions can be grouped into two more or less unrelated fields. One deals with the quality of financial markets and the resulting signals sent out to potential savers. This part includes the often inter-linked literatures on financial liberalisation and the importance of a high degree of financial intermediation or financial depth as it is sometimes called, the existence and effect of borrowing constraints and the influence of interest rates. The second part deals with the impact of government sponsored or controlled saving schemes.

Quality of Financial Markets

The early literature on consequences of distortions in the financial markets, following the financial repression arguments by McKinnon (1973) and Shaw (1973), stressed the potential role of higher interest rates in mobilizing savings which in turn could be put to more productive use. The greater scope granted to market forces in determining interest rates and in allocating credit in general, including such considerations as bank ownership, prudential regulation, security markets and openness of the nation's capital account, was supposed to increase both the saving ratios and the effectiveness of the allocation process and thus the productivity of the whole economy.[243]

[243] The heart of the McKinnon and Shaw argument is that as long as a country has negative interest rates (or equilibrium i) then investment tends to be in unproductive assets such as inventories since the liquidity preference increases. This leads to low efficiency investments and low rates of return, possibly even negative returns. In other words, capital is not used for financial intermediation since there is no incentive to do so. In this situation, which could be regularly found in import substituting economies with a high degree of financial repression, liberalisation of financial markets and the resulting increased interest rates were supposed to lead to more savings, a higher degree of financial intermediation and an improved allocation procedure and thus overall productivity growth.

Unfortunately, the link of higher interest rates leading to increased savings turns out not to be as straight forward as initially predicted and therefore the crucial argument that financial liberalisation leads to more savings has remained somewhat controversial. Whether saving responds positively or negatively will depend on the relative strengths of, on the one hand, the consumer's personal elasticity of substitution between present and future consumption and, on the other hand, the wealth effects of higher interest income on past savings.[244] The situation is further complicated by differing degrees of budget or borrowing constraints, which in turn prevent the consumer to behave according to his actual preferences. Moreover, financial liberalisation usually also incorporates the reduction of borrowing constraints, such as easier access to consumer credit or housing finance.[245] This in turn can lead to lower savings even though interest rates have risen at the same time, so that one effect might offset the other. Not surprisingly, the relevant empirical literature has been subject to long controversies on the actual sign and size of the interest rate elasticity of private savings, in both the industrial and developing countries.[246]

[244] If the consumer is target saving for retirement higher interest will increase consumption because he will need to save less in order to achieve this target.

[245] Along the same lines, Hoff and Stiglitz (2001, p. 448) in an interesting twist on the traditional transitory income argument also point out that growth and borrowing constraints can reinforce each other as impacts on savings. If the consumer experiences severe borrowing constraints his consumption plan will largely depend on past income. If growth is significant but income levels from earlier years are used to determine current consumption, the saving rate will increase. In this way, constraints on borrowing against future income can make saving rates an increasing function of growth. In other words, borrowing constraints can increase transitory income, which in turn is likely to be saved.

[246] For recent summaries and critical assessments on Financial Liberalisation see Bandiera et al. (2000, particularly pp. 240-242), Edwards (1997) or De Brouwer (1999, pp. 128-142) which has a special focus on East Asia and also covers the effects of liberalisation on wages, trade balances, and the real exchange rate among other aspects. Gupta (1987), Balassa (1989 a and b), McKinnon (1991) and Carroll and Summers (1991) discuss and extend the earlier findings of the literature. For a recent summary and critical assessment of the by now rather substantial literature on borrowing constraints see De Brouwer (1999, pp. 143-169) or Lopez et al. (2000), which also discuss the effect of fiscal policies in general. For earlier discussions see, for example, Fumio Hayashi (1987), Hubbard et al. (1987) and Rossi (1989).

Government Sponsored or Controlled Pension Schemes

In general, as Datta and Shome (1981) argue and Wickramanayake (1998) summarises, the impact of government sponsored pension schemes on voluntary savings can be understood to incorporate the relative strengths of three effects:

> Firstly, substitution effect is the effect to which savers regard their social security contributions as a form of savings substitutable to other forms of savings. Secondly, education effect is the result of educating the savers with the idea of long-term financial planning. Thirdly, forced-saving effect incorporates the impact of introducing a compulsory saving scheme which increases household savings with the coverage of non-savers. While, the substitution effect is always negative, the forced - saving effect is always positive. But the education effect can be either positive or negative. Thus the relative strengths of the three effects determine the final impact of compulsory savings on discretionary savings.[247]

Additionally, Kopits and Gotur (1980) point to possible effects transmitted through the level of disposable income and through the degree of income inequality related to the benefit and tax structures implemented to support the social security system. Moreover, the benefit structure can impact retirement decisions and thus the work force participation among the aged, which in turn can impact the saving ratio.[248]

The relative strengths of these conflicting effects have been tested mainly in two historic environments: countries which have recently moved from a Pay-As-You-Go to a more or even fully funded pension scheme and the United States introduction of

[247] Wickramanayake (1998), pp.436-37. The substitution effect can also be extended to include the whole welfare system. If individuals perceive that they will be entitled to high social security benefits in their old age, they might tend to reduce their savings during their active life-span. This extended substitution effect, however, is very unlikely to have been active in Singapore's case because of the country's very limited welfare system.

[248] Kopits and Gotur (1980, p. 185). The retirement effect in their interpretation increases the marginal propensity to save, since the existence of a pension induces earlier retirement which in turn may increase the consumers' desire to save. However, one could also argue that early retirement reduces the proportion of the working population and thus increases the dependency burden and lowers

tax-incentivised saving instruments (IRAs and 401(k)s). In some cases government sponsored retirement schemes seem to have led to some increases in savings, although the results are far from robust or consistent. The reasons for the differing results are still being discussed.[249]

On a theoretical level Loh and Veall (1985) and Datta and Shome (1981) argue that the CPF does not distort private consumption behaviour, because individuals consume out of lifetime wealth, whose present value is not changed by the CPF because it is fully funded and earns interest. However, they do not consider the effects of low and often even negative real interest rates credited to CPF accounts, nor possible effects of borrowing constraints. Koh (1987), on the other hand, points out that if individuals consume out of current disposable income instead of life-time wealth, an increase in the CPF reduces this income and would serve to reduce individuals' consumption below what it would be in the absence of the CPF, supporting the view that the CPF has added to savings.[250] Similarly, the argument that the CPF was used as an anti-inflationary device to mob up purchasing power in order to minimize the domestic inflationary impact of the government's wage adjustment policy would argue for a positive saving effect of the CPF.[251]

savings. For a study dealing with the relative strengths of these effects see Feldstein (1977), Wallich (1983) or more recently Hubbard (1995)

[249] Samwick (2000) offers an overview and analysis of pension systems and savings, with a special focus on the shift from unfunded to funded systems and the resulting effects on savings. Also see, for example, Schieber and Shoven (1996) or Dayal-Gulati and Thimann (1997), who review recent pension reforms in Chile, Australia and Sweden toward a (more) funded pension system and compare the results with East Asian provident fund schemes. The Japanese pension system is well described in Noguchi, U. (1985). For discussions of the effects of the United States saving incentives see Hubbard and Skinner (1996), Porterba, Venti and Wise (1996) or Engen, Gale and Scholz (1996).

[250] Koh (1987, p. 86) Whether individuals consume out of life-time wealth or disposable income is still a controversial question, which is extremely difficult to resolve. It requires an investigation on a micro, i.e. household or individual, level for a comparatively long period of time. Such datasets are only very rarely available.

[251] Lee (1982) and Wong (1986, p. 56). Since 1972 almost every round of NWC recommendations of wage increments was accompanied by an increase in the CPF contribution rates.

II.2. Singapore's Institutional Framework

There is no doubt that Singapore's development in general and her saving and investment performance in particular was led by the government through both its policies and its statutory boards and government-linked companies (GLCs). The natural starting point for a discussion of the country's institutional framework and its effects on the nation's saving behaviour is therefore the government itself.

II.2.1. The Government

In February 1965, a few months before the country was discharged into final independence, Dr. Goh Keng-Swee, the city state's LSE educated finance minister[252], gave a paper at a conference organised by the East West Center:

> Economists are agreed that by far the most important single economic variable determining the scope and effectiveness of a development plan is the amount of domestic savings what can be made available from the economy during the plan period, or more precisely, the proportion of the nation's income that can be saved.[253]

Goh refers to Arthur Lewis' fundamental challenge to all development economists that the central problem in the theory of economic development is to understand the process by which a community is able to substantially transform saving in order to finance the necessary capital accumulation.[254] From the outset saving policy was a

[252] Dr. Goh obtained his doctorate in 1956 at the LSE in applied statistics for a dissertation about "Techniques of National Income Estimation in Underdeveloped Territories, with special reference to Asian and Africa"
[253] Goh (1972, p. 63)
[254] Lewis (1954, p. 155)

central element to Singapore's development strategy.[255] Beyond the government's regulatory power to create and control institutions like the CPF, HDB and the POSBank discussed below, there are four further important roles through which it can affect saving behaviour and decided to actively do so:

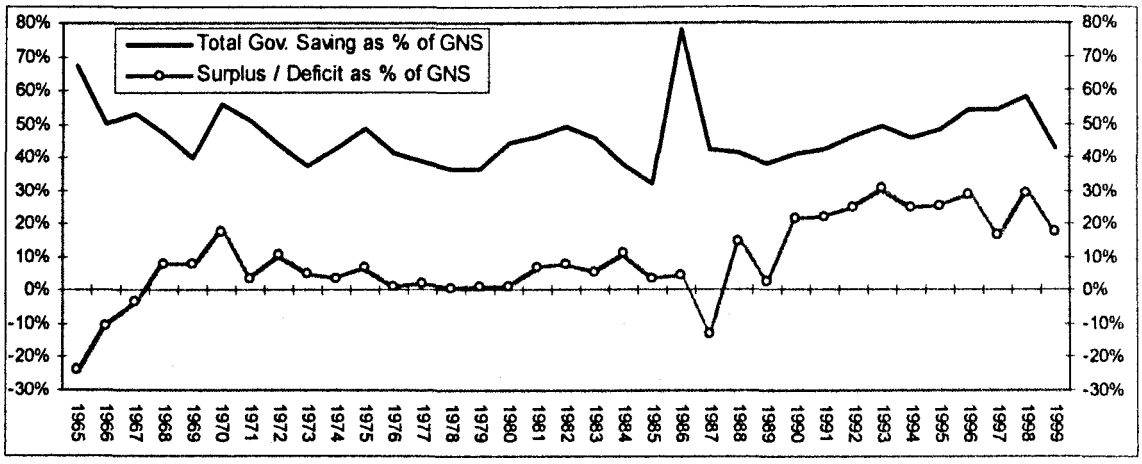
1. financial intermediary through its own saving
2. entrepreneur through its direct involvement in the Singapore economy affecting corporate saving as well as wages, which in turn influence household saving
3. regulator of disposable income and of the welfare system
4. driver of attitudes towards saving

For the period from 1965 to 1999 the government's own savings equalled 48 percent of gross national saving.[256] No matter whether or not Ricardian Equivalence held in Singapore, it is important to point out that through its decision to redirect such substantial funds from the economy into its own saving and the resulting need to find financial investment vehicles, the government basically acted as a nationalised investment fund manager.

[255] Huff (1995, p. 1426) gives another reference supporting this view further: "As early as 1963, Singapore's Minister of Finance, Goh Keng Swee, pointed to a high investment ratio as 'the paramount need ... in an economy which wants to expand its basic wealth at a fast rate, a target like 20% or more should be a aimed at" (Singapore Legislative Assembly, November 1963). Goh concluded in 1968 that Singapore had achieved 'take-off', and recalled telling Lee Kuan Yew that the higher saving rate which could thus be attained would sustain double-digit growth (Goh in an 1989 interview with Huff)."

[256] Government saving is defined as Total Government Revenue less Government Consumption. Koh (1987, p. 82) expands this view to include the whole public sector, i.e. government run companies and statutory boards. According to Koh, the public sector in Singapore commanded in the mid-1980s 70% of savings but only 30% of investment, leaving the government with a substantial intermediary task. For a more detailed discussion of concepts of government saving see section II.4.3. below.

Graph II.2.1.: Government Saving[257]



Through its role as a significant entrepreneur in the Singapore economy, the government also directly affected the level of corporate savings. But potentially even more importantly, it influenced wage levels particularly in combination with its National Wage Council setting guidelines for the whole economy. According to Alten (1995) the public sector - comprising civil service, statutory boards and government owned enterprises - employs about 20 percent of Singapore's workforce.[258] This position gives the government considerable leverage and critical mass to see its wage policies through and thus affect disposable income without the need to use the tax system.

Disposable income in Singapore is characterised by relatively low levels of income tax and no taxes on capital gains. Singapore's tax revenue to GDP ratio is rather low, fluctuating between 15 and 18 per cent during 1991-99.[259] However, its total revenue to GDP ratio was substantially higher during the same period, moving between 29

[257] GNS is the official Gross National Saving Ratio, i.e. without adjustment for investments in HDB housing financed with CPF savings. *Sources: For series on Government saving as a percent of GNS* see data appendix. Government Surplus/Deficit was taken from IMF: International Financial Statistics Yearbook (for 1965-1969 from the 1992 edition, the remainder from the 2000 edition). All data refer to year ending December 31st.

[258] Alten (1995), p. 148

[259] Asher (1999b, p. 4 + 22), Asher (2002, p. 402) and Peebles and Wilson (2002, p. 82); Alten (1995, p. 107) calculates Singapore's tax to GDP ratio for 1990 as 15.77% and points out that this was the lowest among ASEAN countries, while its total revenue to GDP ratio in the same year was the highest among ASEAN countries.

and 43 percent of GDP. This is largely due to a high degree of government revenue not classified as taxes such as fees and levies, yet with a strong tax-nature in their design.[260] Consequently, the government has a multitude of avenues to pursue if it wants to alter disposable income.

It is also noteworthy, that income taxes are not automatically deducted. An employee receives his gross monthly salary after the deduction of only his CPF contributions and is not assessed until the end of the year. He then has six months time to pay his tax debts in instalments. On a net present value basis, this procedure reduces the (direct) tax impact on income further.[261]

Low (direct) taxes, however, are combined with a system which offers compared to western standards virtually no welfare benefits.[262] Low (1999) points out that

> the PAP government is steadfast in its belief that self-help must be encouraged first - from the individual level to family and community levels - before the government steps in. (...) There are no unemployment insurance benefits because of the economic philosophy of the paternalistic government which believes that maintaining a bouyant economy is the best 'insurance'.[263]

[260] Asher (2002, p. 404), Peebles and Wilson (2002, p. 123)

[261] However, it can also lead to a pro-cyclical re-enforcement of the business cycle, a potential further reason for the 1985/86 recession, which only Singapore experienced.

[262] Asher (1994, p.70) describes the welfare system, referring to an unpublished study by Liew (1992): "the paternalistic nature [of the welfare system in Singapore] is reflected in the attempt, so far successful, to control the discourse on welfare in Singapore, and to treat welfare provisions as essentially privileges to be doled out at the discretion of the government in return for gratitude from the citizenry."

[263] Low (1999), p. 1085 and 1078; Yet, in her view, "many CPF schemes and some non CPF schemes together make up a macro social plan which takes care of housing, health, education and asset enhancement but not unemployment and other more traditional welfare state benefits."

The reliance on the family as a welfare provider has been institutionalised in 1995 with the Maintenance of Parents Act, which makes it a criminal offence for a son not to take care of his aged parents.[264]

As a consequence of this welfare policy, government expenditure on social security in Singapore has always been relatively low, especially if compared with high income countries. In 1997 1.79% of the government's total expenditure was spent on social security and welfare, with another 6.72% on health. Switzerland, which ranks only slightly above Singapore in PPP adjusted GNP per capita, spent 50.51% of its government's expenditure on social security and welfare and another 19.74% on health.[265] Even among its Asian peer-group Singapore's government is in the lower half, behind Korea and Malaysia.

The fourth avenue through which the government steers saving is through its influence on public attitudes toward saving as well as its ability to create a stable environment conducive to saving. Singapore's political and financial stability, combined with its openness and integration into international markets must have certainly been beneficial to aggregate saving.[266] Low levels of inflation have amended the incentives to saving by comparatively appreciating future gains and lowering the risk-premium.[267] The government's policy to improve educational attainment will have also helped, by making people more aware of the need and ways of saving, by attracting higher value-added jobs and thus higher disposable incomes and not least by its limiting effect on population growth through the education of women. Moreover, as Fawcett and Khoo (1980) point out, the public

[264] Peebles and Wilson (2002, p. 93) write that "up until early 1999 there were 424 applications of which 328, about 77 per cent, were successful. About two-thirds of the applicants were Chinese. Monthly payments ordered ranged from $10-$1500 and as any parent can receive support from more than one child the range of payments received was from $20 to $2700 a month (Sunday Times, 4 April, 1999)."

[265] IMF: Government Finance Statistics; 1999

[266] In July 1973 the Singapore dollar started to float, supervised by a currency board, which allowed for its gradual appreciation. In June 1978 exchange controls were lifted, allowing Singaporeans to invest their (non-CPF) savings anywhere in the world.

was constantly reminded "that Singapore is economically vulnerable: only a combination of good government planning and continued hard work and sacrifices by the people will assure continued prosperity. The government's economic success allows it to speak with authority in this area."[268]

II.2.2. The Central Provident Fund (CPF)

The CPF was created by an Act of Parliament in 1953 and launched on 1 July 1955 still under colonial administration with the objective of securing retirement incomes for the elderly. It functions on a provident fund principle, under which individuals can withdraw their own and their employer's contributions plus interest on retirement, rather than receive payments being made to retirees from the contributions of those still working. Among the economies classified by the World Bank as high-income Singapore is, with the exception of Hong Kong, unique in using the mandatory national provident fund mechanism to finance its social security.[269]

Contributions are withheld at the source, i.e. on payment of salary, and the CPF is only allowed to invest them in government securities. Membership is mandatory for all resident workers.[270] The self-employed were not obliged to make contributions before 1992. Foreign workers and unpaid family workers have never been required to be active members. Nevertheless, the coverage of the CPF has increased

[267] It might be of interest to note, that the low levels of inflation can be seen as both a means and a result of saving. The high levels of saving allowed the government inflation free access to funds, which it used to finance development investments.

[268] Fawcett and Khoo (1980, p. 552); During the 1997/98 Asian crisis the government temporarily changed its perspective on saving. Government representatives suggested that Singaporeans might save too much and urged for more consumption.

[269] Asher (1994), p. 33

[270] Exceptions are a separate pension schemes for some government employees, which is a non-contributory, unfunded scheme with the pension benefits being paid on a PAYG basis, and a provident fund scheme for certain armed forces personnel, which came into existence in March 1998. See Asher (1999a) endnote 2.

gradually, from about one-half of the labour force in the mid-1970s to over three-quarters in the early 1990s.[271] On top of their own contributions, children are encouraged to top-up the CPF accounts of their parents and at times the government also offered top-up schemes.[272]

Over time the CPF has been transformed from a simple pension fund to a multipurpose saving scheme, which has been used by the government both as a channel of resource allocation and as a macro-economic stabilisation device.[273] Among the main alterations over time was the introduction of early withdrawals for the purchase of public housing in 1968, which was extended in 1981 to include residential properties for investment purposes, for medical (1984 and 1990) and educational expenses (1989) and for approved financial investments (1978, 1993 and 1997).[274] Correspondingly, the pattern of withdrawals has changed over time, see Graphs II.2.2.a. and b.

In 1987 the Minimum Retirement Sum Scheme was introduced. Ever since the mid-1980s the government was increasingly inclined to increase the customary

[271] Faruquee and Husain (1998, p.203), who do not offer an explanation for this increase of the coverage of CPF membership. However, it must be assumed that a large part is due to an increase in formal employment and after 1992 to the inclusion of the self-employed. Early on the Singapore government made sure of a wide participation in the fund through strict enforcement and better administration. The CPF Annual Report for the year ended 31.12.1967 (p. 3) writes: "With an increased field force, over 25,000 visits were made to places of employment and over 11,000 persons were interviewed at the Board's offices. (...) Criminal proceedings were, however, taken against 36 employers for failing to pay contributions for their employees after previous warning and over $118,000 penalty interest was collected from employers who paid their contributions late." Additionally, from 1971 on the CPF used Singapore's identity card numbers as its uniform membership numbers, which improved membership administration. A positive side effect of the CPF must therefore have also been a reduction of informal employment.

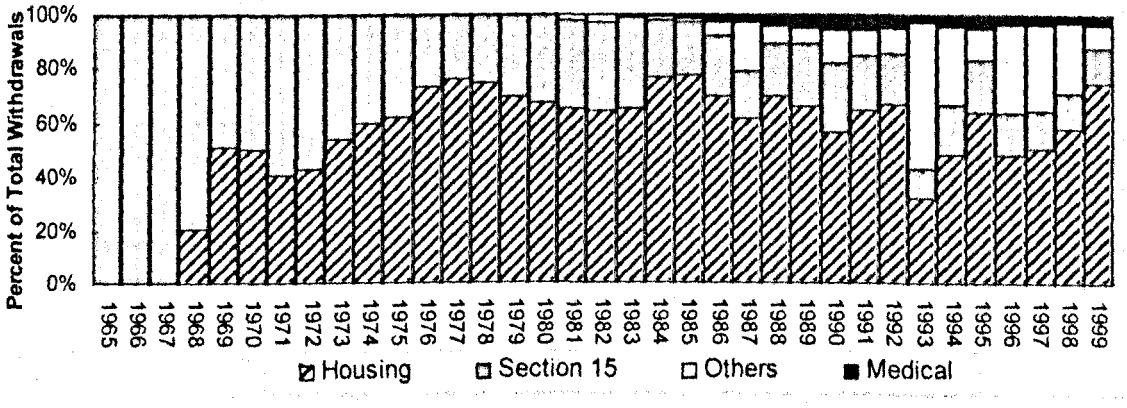
[272] Low (1999, p. 1084). Peebles and Wilson (2002, p. 91) comment: "These transfers from government surpluses have been quite small, a few hundred dollars a time, and infrequent and are not intended to return government surpluses to the taxpayers or redistribute it to those whose balances are low. The latest top-up announced in August 2000...was seen as a pre-election handout by many."

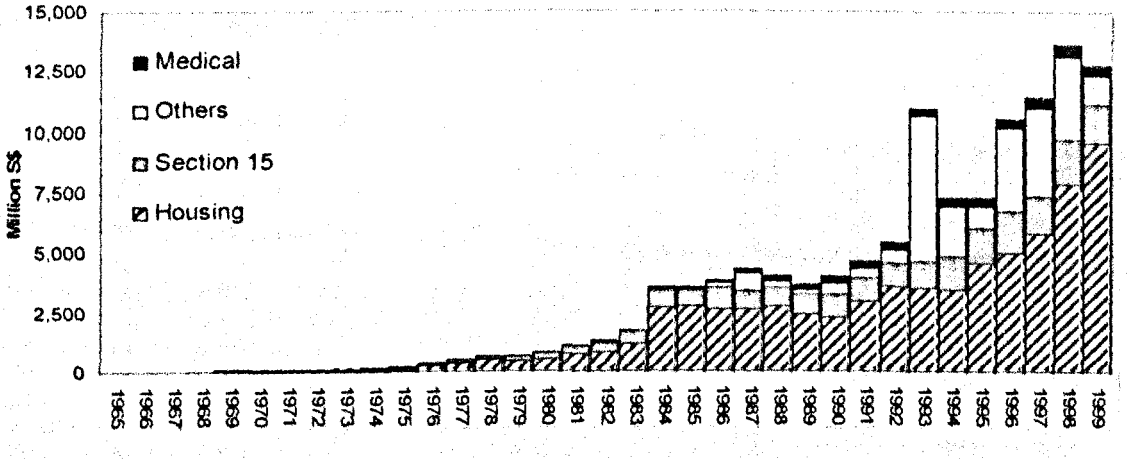
[273] Lee, Kuan-Yew (2000, p. 96) writes: "The colonial government had started the Central Provident Fund (CPF) as a simple savings scheme for retirement: 5 percent of wages contributed by the employee with a matching 5 percent by the employer, to be withdrawn at age 55. As a pension scheme it was inadequate. Keng Swee and I decided to expand this compulsory savings scheme into a fund that would enable every worker to own a home." There exist now a number of very good publications which sketch this transformation. See for example Peebles and Wilson (2002, pp. 87-91), IMF (2000, p. 53-67), Wong and Park (1997) or Asher (1994), p. 35-71; On the issue of the use of the CPF as a macro-economic stabilisation device see also Asher (1999b) and Low and Aw (1997); and particularly for the early years of the CPF, see National University of Singapore (1985).

[274] See IMF (2000, p.59) for a complete listing of the extension of withdrawal rules since 1955.

retirement age (see section II.3.3.). Yet it did not raise the official age of withdrawal of CPF funds, which remained at 55. Instead it required CPF members to leave a certain minimum sum in their accounts until age 60. The minimum sum initially set at S$30,000 has been steadily raised to S$80,000 by the year 2003. After the introduction CPF members were able to use their property to pledge two-thirds of this amount. By 2003 that proportion has be lowered to half. At the official retirement age, which has been continuously raised over the recent years to 67 by the year 2003, each member may receive either a monthly income from this sum plus interest until it runs out or buy an approved life annuity or alternatively deposit it with an approved bank.

Graphs II.2.2.a. and b.: Pattern of CPF Withdrawals[275]





[275] Sources: Monetary Authority of Singapore: Annual Reports; various years. Withdrawals under Section 15 refer to withdrawals for retirement, death, disability, and leaving Singapore and West Malaysia permanently. Other withdrawals mainly include various pre-retirement investment schemes and loans for financing tertiary education in Singapore.

Since 1986 the CPF rate of interest has been an average of the month-end saving and one year fixed deposit rates paid by the four major local banks with a guaranteed minimum nominal rate of 2.5%.[276] Nevertheless, according to Beckerling (1996) and Tyabji (1996), the real rate of interest was actually negative in 1973, 1974, 1980, 1981, 1989, 1992 and 1994. Asher (1999a) calculates that the real rate of interest for the period 1987-97 was close to zero percent, while the annual compound growth in real wages in Singapore was 5.3 per cent.[277] Since July 1999, the interest rates of fixed deposits and saving deposits, which have so far been weighted equally, have attracted respective weights of 80% and 20% in order to reflect more accurately the long-term nature of CPF savings. This is also likely to have raised the CPF interest rate since fixed deposits generally attract higher returns. As Asher (1999a) points out, "paying short-term interest rates for long-term funds, and further restricting the rate to what four relatively insulated local banks pay on local currency deposits clearly shows the administered rather than the market determined nature of the return on CPF balances for the members."[278]

The increasing early withdrawals and the low rate of interest have been blamed for the comparatively low replacement levels of CPF savings once the final balances are withdrawn at retirement. The CPF does not publish actual replacement values, but simulations performed by Wong and Donghyun (1997) put them within a range of 25-35 percent of final salary, while the actuarial firm Watson Wyatt as reported by Beckerling (1996a) show replacement ratios between 15% for a high income, married

[276] Between the fund's creation and 1962 the rate was fixed at 2.5%. From 1963 until 1986 it moved between 5.25% (1963-65) and a top rate of 6.5% (1974-81). See Wee and Han (1983) for the early development of the interest paid on CPF balances.

[277] Asher (1999a, p. 3689). Earlier, Wee and Han (1983, pp. 37-38) had already pointed to the fact that high inflation might eat into the present value of CPF balances, if the interest rates do not adequately reflect developments in the price level. Asher (1994) considers the low rate of return on CPF balances an implicit tax. He estimates the value of this tax for 1990 as S$470 million or 6.6% of that year's contribution. A further reading of early CPF annual reports from before independence strengthens this argument. The CPF Annual Report for the year ended 31. 12. 1964 (p.2) writes: "As long as present [market] interest rates are maintained the annual surplus on income and expenditure account can be expected to increase and if this proves to be the case there seems to be no reason why members of the Fund should not, in due course, enjoy an even higher interest rate than at present." The interest rate credited to members in 1964 was still 5.25%. The conclusion that after independence the government started to use the CPF increasingly as a source for cheap funds at the expense of the CPF's members is very suggestive.

[278] Asher (1999a), p. 3693

contributor with a dependent spouse to 48% for a low income, single contributor. As the IMF (2000) study points out these ratios are well below the 66% of final wage, generally considered the benchmark for a comfortable level of retirement, and are considerably lower than the equivalent figure for other industrialised countries, e.g. US (56%), UK (50%), Japan (52%).[279] This view gives rise to the claim that Singapore's retired are asset rich, due to their high share of housing ownership, but cash poor.

On the other hand, it must be noted that the CPF offers a very lucrative tax shelter because all contributions reduce the employee's taxable income and both interest earned and withdrawals are tax free. This advantage, however, accrues largely to high-income individuals due to the progressive income tax rates in Singapore and due to the fact that the largest part of the tax-benefit is captured at contribution. The latter favours those individuals with CPF balances above the minimum requirement, who can withdraw their funds quickly again and thus make use of the tax shelter while at the same time minimising the penalty of low CPF interest rates.

From a government perspective the CPF also offers the opportunity to be used as a macro-economic stabilisation tool, in that the adjustment of CPF contribution rates can either free or bind consumption.[280] Singapore has used this mechanism in both the recent Asian crisis and in its earlier 1985/86 recession.[281] The government has

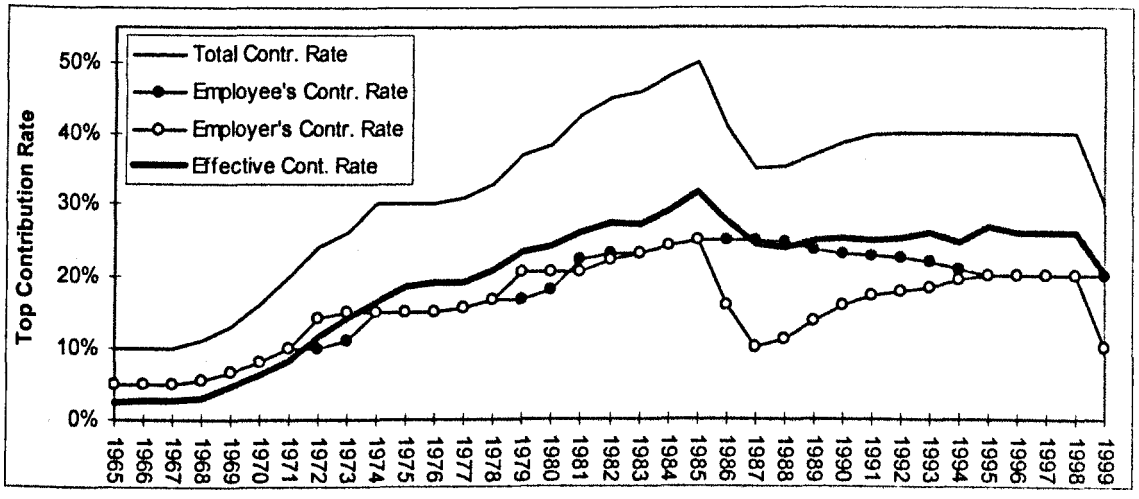
[279] IMF (2000), p. 56 - 57; replacement rates for industrialised countries refer to retirement at the age of 55 in 1995. The adequacy of CPF savings remains a controversial issue - particularly in Singapore. See Peebles and Wilson (2002, pp. 91-93) and Lim (2002) for recent discussions.

[280] Lee, Kuan-Yew (2000, p.97) describes this mob-up process in his autobiography: "Every year, the National Wage Council recommended an increase in wages based on the previous year's economic growth. Once workers got used to a higher take-home pay, I knew they would resist any increase in their CPF contribution that would reduce their spendable money. So, almost yearly I increased the rate of CPF contributions, but such that there was still a net increase in take-home pay. It was painless for the workers and kept inflation down. This was only made possible by high growth year after year. And because the government fulfilled its promise of fair shares for workers through the ownership of their homes, industrial peace prevailed."

[281] A further macro-economic benefit of the CPF has been Singapore's ability to escape or successfully manage the trilemma problem, which states that a country can not have a fixed exchange rate, full capital mobility and an independent monetary policy. In the long-term the country must abandon one of the three. Singapore's strong control over domestic savings allowed the country to oversee a controlled appreciation of its currency under a regime of full international capital mobility while not being negatively affected by international monetary developments, which in theory for a small open market economy like Singapore would dictate the country's domestic monetary policy if it chose to

now adopted a long-term target of 40% although it did reduce the rate in 1999 to 30%. Graph II.2.2.c. shows the development of different measurements of the contribution rates.

Graph II.2.2.c.: CPF Contribution Rates [282]



As a final word of caution, it must also be noted, that depending on one's view of the government's asset position, the limitation of the CPF's investment to government bonds can be construed as analytically analogous to a Pay-As-You-Go scheme since it may be the future generations from whose taxes the bonds will have to be redeemed.[283]

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control its exchange rate and allow full capital mobility. Similarly, Singapore was in the relatively fortunate position not to have to worry about the limitations defined by the Mundell-Flemming open-economy hypothesis, which states that monetary policy does not work with a fixed exchange rate, only fiscal policy is available. Or as Dr. Goh (1995, p. 166) puts it in his parliamentary speech delivered at the Second Reading of the Monetary Authority of Singapore (Amendment) Bill 1984 on 24 August 1984, answering the self-posed question why the MAS does not watch the development of the money supply: "Why do we ignore our Ms? For the very reason Western central banks have to watch theirs. Their public sector accounts are in a state of chronic deficit. Ours are in a state of chronic surplus. We are in a state of chronic surplus because employees have 50% of their pay packet sequestered in the Central Provident Fund. Further, the Finance Ministry does not part easily with the revenues harvested by its assiduous tax collectors."

[282] Sources: see Data Appendix. Although the vast majority does, not everybody pays the maximum contribution rate. At times rates changed during the year. In those cases changes were apportioned respectively. The effective contribution rate is defined as total contributions over an estimate of total employees' remuneration. This figure takes into consideration that not necessarily everybody pays into the CPF and that not everybody pays at the top rate.

[283] Asher (1999a), p.3691

II.2.3. Post-Office Savings Bank (POSBank)

While the CPF is the most important institution with respect to compulsory private saving in Singapore, the POSBank arguably was the most important institution with respect to voluntary private saving. In 1966 the POSBank was put under control and management of the Singapore Postmaster General. However, under the Post Office Savings Bank Act 1972 the POSBank was again separated from the Postal Service Department and given its own identity as a government-owned institution with the objective to provide retail banking services and to mobilise deposits for public development. In November 1998 it was sold to DBS-Bank, a government led company.

Postal savings institutions particularly in developing countries offer low-income households greater security and lower transaction costs than private banks, and provide two important elements that encourage savings: security and an orientation toward small savers. Japan established the region's first postal savings program in 1875, drawing on British experience, with the explicit goal of fostering saving by rural dwellers and people with low to moderate incomes in the cities and towns. Until then, such people were effectively excluded from the financial system, which lacked rural networks and discouraged small depositors by requiring minimum balances or paying very low interest rates on small deposits.[284] Commercial deposit banks preferred large clients due to the lower transactions costs on their deposits.

Deposits with Singapore's POSBank had the further advantage of being tax-exempt until after its sale to the Development Bank of Singapore (DBS).[285] As a further incentive, in 1974 the Bank began to offer a higher interest rate than commercial banks. The amount of new POSBank saving deposits exceeded the aggregate of deposits placed with all the finance companies together, for every year between 1977

[284] Page (1997, p.38) and World Bank (1993, p. 218)
[285] Following the sale in 1998 the tax exemptions were slowly rolled back in the subsequent years.

and 1988.[286] By the mid-1980s the savings deposits placed with the POSBank exceeded those of all Singapore's commercial banks put together.[287] On 31 December 1995 a total of 4.7 million saving accounts and 511,000 current accounts were held at POSBank, with total depositors' balances of S$22.3 billion.[288] In June 1998, a few months before its sale to the DBS, the number of accounts stood at 5,866,200 far exceeding total population.[289]

The tax concessions enjoyed by the POSBank's depositors certainly played a significant role in its growth. However, Lim (1988) also points to the POSBank's aggressive expansion strategy after 1972 formed around many innovative services such as group savings, save-as-you-earn, Giro payment, and a highly computerised banking system.[290] A two tier-interest rate structure, which pays higher interest rates for deposits below $100,000 then for deposits above, will have also helped to attract the mass market of the saving public.

II.2.4. Domestic Financial Markets[291]

The main issues about the domestic financial market in Singapore are its high-degree of government control and its overall stability. The control, which the government exerted over funds available in the system, becomes evident, once one considers the mere size of public and CPF saving. In aggregate they accounted for 71.2% of GNS in the years 1965-99. Moreover, if one was to add voluntary savings, which were deposited at POSBank and DBS, as well as retained earnings by its

[286] Lim (1988, p.226)
[287] Huff (1994, p. 336)
[288] Beckering (1996, p.68) The total population in 1995 is estimated as a little less than 3.5 million so that in average every Singaporean had 1.34 savings accounts with the POSBank.
[289] Peebles and Wilson (2002, p. 117)
[290] Lim (1988, p.226). In 1996, for example, the POSBank accounted for 60% of all cash-less payments in Singapore through its wide ATM system.
[291] For a more encompassing description of Singapore's financial markets and their development over time see for example Khalid and Tyabji (2002), Ariff and Khaild (2000) or Tan (2000).

statutory boards and GLCs, it is a conservative estimate that the government had in fact exercised direct control over the equivalent of eighty percent of the nation's gross national saving in this period.[292] Additionally, the design of withdrawal rights from the CPF gave the government yet another but more indirect lever of control. On top of this already extremely strong position, the Monetary Authority of Singapore acts as an (additional) watchdog.

In the light of the central role of the government, it should not be surprising to find that Singapore's capital markets (fixed income as well as equity) and the fund management industry are comparatively less developed according to the IMF (2000) and have played a smaller role in contributing to Singapore's financial growth.[293] The IMF (2000) study also points to a number of reforms underway or planned for the future with the objective to improve this situation.[294]

Commercial international banking and foreign exchange, on the other hand, are a strong point in the country's financial development. Singapore - together with Hong Kong and Japan - was among the first in East-Asia to strengthen prudential regulations of banks already in the 1970s, e.g. the introduction of Bank of International Settlement (BIS) capital adequacy requirements. Malaysia, Thailand and Taiwan, for example, did not follow suit until the 1980s. When Indonesia finally did, it had problems achieving BIS capital requirement levels.[295] In 1975 a cartel arrangement, which had fixed commercial banks' interest rates, was broken up when the Monetary Authority of Singapore introduced a policy to promote free and

[292] See Chapter Three for details.

[293] See Murinde and Eng (1994) for an econometric analysis of financial development and growth in Singapore.

[294] See IMF (2000, pp. 42-49), as well as IMF (2001, pp.20-32); For a detailed description of the reforms and the reform process see Tan (2000, pp149-177) or Kahlid and Tyabji (2002). For a critical assessment see The Economist, July 7th, 2001, p. 95

[295] World Bank (1993, p. 213)

open competition.[296] In 1978 exchange controls were abolished. The repatriation of foreign profits is unrestricted and generally tax-free for foreign investors.

The resilience of Singapore's banking system was recently confirmed during the 1997/8 Asian crisis, when most of its Asian counterparts struggled severely while Singapore's banks seem to have escaped any major disturbances. According to the IMF's ex-post classification, Singapore had the lowest ratio of non-performing loans with only 4.4% of GDP or 4% of the total loan portfolio.[297] Since the 1990s, the country also ranks fourth in foreign exchange trading after London, New York and Tokyo and fifth in derivatives trading.[298]

II.3. Singapore's Demographic Development

With respect to saving behaviour the development of the age structure of the population is of particular interest - especially the relative size of the working, i.e. saving, population versus the adolescent and the retired, i.e. dissaving population. These ratios are influenced by the development of life-expectancy, fertility, time of retirement and net-migration.

II.3.1. Population Age Structure - an Overview

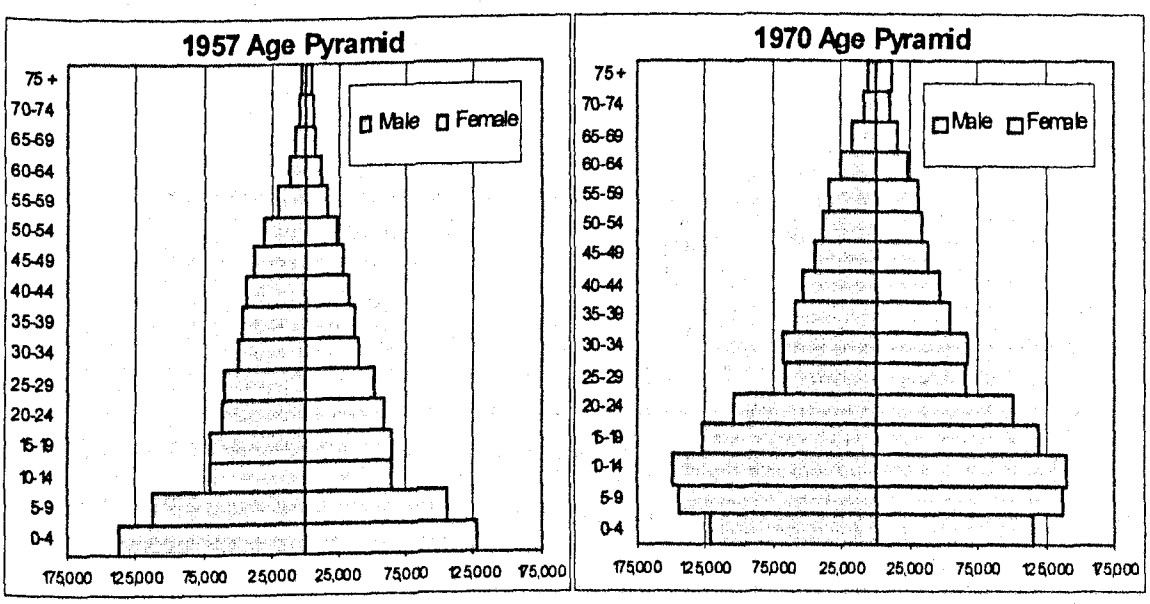
Graph II.3.1. shows Singapore's age structure at the respective census years between 1957 and 2000. Both the growth of the population from 1.44 million to 4.02 million in 2000 and the transition from an expansive age pyramid in 1957 to a constrictive age

[296] Wong (1986, p.57) It might be noteworthy that the government had started its own commercial bank (DBS) only six years earlier and that in the year prior to the cartel break-up the government's POSBank started to pay higher interest rates on deposits than its commercial banking competitors.
[297] IMF (1999)

distribution in 1990 as well as an increasingly stationary age structure by 2000 become apparent.

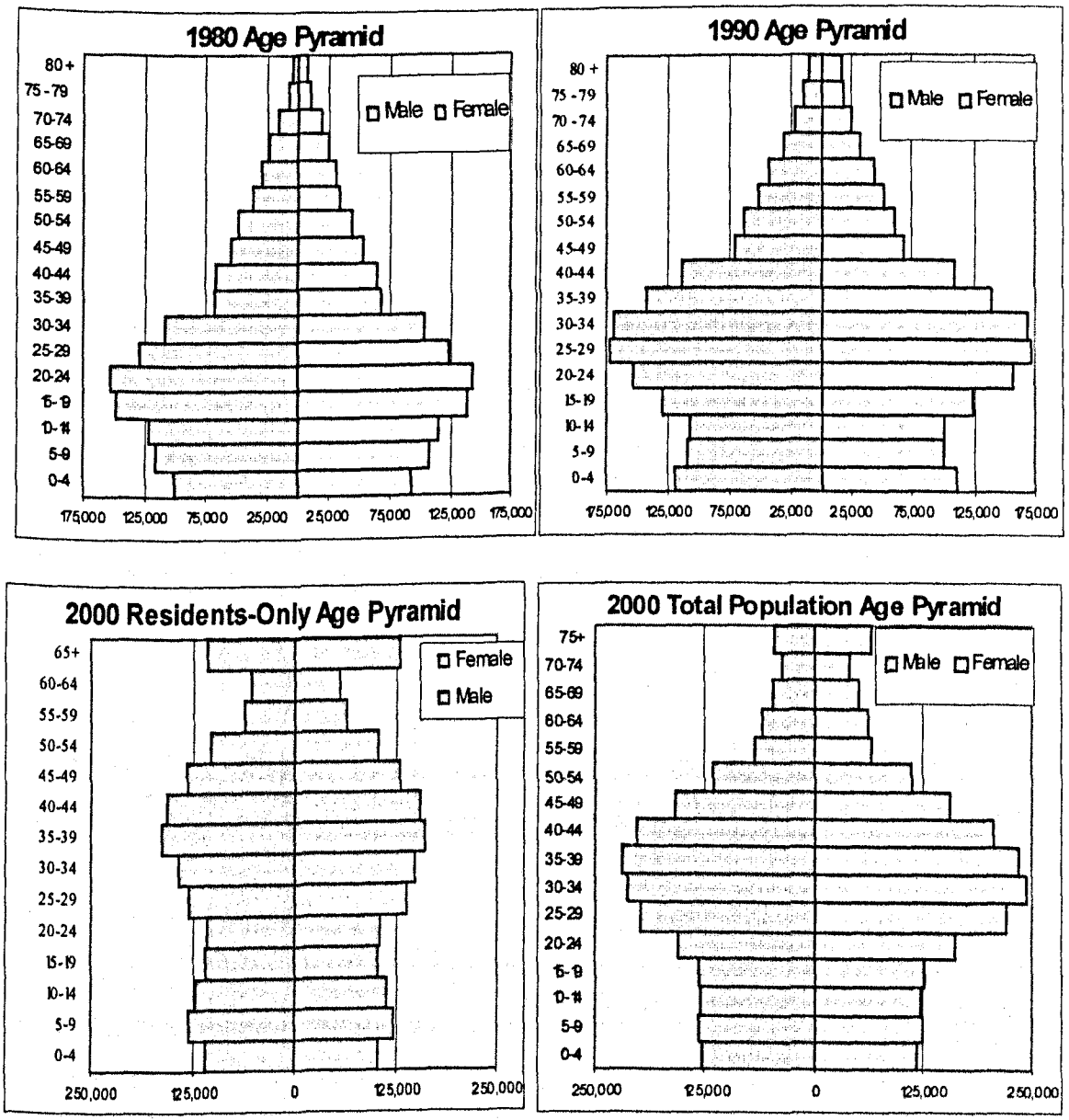
The main reason for this development must be seen in the falling fertility after 1960, combined with increasing life expectancy and particularly falling mortality rates for the first five years of a new-born's life. The progressive age pyramids above clearly show how the last high fertility generation born in the 1950s to mid-1960s move through their life-cycle. Not until the first half of the 1990s has the size of the under 5 year old age cohort again been above 125,000 as it was in the second half of the 1950s.

Graph II.3.1.: Singapore's Changing Age Structure[299]



[298] IMF (2000), p.26

[299] Sources: 1957 and 1970 are taken from Seng et al. (1971) tables 1 and 3, pp. 78-80; 1980 and 1990 are taken from the respective Census publications of Singapore's Department of Statistics (1980, 1990 and 2000). A breakdown by ages including the non-resident population for the census 2000 has not been published. The age pyramids for 2000, therefore, show the Department of Statistics' Residents-Only figures for 2000 and the projection by the U.S. Bureau of the Census published as part of their international online database. Their estimate for the total population of 4.15 million is slightly above the actual Singapore Census figure of 4.02 million.



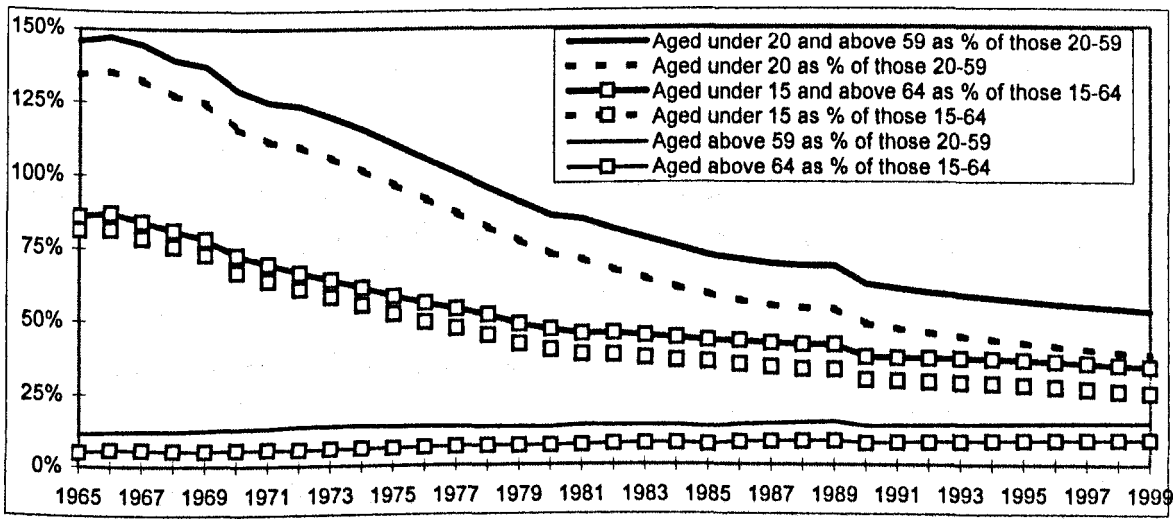
II.3.2. Dependency

From the mid-1960s onwards Singapore was able to reduce its young dependency ratio substantially. In 1965 under 15 year olds constituted 43.7% of the total population. Every 15 - 64 year old had to support in average 0.81 children under the age of 15 and for every 20 - 60 year old there were 1.34 under twenty year olds.[300] By

[300] For sources see explanation to Graph II.3.2. below

1999 the under 15 age cohort only accounted for 18.6% of the total population. Every 15-64 year old had to support only 0.25 children under the age of 15 and for every 20 - 60 year old there were only 0.38 under twenty year olds. Young dependency dropped during these 35 years by over two-thirds. Graph II.3.2. shows the development from 1965 onwards.[301]

Graph II.3.2.: Dependency Ratios[302]



During the same time period old-age dependency as measured by the size of the 65+ age cohort relative to the 15-64 age cohort increased from 5% in 1965 to 9% in 1999. Nevertheless, if old and young dependency are given equal weights, total age-

[301] It is noteworthy, that the decline in youth dependency in Asia was compressed within two or three decades, only half the time it took most late-nineteenth century industrialising countries to record less-spectacular reductions. Taylor and Williamson (1994, appendix table A1, pp. 352-3) document very high dependency rates in the countries of the New World when they started their modern economic growth transition. For example, 56 percent of Canada's population in 1851 was younger than 15 years. For Argentina the same ratio in 1869 stood at 45.2 percent.

[302] Sources: Data for the breakdown into below 20 and above 60 years of age was taken from Singapore Dept. of Statistics (1982) table 2.2. p.8 for the years 1957-1980, for 1981-89 from Statistical Yearbook (1991), for 1990-1999 from US Census Bureau internet site – international demographic database. Observations for the years 1981-89 refer to resident population only, i.e. exclude 120,000 – 320,000 non-residents with a predominantly working-age distribution. This data inconsistency can explain the sudden drop in dependency ratios in 1990. Data for the breakdown into below and 15 and above 65 years of age was taken from Dept. of Statistics: Key Statistical Indicators (various years) for 1969-81; 1981-99 same source and data problem as the breakdown into 20 and 60 age brackets. The observation for 1965 is taken from UN: World Population Prospects; 1966 from Seng et al. (1971) table 1 p.79; years 1967 and 1968 are linearly interpolated.

dependency still fell by over 60% due to a substantial decline of the average fertility rate, which more than counter-balanced the increase in life expectancy.[303]

Fertility among the resident population fell from an average of 4.7 children per woman in her child-bearing years in 1965 to slightly under 1.5 by 1999. Correspondingly, the crude birth rate fell from 30.7 new-borns per 1000 residents in 1965 to 12.8 in 1999. Fertility has been below replacement level of 2.1 from 1975 on.[304]

The fall in fertility can be attributed to changes in nuptiality patterns. The potential additional effect of a restrictive "Stop at Two" population policy employed after 1966 remains controversial. Fawcett and Khoo (1980) conclude that the population policy certainly had an impact, but are not able to quantify its magnitude. They also point out that the fall in fertility had started before the implementation of the policy. However, a closer look at the developments in the 1980s, i.e. after their study, offers suggestive evidence about the impact of the policy. After Singapore had sustained a fall in fertility for over twenty years, the government introduced a policy supporting the status-quo in 1980. In 1986 the Population Planning Unit (PPU) was formed by the Ministry of Health, which in 1987/8 officially publicised its pro-natalist policy under the slogan of 'Have three, more if you can afford it'. Subsequently, the fertility rates increased again from a low of 1.43 in 1985 to 1.96 in 1988, at which point it started to decline again to 1.475 by 1999, still above its 1985 level. The government's population policy can thus be seen as at least supportive to an already existing trend of falling fertility and possibly as an enhancing factor to that development, supported by the fact of the 1985-88 correction. The effects of the correction in the

[303] One could raise the argument that with mounting health care costs, compounded by the longer life expectancies of older people, old-dependency should receive an increasingly higher weight than young dependency. In other words, older dependents might be increasingly more expensive than young dependents and should thus have a higher impact on the saving behaviour of the working population. Moreover, a reduction of the importance of the extended family would increase the necessity for saving even further.

[304] Fertility and Crude Birth Rates for the resident population are taken from World Bank Development Indicators CD-Rom (1999 edition) for the period before 1997 and thereafter from Sing. Dept. Of Statistics: Yearbook of Statistics. Data referring to fertility developments among the non-resident population are not published.

mid-1980s can also be seen by the increase in the size of the age cohort of children below 10 years between the 1980 and the 1990 censuses - see the respective age pyramids above.

The policy's main tools were discrimination against families with more then two children, emancipation of women and incentivisation of education.[305] Families with more than two children were penalised through lower priorities in public housing and schooling, progressive hospital fees for births after the second child, decreasing child support and decreasing maternity leave options. The integration of women into the workforce was supported, leading to an increased female participation rate up from 29.7% in 1970 to 47.9% in 1985. Abortion was legalised in 1970, resulting in a more than 13-fold increase of the (officially reported) abortion rate per 1000 births (up from 41.6 in 1970 to 552 in 1985), so that by 1985 in average every third pregnancy was aborted. This high abortion rate came on top of a high utilisation of contraceptives. In 1982 the percentage of women aged 15 - 49 practising any form of contraception was reported as 74.9% in Singapore, which compares to the USA at 68%, Japan (1984) 57%, Thailand (1984) 65%, Hong Kong (1985) 72% or the UK (1983) 82%.[306]

Education, particularly for women, was also directly incentivised. For example women with five O levels could take advantage of a special form of tax relief. Nuptuality patterns also changed, with the age at marriage rising steadily. While close to one in five women aged 15-19 was married in 1957, the proportion was less than one in 20 in 1975. Among women aged 20-24, two out of three were married in 1957. In 1975 less than one out of three was married. These policies went hand in hand with the government's efforts to promote female labour force participation. For example, protective restrictions on the employment of women have been removed

[305] For a more detailed description see Lim et al. (1988a, pp. 111-136) and Shantakumar (1996, pp. 52-54)

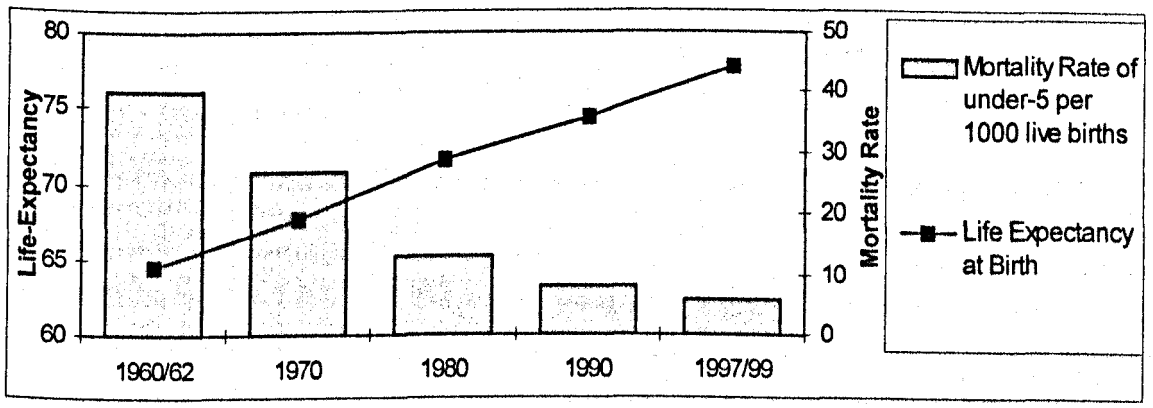
[306] World Bank Development Indicators CD-Rom (1999)

and the government fostered childcare, part-time work, job sharing, and flexible shifts.[307]

II.3.3. Life-Expectancy and Retirement

Life expectancy at birth increased in Singapore from 64.5 years in 1962 to 77.6 years in 1999. Particularly the falling mortality rate before the age of 5 from 40 per 1000 live births in 1960 to 6 in 1997 must be noted in this regard. But also the mortality of men and women between ages 15 - 60 dropped dramatically during those years: for men from 305 to 136 and for women from 210 to 77 per 1000 male/female adults between 1960 and 1997.[308]

Graph II.3.3.a.: Falling Mortality and Increasing Life Expectancy[309]



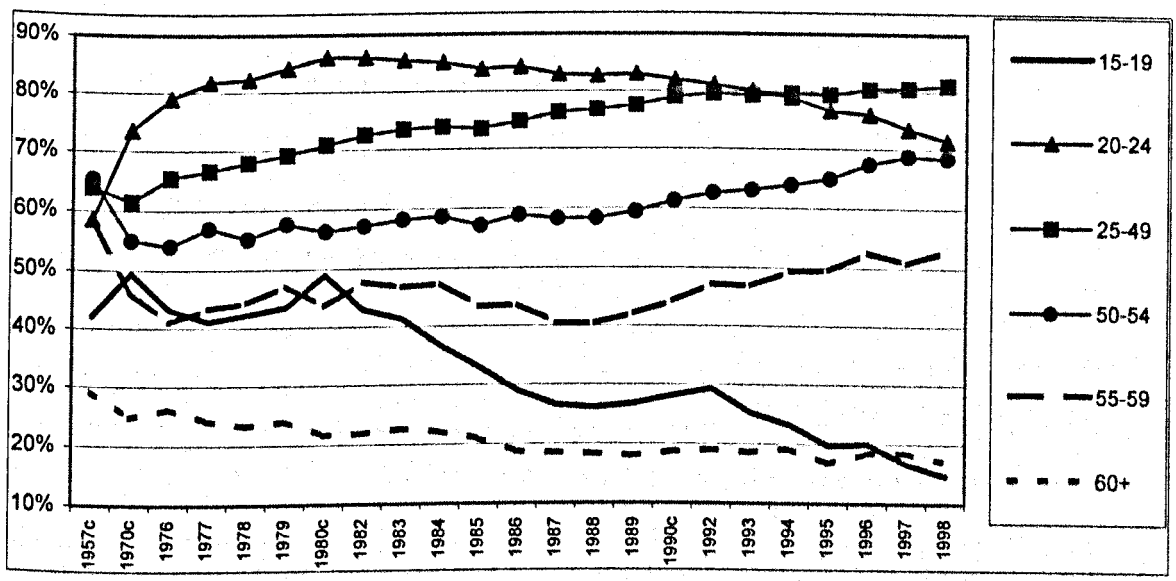
[307] In 1965 15.7 percent of all women aged 15-64 were part of the labour force. In 1999 this figure stood at 39.3 percent; World Development Indicators CD-Rom (2001). Findlay and Wellisz (1993, p.117), measuring female labour force participation as a percentage of total female population, write that at the country's independence 17 percent of women worked, while in 1993 already 46 percent were part of the labour force. They also mention that it was the government's goal to achieve a 50 percent female participation by 1995.

[308] World Bank Development Indicators CD-Rom (1999)

[309] Source: World Bank Development Indicators CD-Rom (1999). The under-5 mortality rate measures the probability of dying before reaching the fifth birthday per 1000 live births. Life-Expectancy was not available for 1960. The closest date was 1962, which is given above. Under-5 Mortality was not available after 1997.

Correspondingly the length of retirement increased. However, the effect of increased life-expectancy was partially offset by postponing the official retirement age. Prior to legislation adopted in 1993, the mandatory age of retirement in Singapore was 55. Yet, as early as 1984 a Ministry Health committee report, popularly known as the Howe report, recommended increasing the retirement age, first to 60 and later to 65. The National Wage Council had also, since 1988, urged companies to raise the retirement age norm from 55 to 60 or above. Employers were reluctant to do so, largely because of the seniority wage system.[310] Since employers were generally unwilling to change retirement practices, the government passed the Retirement Age Act in April 1993. This act prohibits employers from dismissing workers below age 60 on the basis of age. The retirement age will be raised further to 67 by the year 2003.

Graph II.3.3.b.: Economically Active Population[311]



The combined actual effect of increasing life-expectancy, postponement of retirement age as well as other economic and social factors such as education can

[310] Bauer (1996), p.137

[311] Source: International Labour Office (Geneva), various years; no information given for years 1958-69, 1971-75, 1981, 1991

best be seen by studying the developments within the economically active population, shown in graph II.3.3.b.

The development of the 50-54 age bracket shows a slow but steady increase in its participation rate. This age group is clearly part of the working population. Whether the rise of the participation, particularly after the 1984/5 recession is due to increased pressure on postponing retirement, increased financial needs for retirement or simply due to the strong economic conditions is not clear. The development of the 55-59 age group is very suggestive. Its participation rate falls from 57.9% in 1957 until the mid-1980s and starts to climb significantly again from 1988, when the NCW made its recommendation for postponing retirement age until 60. By 1999 it is only 4.9% below its 1957 level. The very fast fall between 1957 and 1970 however is more difficult to explain. The contemporaneous increase in participation among the 20-24 year olds seems to indicate a substitution between age groups. The short-term recovery between the mid-1970s and mid-1980s is probably due to a tight employment market. On the other hand, the continuously falling participation rate of the 60+ age group must be seen as a clear sign of Singapore's overall economic development. Retirement after 60 has clearly become the norm by the mid-1980s, while in 1957 still 29.3% of the 60+ age group had to work.

The younger ages are also of interest. The 15-19 age bracket exhibits the most striking development with a participation rate falling from 49.5% to 14.7% between 1970 and 1998. This is most likely due to increases in enrolment in secondary education, which rose from 46% to 67% during the same time period, coupled with higher incomes of the upbringing families.[312] An initially opposite development in the 20-24 age bracket with rising participation rates until 1980, is slightly reversed in the following years. The increase between 1957 and 1980 is most likely due to an overall reduction of unemployment, higher female participation and falling tertiary

[312] Some of the annual interpolations, by the ILO however, seem dubious particularly between the 1970 and 1980 censuses. Yet, the overall trend is unaffected. Gross enrolment taken from World Bank Development Indicators CD-Rom (1999).

education enrolment rates (down from 10% in 1965 to 7.8% in 1980). After 1980 a rise in enrolment in tertiary education (26.8% in 1993) and the less restrictive population policy must have lowered participation rates in this age bracket. The main age group of those aged 25-49 shows a steady increase in overall participation in the workforce, again most likely due to falling unemployment and higher female participation rates.

II.3.4. Migration

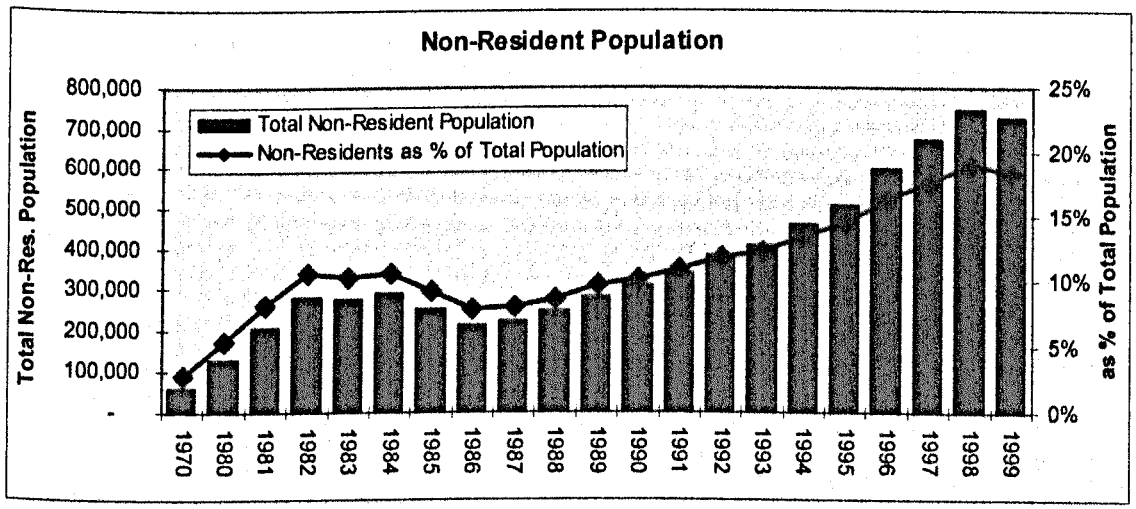
Beyond falling fertility, declining mortality and the correspondingly increasing life-expectancy, we also need to consider the effects of net-migration in order to explain the changing age structure of Singapore's total population. In 1970 non-residents numbered 60,900, which corresponded to 2.94% of the total population. By 1999 the number of non-residents had increased to 676,200 or 17.4% of total population. This means that the non-resident population between 1970 and 1999 has grown in average by 8.75% per year, while the resident population experienced a growth rate of 1.62% only.[313] Moreover, a (large) proportion of the growth of the resident population must be due to the transition of some non-residents into resident status or direct migration into resident status considering the fact that total fertility rate was below replacement from 1975 on.

Unfortunately, beyond such a general view the development of Singapore's non-resident population is not well documented, particularly in respect to age-composition, workforce participation, dependency and its potential transition into resident status. Hui (1998) offers foreign workforce estimates for selected years between 1970 and 1997. However, it turns out that his foreign workforce participation rate remains constant at 75% over the whole period, which casts doubt

on the correctness of his data. Wong (1997) also offers some foreign work-force estimates. However, once compared to total non-residents, the estimates show a very low work-force participation among foreigners in 1970 of slightly above one-third, which changes to a participation rate of slightly above 90% by 1980. This high volatility again casts doubt on these estimates.[314]

In the absence of better data, a separate assessment of the impact of migration on the Singaporean population, particularly its age structure and dependency rates, is not possible.

Graph II.3.4.: The Non-Resident Population[315]



[313] At the same time outward migration of Singapore residents is also likely to have increased. Peebles and Wilson (2002, p. 29) write that: "In 2000 there were 200.000 Singaporeans living outside Singapore. This would include retirees, students and workers."

[314] Hui (1998), table 5, p.204, based on figures obtained from the Singapore Ministry of Labour. The foreign workforce is estimated as that part of the foreign population aged between 20 and 60 years old; Wong (1997), p.140, table 4

[315] Source: Singapore Department of Statistics online data resource: www.singstat.gov.sg. At this source nor at other sources, was data for the non-resident population available for the years before 1970 or 1971-79.

II.4. Literature Review

The spectacular growth performance of Singapore and its concurrently high saving rate has attracted a fair share of attention. However, a consistent answer to what drove the saving rate, i.e. how much of it was due to demographic or institutional factors and how much was due to income effects, has not emerged. Most studies have focused on a comparatively short period of time or a cross-sectional comparison at one point in time across a number of countries. Moreover, the definitions of saving as well as the testing methods have varied widely. Unfortunately, a substantial part of the literature - particularly earlier studies - must be rejected on methodological grounds. Investigations into sub-aggregates of Gross National Saving have been rarely undertaken. What remains is a rather limited state of investigation into Singapore's saving behaviour.

II.4.1. Results of Earlier Studies

The findings of earlier studies into saving behaviour in Asian-Pacific countries, including Singapore, have been summarised in Chandavarkar (1993), Faruqee and Husain (1998), Wickramanayake (1998) and Tan and Soon (1997). The IMF (2000) offers a summary specifically dealing with Singapore as does Peebles (2002) and Peebles and Wilson (2002).[316] Wickramanayake (1998) and Asher (1994) offer a review with a particular emphasis on the effects of the CPF. Largely, however, these reviews remain methodologically uncritical and report results of earlier studies notwithstanding their statistical weaknesses. This section will concentrate on the overall areas of disagreement in the literature and highlight the findings of the few studies, which appear comparatively robust.

[316] Peebles and Wilson (2002, pp. 81-86)

The main disagreements about what influenced the saving behaviour in Singapore can be summarised into four main groups of determinants around which the controversies centre, with the degree of disagreement increasing along the following order: income measures, demographic variables, CPF saving and other miscellaneous factors.[317]

The Role of Income

In almost all studies income in one form or another has been shown to be an important determinant of saving in Singapore. Most often the growth rate was shown to be significant. Levels of income were less often cited as meaningful variables. The investigation of transitory income struggled with getting to terms with its measurement and was not often undertaken. Causality has until recently been rarely tested.

Carroll, Weil and Summers (1993) and Caroll and Weil (1994) studied the income-savings relationship in a broad cross section of economies. Their results indicate that while income and savings growth are highly correlated, incomes have often risen before savings rates rather than after, suggesting that growth indeed drives savings rather than the other way around. Gavin, Hausmann and Talvi (1997) replicate their tests and find very similar results. Attanasio et al. (2000) also investigate the robustness of Carroll and Weill's (1994) findings. However, they show that the results are sensitive to the instrumental scheme, to the fact that they used five-year averages and to the relatively small sample size of 64 countries used in their analysis. In their own study Attanasio et al. (2000) find that growth and saving are mutually and positively related, but that Granger causality either way can not be established in a robust format. Rodrick (1998) concludes for his cross-country studies on economies which experienced saving transitions, that even after other

[317] Faruqee and Husain (1998, pp. 197-99), as well as Tan and Soon (1997) offer a concise summary of most of the potential determinants of saving behaviour. See also Section II.1. above.

possible determinants are controlled for lagged income growth exerts a statistically positive effect on the saving rate. This effect operates entirely on private saving. Lagged growth has no significant effect on public saving.[318] Loayza et al. (2000) find in their panel study of 69 countries for 1966-99 that as predicted private saving rates rise with the level and growth rate of real per capita income, but that the influence of income is larger in developing than in developed countries.

The World Bank (1993) assigns most of the reason for the development of savings in East Asia to rapid growth, rapid demographic transition and the government. The study tests for Granger-Causality running from saving to growth or from growth to saving for eight East Asian countries and the United States. In general its results indicate that past values of per capita GDP growth at 1985 international prices are a very good predictor of the Gross Saving Rate, but that the reverse is not true.[319] However, Singapore is the odd country in the sample, where the growth variable is not significant on any of the five lags tested in predicting savings for the period 1960-84, while savings is significant in predicting growth at least on lags 4 and 5.[320] As a conclusion for Singapore, the World Bank (1993) therefore follows a study by the Monetary Authority of Singapore (1991) and argues that income changes were not a significant factor in the spectacular rise in saving rates in the 1970s and 1980s, consistent with the view that demographic factors and, to a lesser extent, the policies of the Central Provident Fund determined the rise.[321] Page (1997) echoes this conclusion.[322]

Faruqee and Husain (1998) found in their error-correction model that changes in the rate of growth positively affected the saving rate in the short-run, suggesting a possible transitory income effect.[323] Their ECM model would indicate that an

[318] Rodrick (1998, p. 16)
[319] World Bank (1993), p. 245
[320] World Bank (1993); Table A5.2, p.244
[321] World Bank (1993), p. 204
[322] Page (1997), p. 33
[323] Faruqee and Husain (1998), p. 215

increase/(decrease) of 1% in the growth-rate of real private disposable income would result in an increase/(decrease) of 0.37% of the private saving ratio in the short-run. Since the growth variable in their sample proves to be stationary, it is not included in their long-run co-integration formula. Instead, real per capita private disposable income is shown to be co-integrated with the private saving ratio and thus Faruqee and Husain (1998) conclude that Singapore's sustained rapid increase in per capita income appears to have had a strong long-run relation with saving.[324]

In a rare attempt to investigate saving behaviour on the individual level, Deaton and Paxson's (1999) results indicate that for Taiwan (using annual cross-sections between 1976-95) increases in growth can result in large increases in saving rates, particularly when the rate of population growth is low. By contrast, for Thailand (using six cross-sections between 1976-92) they find that increases in economic growth raised the wealth of the very youngest individuals, who are dissavers, causing a reduction in the aggregate saving rate. Rodrik (1998) focusing on countries which exhibited transitions in their saving and growth performance find that while growth transitions lead to sustained increases in saving rates, saving transitions tend to result only in temporary increases in growth, which supports the hypothesis that it is mainly growth that drives the time-series relationship between the two variables. The estimated coefficients indicate that an increase in the growth rate of one percent raises the national and private saving rates the following year by between 0.2 and 0.3 percentage points of national income. However, for Singapore Rodrik can not establish causality either way, which might be explained by the important role of the CPF. Agrawal (2001), on the other hand, finds uni-directional causality with increasing income per capita granger causing increasing savings in Singapore. His DOLS model shows that this is due to both dynamic and long-term

[324] Faruqee and Husain (1998), p. 209; The coefficient of Singapore's real disposable income variable in the Engle-Granger OLS co-integration procedure is 0.19. However, an exact elasticity is not obtainable, since it appears that the income variable was actually a ratio of real (PPP) income per capita in Singapore in relation to the equivalent US figure. Unfortunately, no details or data are supplied.

effects, with the increase in per-capita income accounting for a little over half of Singapore's rising GNSratio between 1970 and 1990.

The Role of Demographics

The significance of demographic variables has varied across different studies. A comparison is further complicated by the fact that the studies have also differed on the time-periods covered, the demographic variables used, the methodology applied and perhaps most importantly the list of other dependent variables tested. Additionally, a much cited study by the Monetary Authority of Singapore (1991) has not been made publicly available. Assuming superior access to data, its finding (as cited by the World Bank, 1993) that the increased saving rate from 19 to 46 percent between 1970 and 1989 was (largely) attributable to declining dependency ratios takes particular weight.

Faruqee and Husain (1998) find that shifts in the demographic structure of the population appear to be the main factor explaining the sustained rise in the rate of saving in the four countries (Indonesia, Malaysia, Singapore, Thailand) tested for the period of 1970-92. Moreover, the long-run impact of demographic changes on saving is nearly identical in three of the countries in the sample, and even stronger in the fourth (Indonesia).[325] Singapore specific, however, their cointegration tests indicate that demographics as measured by the proportion of the working age population, i.e. those aged 15-64, alone cannot explain the long-run movements in private sector saving.[326] Indeed, Engle-Granger estimates indicate that financial deepening and possibly provident fund saving, in addition to demographics, jointly explain the long-run movements in the saving rate. Alternatively, changes in provident fund saving and per capita income are able to jointly explain trend movements in the rate of private saving. Within their co-integration equations the coefficient of the

[325] Faruqee and Husain (1998), p. 197

proportion of the working-age population obtains a value between 1.03 and 1.38. Since the proportion of the working-age population has increased by about 12.7% between 1970-92 and the private saving ratio has risen by 16.5% during the same period, Faruqee and Husain's findings would attribute the majority of the rise in saving to demographic effects. However, since working-age population does not appear to be significant by itself, this demographic effect appears to need the (statistical) support of Central Provident Fund saving and either financial deepening or per capita income.[327] Agrawal (2001) finds a strong negative correlation between per-capita income and the dependency ratio for Singapore, which prompts him to drop the latter variable from his cointegration procedure in order to remove the multi-collinearity from the DOLS procedure.

The Role of the Central Provident Fund

The results of existing studies into the role of pension schemes have been mixed, which also mirrors the generally inconclusive theoretical literature. This is largely due to the problem of finding separate proxy variables for the respective mechanisms through which pension schemes are thought to either substitute or crowd-out voluntary savings. The discussion in regards to Singapore is conducted on three levels: an analysis of simple saving ratios and developments of these ratios over time, a more formal approach via regression models to determine whether a variety of CPF variables can be shown to be statistically significant and an investigation of a potential crowding-out relationship between voluntary and compulsory savings. The latter string of the discussion is the crucial one, since even if CPF variables might prove statistically significant, this does not show that the CPF

[326] Faruqee and Husain (1998), p.209

[327] Agrawal's (2001) finding about the necessity of the inclusion of the CPF rate in order to obtain a cointegration vector (see below) strengthens this interpretation of Faruquee and Husain's (1998) finding. However, Faruqee and Husain (1998) do not offer this conclusion. Nor do they supply the data for their variables, so that this interpretation of their co-integration findings is based on data collected for this thesis, which uses a slightly different definition for private saving and possibly different sources for the working population (see Data Appendix).

was actually able to mobilise additional savings, which Singaporeans would not have saved anyway.

The Monetary Authority of Singapore (1991) only attributes a minor role to the CPF. Of the increase of the gross national saving ratio by 37 percent between 1970-89, only 3.9 percent were due to the CPF.[328] Faruqee and Husain (1995 and 1998) find some evidence of compulsory saving having had a long-run impact on the trend rate of saving in Singapore. But almost three-fourth of the rise in compulsory saving was offset by a reduction in voluntary saving.[329] A 1% increase in the ratio of CPF saving to private disposable income only led to an increase in the long-run private saving ratio of 0.29% within their co-integration formula. In their ECM model, the authors found that an increase of 1% in their CPF-saving-rate added 0.48% to the private saving ratio in the short-term. Agrawal (2001) finds that the CPF rate has contributed significantly to Singapore's high saving rates, accounting for savings increasing by nearly six percent of GNP out of a total increase of 14.5 percent between 1975 and 1990. In fact, Agrawal's savings-rate function does not cointegrate unless the provident fund rate is included as an explanatory variable, suggesting that high CPF rates have been a central factor behind the savings performance in Singapore.

Many of the earlier studies have also investigated the CPF's effect on savings. However, due to their methodological weaknesses their econometrical findings are somewhat questionable. Table II.4.1. offers their results in summary. Section II.4.2. below presents the detailed methodological criticisms.

[328] As cited by World Bank (1993, p. 219), which also echoes this view, and Ermisch and Huff (1999, p. 30).

[329] Faruqee and Husain (1995, p. 20) also point out that compulsory provident fund saving within their co-integration model for Malaysia was not significant. They argue that this difference "may well be tied to each country's differing experience in the management of their compulsory saving schemes."

Table II.4.1. Historiography of Less-Than-Robust Investigations

Article	Methodology	Finding
Kopits and Gotur (1980)	OLS on pooled sample of 54 industrial and developing countries (inlcuding Singapore) using average annual observations for 1969-71	For the developing countries the net effect of social security schemes was a 'draw' - there was neither a positive nor an adverse net-impact on voluntary saving.
Datta and Shome (1981)	OLS and 2SLS regressions for Singapore (1961-76) and for pooled sample (1965-74) for Singapore, Malaysia, The Philippines and Sri Lanka	No statistically significant effect of compulsory saving on non-compulsory saving. However, even though the compulsory saving variable is not significant at the five percent level, it consistently obtains a positive coefficient indicating that compulsory saving might add to non-compulsory saving. Depending on the sample and regression method employed one dollar of compulsory saving can add up to 97 cents to voluntary private saving. Only in the pooled 2SLS equation is the crowding out effect almost complete, i.e. an increase in the compulsory saving rate by one percent is estimated to add only 0.09% to the voluntary saving rate.
Wee and Han (1983),	Interpretation of correlation matrix between private expenditure, CPF-contribution rates, disposable income and private savings, for 1971-80	Negative correlation between change in employee CPF contribution rates and private savings are interpreted as a sign that CPF savings have crowded out private savings. While the positive correlation between changes to the total CPF contribution rate and private expenditure are seen as indicating that in the light of the employer's contribution the consumer is actually decreasing his voluntary savings by more than his own CPF savings, resulting in increases in personal expenditure.
Loh and Veall (1985)	OLS regression 1966-79	Find no evidence that social security provisions (including CPF benefits) had any significant impact on private saving for Singapore, suggesting that crowding-out did not exist.
Wong (1986)	OLS regression 1974-83	Compulsory saving has crowded out voluntary saving from 1974 to 1983. One Singapore dollar saved through the CPF has reduced private non-CPF savings by 1.25 dollars. "In other words, CPF saving has served as a substitute for voluntary saving."(p.67)
Lim et al (1988a, pp.215-236)	OLS regression 1974-84	Voluntary saving during 1974-84 was positively related to disposable income and negatively related to CPF savings. However, the negative coefficient is quite small, so that one additional Singapore dollar saved through the CPF is only reducing private voluntary savings by less than two cents, which is hardly a case for crowding out, although Lim et al. (1988a) argue differently merely focusing on the negative coefficient.[330]

[330] Lim (1988, p. 226) gives an example of crowding out: "Endowment policies, closest in nature to the CPF savings plan, suffered a decline of 18.6 percentage points in their share of total new annual premiums from 1979-84. During that period, CPF contributions increased from 33 per cent of wages to 50 per cent."

Table II.4.1. continued:

Hoon (1991)	Overlapping generations model	As long as CPF savings earn the same market rate of interest as the employees' regular savings would, employees' contributions to the CPF are exactly offset by a fall in private non-CPF savings. On the other hand, however, a rise in the employer's contribution is not fully offset by a fall in savings. An increase in the employer's lifetime contribution rate raises the worker's lifetime resources, and hence leads him to raise current consumption to a degree and thus lower private savings. Yet, this effect does not fully offset the increase in the employers compulsory savings, so that total savings rise. However, if wages adjust to an increase in the employers CPF contribution (i.e. wages fall), the increase in the employers' savings will be fully offset by a fall in the employees' voluntary saving
Hoon (1992)	Extension of Hoon's (1991) overlapping generations model	A potential increase in income tax will result in rising private saving, while an increase of capital tax will lead to a fall in private saving. However, if the government has to reduce its spending due to the tax-free status of CPF contributions, this might lead to lower disposable per capita income, and thus have a negative impact on private saving
Chandavarkar (1993)	Observation and view on existing literature	the phenomenal rise in Singapore's national saving rate is largely accounted for by 'forced saving' through the CPF [331]
Huff (1994)	Observation, i.e. tracking of saving rates over time 1974-85	After 1974 public-sector and CPF savings progressively reduced the importance of voluntary private sector savings. The contribution of voluntary private savings fell from almost three-fifths of national savings in 1974 to less than one-quarter by 1983.[332]
Husain (1995)	2SLS for 1970-92	The CPF saving rate is not found to be statistically significant in modelling the first differences of real per-capita consumption. This is interpreted by the author as a sign that CPF savings have been fully offset by reduction in private voluntary saving.[333]
Cao and Ng (1995)	OLS on quarterly voluntary savings 1977Q3 to 1994Q2	CPF saving has not distorted people's behaviour of voluntary saving, i.e. the high gross private saving in Singapore has not been due to high compulsory saving.
Han (1996)	OLS, 2SLS and 3SLS	According to the 3SLS, one percentage point increase in CPF savings increases the growth rate of total gross national savings by only 0.0062 percentage points. The growth rate of CPF savings is not found to be significant.[334]
Peebles and Wilson (1996)	Observation of national income identities	"quite clearly, the CPF, being a form of forced saving, depresses individual spending so that the private consumption rate in Singapore is the lowest in the world."[335]

[331] Chandavarkar (1993), p. 13

[332] Huff (1994, p. 332-334)

[333] Husain (1995, p. 49)

[334] Han (1996) interprets the low significance of the CPF variable as arguing against crowding-out. However, since Han's dependent variable is the rate of growth of Gross National Savings and since even according to Han's own calculations the CPF accounted for 13 percent of total National Savings, a coefficient close to zero actually indicates that savings created through the CPF must have been compensated with less – presumably voluntary – savings. Otherwise, the CPF variable should actually attract a positive coefficient.

[335] Peebles and Wilson (1996), p. 24

Chen and Tan (1998)	OLS regression 1974-96	The effective CPF rate is significant in their regression model and positively related to private saving with a similar strength of impact as the growth rate of GDP.
Wickramanayake (1998)	unrestricted error correction model for the sample period of 1970-94	finds significant positive effects on financial (voluntary) savings in real terms and also on real private savings. On average an increase (decrease) of one percentage point of CPF savings would increase (decrease) the level of real financial savings and real private savings by 0.81% and 0.56% respectively. This would translate into an increase (decrease) of real domestic savings and real national savings of 0.18% and 0.21% respectively.

The Role of Other Factors

Even though other factors, which might influence saving behaviour, are often not explicitly discussed, their exclusion and the possibility of missing (statistical) effects on the outcomes of the investigation of income, demographic, or CPF variables, make them implicitly the most controversial aspect of the discussion. In other words, the largest disagreement lies in what to agree on testing in the first place. Particularly, the role of the government and the impact of the quality of a country's financial institutions are still controversial issues.

Loayza et al. (2000) find in their panel study of 69 countries for 1966-99 that fiscal policy is a moderately effective tool to raise national saving. An increase in public saving by 4% of Gross-National-Disposable-Income will raise national saving by 2.8% of GNDI within a year, but only by some 1.2% of GNDI in the long term. The evidence points against full Ricardian equivalence. Inflation has a positive impact on private saving supporting a precautionary motive argument, i.e. people tend to save more in an unstable environment. Financial liberalization, on the other hand, is found to be detrimental to private saving rates. Enhanced credit availability reduces the private saving rate, while larger financial depth does not raise saving, and nor do higher real interest rates.

Similar to Loayza et al. (2000), Edwards (1997) also finds that although higher government savings crowd out private savings, they will not do so 'one-to-one'.[336] Rodrik's (1998) panel study focusing on countries which have experienced saving transitions (including Singapore) estimates that an increase in public saving of one percentage point of national income raised total national saving by 0.40-0.74 points. While public saving crowd out private saving, the regressions reveal that the crowding out is far from complete. Moreover, he notices an increase in public saving around the time that the transition begins. He concludes that "all in all, mobilizing public saving seems to be one of the most potent ways of raising national saving."[337] Generally, the degree to which Full Ricardian Equivalence is rejected differs widely in the literature.[338] Lopez et al. (2000) attribute part of this variance to differences between developing and industrialised countries, while Edwards (1997) points to potential differences in the political economy influencing the saving decisions of the resepctive political decision makers, namely on the probability that the governing party will still be in power when the investment financed through government saving comes to fruition.

With respect to Singapore, Faruqee and Husain (1998) show financial deepening or monetisation, as measured by the ratio of money and quasi money to disposable income, to be significant. A one percent increase in the ratio of money and quasi money to private disposable income added 0.05% to Singapore's long-term private saving ratio between 1970-92. Similarly, Dayal-Gulati and Thimann (1997) find that the M2-to-GDP Ratio as a proxy for financial deepening and the inflation rate as a proxy for macro-economic stability both contributed positively to South East Asian high saving rates - particularly private saving. As far as national saving is concerned, much of the difference between South East Asia and Latin America can be explained by higher public saving in Southeast Asia and especially by the

[336] Edwards (1997, p. 147)
[337] Rodrick (1998, p.16)
[338] For a recent review of the literature dealing with Ricardian Equivalence see Lopez et al. (2000). For a discussion of the Ricardian Equivalence Theorem see for example Seater (1993).

relatively low offset coefficient in that region of 0.15 against 0.7 in Latin American countries.

The World Bank (1993) points out that the positive impact of real interest rates appears to be especially evident for changes from highly negative to positive real interest rates and the impact of that change on financial savings. Agrawal (2001) finds the impact of real interest rates not to be significantly different from zero for Singapore. Even when the coefficients are significant for some of the other countries tested, they are very small, so much that a five percent increase in real interest rates will change savings by less than one percent of GNP in Indonesia or Thailand. Furthermore, the effect is negative in Indonesia and positive in Thailand. Overall, Agrawal (2001) concludes that interest rates have only limited impact on saving rates. This contradicts Rodrik (1998) and Loayza et al. (2000) who find a negative coefficient for the real interest rate in their cross-country analyses. On the other hand, Bandiera et al. (2000) do not find a reliable interest rate effect at all in their cross-country study of eight developing countries. Faruqee and Husain (1995 and 1998) do not investigate the role of interest rates.

De Brouwer (1999) finds some evidence of domestic liquidity constraints in Singapore. But his results also suggest that liquidity constraints have eased in Singapore over time, as a result of financial deregulation eventually allowing for some degree of consumption smoothing. De Brouwer (1999) also speculates that forced savings through the CPF might be a reason why borrowing constraints still appear higher in Singapore than for example in Hong Kong or Australia.[339] Nevertheless, Singapore is less inhibited by borrowing constraints than the remaining Asian countries in his sample (Indonesia, Taiwan, Malaysia, Thailand, Japan, South Korea and the Philippines).

[339] De Brouwer (1999, p. 178)

II.4.2. Methodological Problems of Earlier Studies

A number of studies have run Ordinary-Least-Square (OLS) or Two-Stage-Least-Square (2SLS) regressions to sort significant from insignificant determinants of saving behaviour. However, most of the variables used, particularly income, demographic developments as well as CPF data are most likely non-stationary and thus if tested in standard OLS fashion yield spurious regression results. The statistical findings of Datta and Shome (1981), Loh and Veall (1985), Wong (1986), Lim et al. (1988a) and Chen and Tan (1998), which all use OLS or 2SLS regression techniques, are therefore highly questionable on methodological grounds.[340] Some of the OLS regression models will also most likely suffer from multi-collinearity among their explanatory variables. Neal (1990), for example, points out that per capita income and inflation are generally correlated to financial depth, the former positively and the latter negatively. Thus, the results regarding the importance of financial deepening, for example by Lim et al. (1988) and Faruqee and Husain's (1995 and 1998) OLS Engle-Granger co-integration, might be sensitive to issues of multi-collinearity.[341]

The International Monetary Fund has sponsored a series of papers dealing with Asian Saving - Lahiri (1988 and 1989), Husain (1995), and Faruqee and Husain (1995), which is also the basis for Faruqee and Husain (1998). Lahiri (1988 and 1989) cover the period of 1965-84 for Singapore together with similar time periods for seven other South-East Asian countries. The fact that Lahiri first-differenced the dependent variable (log of private consumption) indicates that he must have been aware of non-stationarity issues. Yet, he gives no information about the stationary properties of his explanatory variables and continues with OLS equations. But some

[340] For a more detailed explanation of this problem see any recent advanced statistical textbook. For a recent assessment of the pitfalls of non-stationary data as applied to saving investigations see for example Agrawal (2001, p. 500-501).

[341] Wong's (1986) findings also suffer from serial correlation of the residuals as shown by the Durbin-Watson statistics given. Lim et al. (1988a) criticise Loh and Veall (1985) also for reporting regression results after removing variables whose t-values were low without re-estimating the equation, which invalidates their findings.

of his independent variables are most likely to be non-stationary in Singapore's case, for example the percent of the population aged between 15 and 64. Similarly, Husain (1995) uses 2SLS with the first difference of the log of real per capita private consumption as the dependent variable. A number of explanatory variables are in first-difference format. However, they prove not to be significant and are thus dropped from the final equation. The final 2SLS results find the rate of growth of disposable income, the lagged consumption ratio, the percentage of the population aged 15-64 and a dummy for the 1985-6 recession significant. However, Husain (1995) does not offer unit-root tests for these variables and some of them are likely to be non-stationary.[342]

Some authors do not use statistical analysis to support their claims. Instead they derive conclusions from merely looking at the development of different saving aggregates. Huff (1994), for example, argues that the CPF increased the domestic saving rate due to its Provident Fund principle and that after 1974 public sector together with CPF savings progressively reduced the importance of voluntary private savings.[343] Peebles and Wilson (1996) argue for crowding out effects of CPF savings simply due to the CPF's compulsory nature, but after surveying the literature conclude that there is no definite answer yet.[344] Sandilands (1992) remains completely on the descriptive level and so do his conclusions. Chandavarkar (1993) argues that "the phenomenal rise in Singapore's national saving rate is largely accounted for by 'forced saving' through the CPF."[345] However, he does not support his claim with any evidence beyond the high proportion of CPF saving as part of total saving in 1990. Except for its Granger-Causality test for the link running from growth to saving, the World Bank (1993) also derives its conclusions about determinants of saving behaviour in East-Asia from observational evidence supported by an unpublished study by Singapore's Monetary Authority (1991).

[342] Husain (1995, p. 48) theoretically discusses and refers to the error correction model proposed by Davidson et al. (1978) but nevertheless continues with 2SLS.
[343] Huff (1994), p. 334
[344] Peebles and Wilson (1996), p. 24
[345] Chandavarkar (1993), p. 17

Some studies do not include the Central Provident Fund in their investigation, e.g. Lahiri (1988 and 1989) and Gupta (1987). With such a strong compulsory saving regime in Singapore, this would only be acceptable if it had been proven that the CPF did not influence saving behaviour. However, this is still one of the most contested aspects in the literature. Therefore, the results of these studies by implicitly assuming that the CPF did not matter must be considered very unstable. Tan and Soon (1997) drop their significant CPF variable from their cointegration formula with per capita consumption as the dependent variable because its inclusion results in a negative coefficient for old-age dependency. This, they argue, is a sign of misspecification of the model, since it goes counter their expected relationship, which would argue that an increase in old-age dependency will lead to an increase in consumption. However, one can make the argument that such a negative relationship could exist in reality and should thus not be a sign for misspecification. An increase in old-age dependency could lead to a fall in consumption if it leads to changes of retirement expectations of the working population resulting in higher savings (possibly enforced by a compulsory scheme) or alterations in the government's saving behaviour. Han (1996) works with growth variables and thus escapes the non-stationarity problems. However, Han's regression equation omits a number of potentially very important factors. Han's equation only tests for the influence of the interest rate, growth of GDP and growth of CPF savings, of which only GDP growth proves significant.

Hoon (1991) tries to escape these econometric pitfalls altogether by constructing an overlapping generations, general equilibrium model which tries to take into account some of the institutional factors of the CPF. However, the model's very general assumptions (for example: perfect capital markets, i.e no borrowing constraints, full employment and no young dependency, i.e. population consists only of workers and retirees) limit the applicability to Singapore's actual history.

A study by Wickramanayake (1998), which appears robust on its statistical methodology, suffers from a substantial weakness in the definition of its saving

variable. Wickramanayake (1998) employs unrestricted error-correction models to overcome the non-stationary quality of the data. However, he defines public saving simply as the government's budget balance, which seriously under-estimates public saving and consequently leads to an over-estimation of private saving.

Faruquee and Husain (1995 and 1998) adopt co-integration to deal with the non-stationary character of the data for Malaysia, Singapore, Thailand and Indonesia both in individual time-series and panel analyses. Both studies are essentially identical, apart from the inclusion in the 1998 paper of real per capita income among the explanatory variables. The time period under investigation is 1970-92 and the dependent variable is the private saving ratio. They run a battery of tests: OLS Engle-Granger co-integration for each country's time series, pooled panel OLS and non-linear-least-square (NLS) regressions as well as an error-correction model. However, they derive private saving by deducting tax revenue and private consumption from national income, which is likely to overstate private saving - particularly in Singapore's case where a large part of the government's income stems from non-tax revenue (see section II.2.1. above). Additionally, they do not state how their explanatory variables were calculated, i.e. how they define CPF saving or real private disposable income, and their OLS-time-series still suffer from serial correlation with DW-statistics for Singapore of around 1.4-1.6. Nevertheless, their methodology is a substantial improvement and it should not be surprising that their results contradict Husain's (1995) in relation to the effects of CPF savings.

Overall, the most robust investigation to date has been undertaken by Agrawal (2001) Agrawal regresses national saving ratios for Indonesia, Thailand, Singapore, Malaysia, Korea, Taiwan and India on a selection of variables including per-capita income, growth, foreign savings as per cent of GNP, young and old dependency burdens, interest and provident fund rates. The period covered for Singapore is 1965-92. The cointegration vectors are estimated via dynamic OLS (DOLS) following Saikkonen (1991) and Stock and Watson (1993). The DOLS procedure was chosen because it has the advantage that endogeneity of any of the regressors has no effect,

asymptotically, on the robustness of the estimates, allows for direct estimation of a mixture of I(1) and I(0) variables and since the estimators are asymptotically normally distributed allows for inferences to be drawn from the coefficients. Moreover, Granger causality tests were used to determine the direction of the relationship between growth and saving. Nevertheless, a few weaknesses remain, namely the lack of potentially influential explanatory factors and likely multi-collinearity affecting the quality of the coefficients.

II.4.3. Accounting Identities and Differing Concepts of Saving Aggregates

In its most basic definition, saving is the difference between income and consumption. Gross National Saving (GNS) is, therefore, generally calculated as a residual in the National Income Accounts, after measuring the country's GNP and total consumption. Private National Saving (PNS) is then derived by deducting public saving from national saving. Depending on the availability of data, private saving can be split further into voluntary and compulsory saving, as well as into corporate and household saving. Consequently, all explorations into saving behaviour are extremely sensitive to the quality of the national accounts and the definition of public saving.[346]

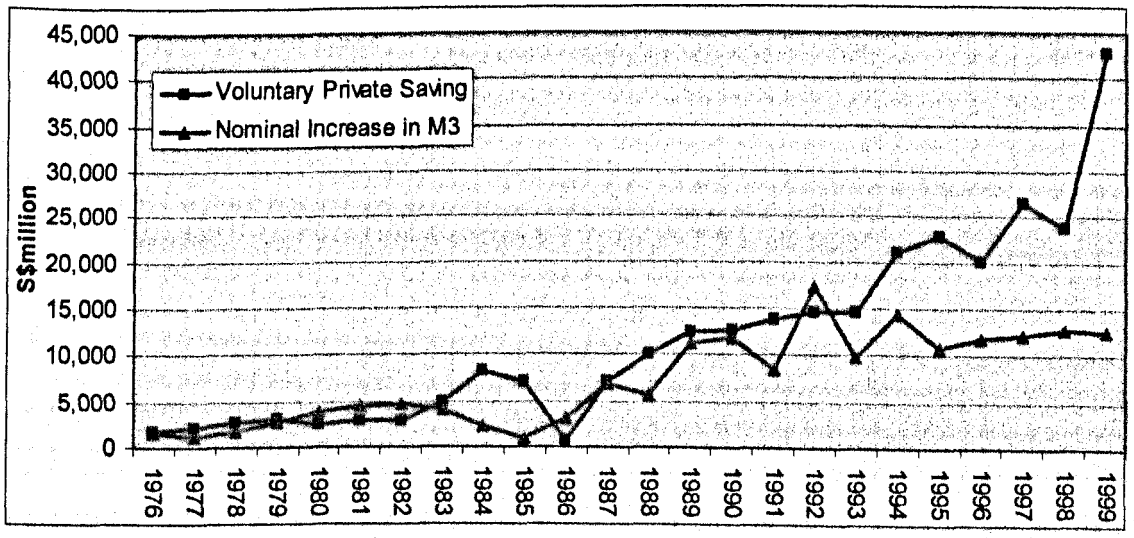
Some studies dealing particularly with private saving consider this issue so fundamental that they try to avoid using national income accounts altogether and estimate private saving by adding money balances and different measures of private investments, generally called financial saving.[347] This approach, however, often

[346] Also see section I.2.1.1., which discusses the problems of saving estimates in cross-country studies.

[347] See for example: Wickramanyake (1998), Lim (1988a), and Datta and Shome (1981), who use M2 balances plus finance company deposits, POSBank deposits and life insurance savings as their estimate for voluntary private saving. Yet another approach is propagated by Bradford (1991), who argues that the correct saving measure should be the change in wealth, which in turn should be derived from the change in stock market valuations. Joseph Stiglitz in his comment on Bradford's article disagrees.

encounters major data coverage problems particularly in respect to saving held overseas by residents, which are therefore generally not included, and the necessary differentiation between deposits held by public and by private entities. Furthermore, it does not net loan obligations and excludes savings which have been invested in equities or other traded securities. Stemming from their construction, financial saving estimates end up tracing money supply rather than private saving. However, private saving and money supply are often highly correlated. Graph II.4.3.a. contrasts the annual increases of Singapore's M3 money supply and the voluntary private saving figures derived from the country's national income accounts. The correlation between the two for the years 1976-99 is 0.77.[348]

Graph II.4.3.a.: Private Savings from National Accounts or Money Supply[349]



[348] The year 1999 is a good example of the weaknesses of financial saving estimates. In 1999 the government's total revenue fell by S$10 billion and the net-contributions to the CPF fell by a further S$3 billion compared to 1998, while total national saving still increased by S$4 billion. In other words, a large portion of what the government used to save has now been saved by the private sphere. Yet, the private sphere did not increase its financial savings, i.e. currency holdings or deposits with banks or other financial institutions. As the data compiled for Chapter Three shows, in 1999 private banks increased their overseas investment by over S$18 billion and private investments in Singaporean equities increased by S$10billion. Both of these transactions would not be recorded in the financial saving measure.

[349] M3 is defined as the Sum of Currency in Circulation, Demand Deposits, Quasi Money (Fixed Deposits, Savings and other Deposits), Net Deposits with Finance Companies and POSBank. M3 is taken from MAS Annual Report (various issues). The MAS does not report M3 before 1975.

In summary, financial savings are no substitute for national savings and even if the study was to exclude public savings a number of substantial problems remain particularly in a financially advanced and open economy. In the case of Singapore with both the government being a very important saver and her citizens and corporations having access to a number of investment vehicles not traced by financial savings, using national income accounts remains the best option. However, caution must be applied in deriving public and thus private savings.

Due to the high degree of government involvement, the definition of public saving is crucial to Singapore. In order to derive the correct estimate for public saving, let us consider how Gross Domestic Saving is derived in Singapore's National Accounts, starting from the basic national accounting identity:[350]

$$(1)\ Y = I + C + G + NX$$

where
Y = Gross Domestic Production
I = Investment
C = Private Consumption
G = Government Final Consumption
NX = Net-Exports

Gross Domestic Saving is then derived as a residual:

$$(2)\ GDS = I + NX = Y - C - G$$

where
GDS = Gross Domestic Saving

Since only Government Consumption is deducted from GDP in the GDS calculation, total government saving must equal the difference between Total Government Revenue (TGR) and Government Consumption.

$$(3)\ PuDS = TGR - G$$

where
PuDS = Public Domestic Saving
TGR = Total Government Revenue

[350] For simplicity's sake of the following calculations only GDS is considered. The extension from Gross Domestic to Gross National Saving would require the inclusion of Net-Factor-Income-From-Abroad (NFIA). The income concept would then be extended from GDP to GNP. Equations (1) and (2) would read: (1') GNP = I + C + G + NX + NFIA; (2') GNS = I + NX + NFIA = GNP - C - G; where NX + NFIA can also be expressed as the Current Account Balance (CA).

Deducting government saving from GDS then defines Gross Domestic Private Saving as:

$$(4)\ PDS = GDS - PuDS = GDS - TGR + G$$

where
PDS = Gross Private Domestic Saving
Substituting GDS with the equation (2) GDS = Y - C - G from above yields

$$(5)\ PDS = Y - C - TGR$$

Private saving itself can be separated into voluntary and forced saving:

$$(6)\ PDS = VPDS + FPDS$$

where
VPDS = Voluntary Gross Private Domestic Saving
FPDS = Forced Gross Private Domestic Saving

Since the CPF is Singapore's only mechanism for forced saving, CPF saving can be substituted for FPDS. Then solving for VPDS yields:

$$(7)\ VPDS = PDS - CPFsav$$

where
CPFsav = CPF saving

The literature, however, features a number of differing concepts estimating public saving.[351] Defining public saving as the government's budget balance, for example, will lead to a substantial underestimation of government saving. It does not account for the fact that the government needs to save money in order to finance its capital expenditures and lending activities. A second approach, deducts current expenditure instead of government consumption from total government revenue.[352] Since current expenditure and government consumption are not exactly equal, this approach leads to yet another saving estimate. In Singapore's case the former usually exceeds the latter and thus this procedure will also lead to a slight

[351] See also Peebles and Wilson (2002, p. 82) for a discussion of the differing concepts defining public saving.
[352] See for example Asher (1999b)

underestimation of public saving.[353] Yet another approach is to deduct tax income raised by the consolidated government from GNP to derive disposable income and then deduct private consumption to yield private saving.[354] This third approach is similar to equation (5) above. But a reason why only tax revenue and not total government revenue should be deducted, is not clear. Particularly in Singapore, where a large proportion of government revenue stems from fees, which have a tax-like nature, the third approach seems to understate public and thus overstate private saving for no apparent reason. Moreover, all alternative approaches are not consistent with national income accounts, which can lead to empirical problems if other variables taken from the national income accounts are used in statistical modelling. This paper will, therefore, employ the definition set-out in the above equations.

Nevertheless, a number of problems remain with Singapore's saving aggregates. Firstly, the government cultivates a number of off-budget and therefore also off-national-accounts items.[355] Secondly, the government is highly involved in the corporate sector either through statutory boards or through Government-Controlled-Enterprises (GCEs), whose saving should arguably be included as public saving depending on one's view about their respective market-orientation. However, data limitations restrict both the formation of a well-based view and the

[353] Final government consumption, following the United Nations definition (United Nations, 1995, p. xiii) and Singapore's national accounts reporting, is "equal to the service produced by general government for its own use. Since these services are not sold, they are valued in the gross domestic product at their cost to the government. This cost is defined as the sum of (1) intermediate consumption, (2) compensation of employees, (3) consumption of fixed capital and (4) payments of indirect taxes, less (5) the value of own account production of fixed assets, and less (6) sales of goods and services." The deduction of (5) and (6) plus a more selected inclusion of current expenditures limited to items (1) to (4) create the difference between final government consumption and current expenditure. In Singapore's case current government expenditure can include "investment expenditures as well as financial items such as current and capital transfers, e.g. CPF topup schemes for households, payment to telecos for early liberalisation of the telecommunication sector." (email from Singapore's Department of Statistics to Author; March 02, 2002)

[354] See for example Faruquee and Husain (1995 and 1998)

[355] IMF Consultation with Singapore, Public Information Notice No. 00/46, June 30, 2000, p. 3: "Directors also emphasized the benefits of fiscal transparency and encouraged the authorities to consider providing more information on the government's investment income, and to consolidate the various off-budget accounts, so as to enhance fiscal analysis on a consolidated basis."

calculation of the respective savings in the first place.[356] Therefore, saving by GCEs and statutory boards can not be differentiated from private saving. Thirdly, no information on household versus corporate saving is publicly available, so that private saving can only be subdivided into voluntary and compulsory. The necessary data on household consumption patterns appear to exist in Singapore as part of the information raised in the country's regular household surveys conducted by the Department of Statistics, which however are only published in aggregate form. In fact, the Department of Statistics itself has used the unpublished disaggregated source data obtained through the household surveys for a number of initial investigations into the consumption and saving behaviour of Singapore residents published in the department's Occasional Papers series, albeit without the original data.[357] A request by the author to obtain access to the original data collected in the quintannial Household Surveys has been rejected by the Department of Statistics due to privacy issues.[358] On the other hand, it can also be argued that aggregate savings figures are after all the correct measure because of substitution effects between corporate and private saving - at least in the long-run. See for example Leff (1980, p.207) who summarises the question and evidence on whether to look at household saving or aggregate saving.

[356] Only for the years 1974-84 consolidated public accounts exist, which include the seven major statutory boards within the government accounts. See Huff (1994) or Wong (1986).

[357] For example Occasional Paper No. 47, April 1999: 'Income, Expenditure, Saving and Investment of the Household Sector' calculates income, expenditure, saving and investment of Singaporean households for 1997 and 1998. 'Private Consumption Expenditure - Concepts and Trends', (Occ. Paper, No. 30, August 1997) estimates a private consumption expenditure time-series which according to the paper exist at the Department of Statistics since 1956. 'Life Cycle Analysis of Singapore Households', (Occ. Paper, Nov. 1993) reclassifies 1990 census data to look at households in different life-cycle stages based on children per family and marital status, but does not link it to saving, instead some linkage with housing information, educational profiles and average monthly income exists. 'Households in Mid-Life: Asset and Consumption Profile' (Occ. Paper, Jan. 1995) offers consumption patterns of selected life-cycle households based on 1992/3 household survey as well as some limited information about asset holdings.

[358] Asher (1994, p. 34) writes about the strategic use of data by the Singapore government: "It should be noted that in Singapore a paternalistic approach to government is combined with regarding economic, social and related information as a strategic resource at the state's disposal rather than a public good. (...) In the Singapore context, paternalism has meant the government defining what is in the public interest, that is, it sets goals and agenda. It also formulates strategies to achieve these agenda. The Singapore style of paternalism derives from an organic concept of the state and those in disagreement with state policy are afforded little or no room to manouvre."

A fourth and final problem lies in finding the correct figure for CPF saving, i.e. estimating what proportion of the withdrawals from the CPF are merely portfolio shifts from one type of saving into another and what proportion is actually dissaved, i.e. used for consumption purposes.[359] The broadest measure considers all contributions to the CPF plus accrued interest on past balances as saving. Without netting consumptive withdrawals, such as for medical care, this measure overstates the contribution to national saving. The narrowest measure includes only the change in CPF balances during the year, thus regarding all withdrawals as current consumption, which particularly after the opening of the CPF in respect to withdrawals on behalf of other saving vehicles such as designated equities or investment funds will lead to an underestimation of voluntary private savings. The estimate employed in this paper will, therefore, use total contributions plus interest earned less withdrawals under Section 15 and less withdrawals for medical reasons.[360] In other words compulsory CPF savings are defined as the increases in the members' balances plus withdrawals under the Housing and Other categories. The Other category includes withdrawals for equity and investment funds, which are simply shifts from one saving portfolio to the other. Withdrawals for the purposes of buying HDB housing analytically also simply constitute a shift from one asset category to the other, particularly considering Singapore's unique institutional framework with a strong cohabitation between the HDB and the CPF. However, based on international accounting convention investment by private individuals into residential housing is considered consumption for national accounts' purposes. Therefore, this adjustment leads to an inconsistency within the national saving aggregates. In order to compensate GNS needs to be adjusted for withdrawals from the CPF for purchases of HDB housing. Adding these withdrawals to Gross-National-Savings, which the national accounts would consider consumption, allows us to keep consistency within the individual saving sub-aggregates and to

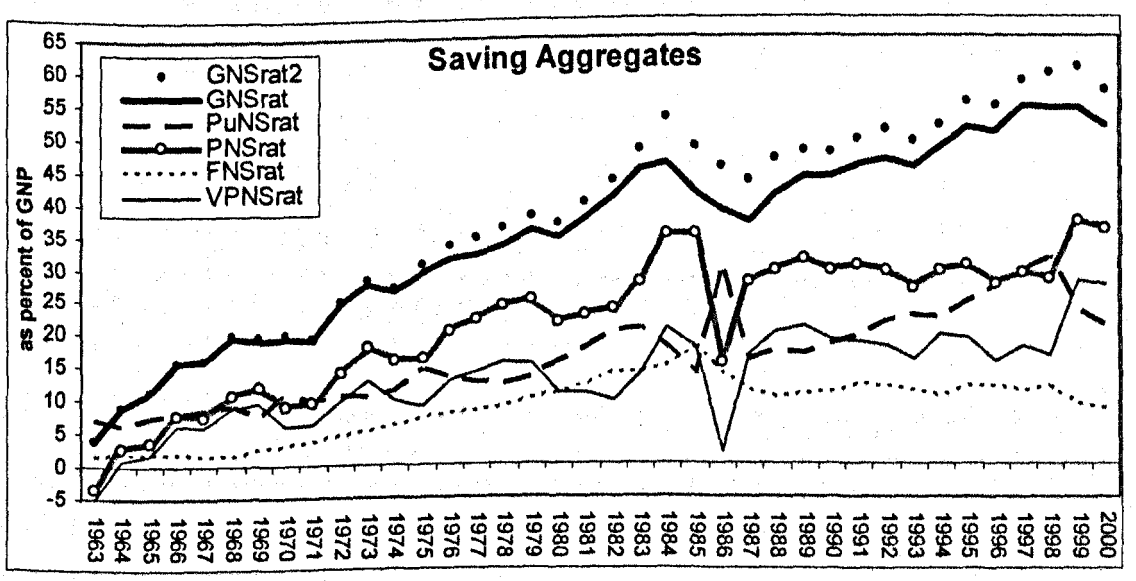
[359] For a discussion of the different methods see also Asher (1994, pp. 66-69)

[360] Withdrawals under Section 15 refer to withdrawals for retirement, death, disability, and leaving Singapore and West Malaysia permanently. Since not all withdrawals under Section 15 will lead to immediate consumption, this figure still slightly understates compulsory saving via the CPF.

appropriately capture Singapore's peculiarities in respect to the CPF and its close tie with investments in HDB housing.

On the other hand, the study also needs to keep consistency with the literature which so far has made no such adjustment to the official GNS-Ratio. Therefore, both the official GNS-ratio and the adjusted GNSratio (GNSrat2) will be econometrically tested alongside the voluntary (VPNS), compulsory (FNS), private (PNS) and public (PuNS) national saving sub-aggregates. Graph II.4.3.b. shows the development of all these saving aggregates over time.

Graph II.4.3.b. Singapore's Saving Aggregates over time



II.5. Econometric Models of Singapore's National Saving

II.5.1. Statistical Methodology

The investigation has five distinct stages. Initially the order of integration of the respective variables needs to be established. In a second stage single explanatory dimension models are estimated in order to verify whether a single factor, such as income or demographics, can 'explain' Singapore's saving behaviour. This will also include an investigation into the direction of causality based on Granger causality tests. The third stage will replicate Agrawal's DOLS model for Gross National Savings. In the fourth stage multiple regression models are estimated for each saving sub-aggregate, namely voluntary private, forced private, private and public saving. Finally, the fifth stage will combine the models found for these sub-aggregates of saving and compare the findings with the Agrawal reproduction models.[361] Depending on the stationary quality of the dependent variable, OLS models or DOLS procedures will be employed.

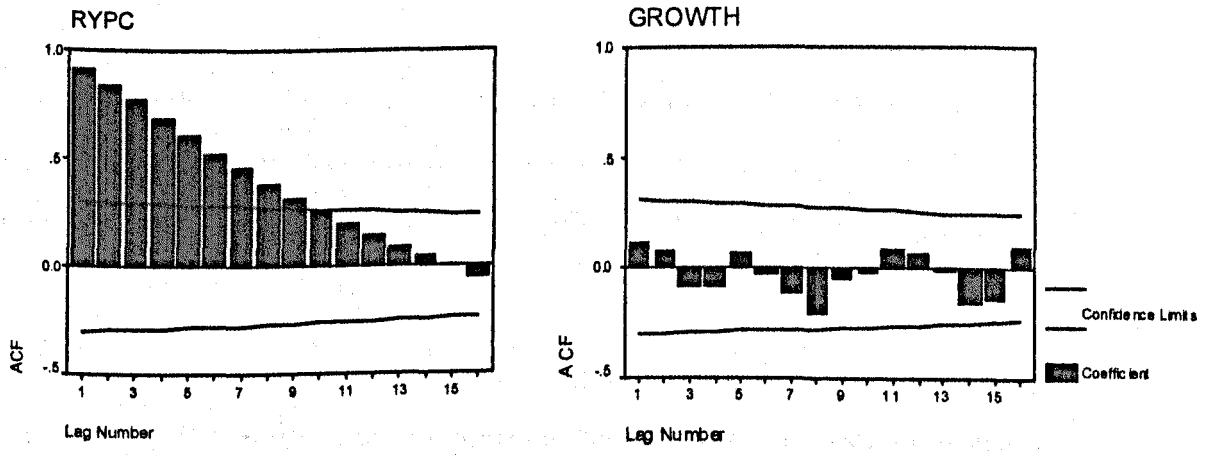
Testing for Stationarity

A stationary time-series fluctuates around its mean in a seemingly random manner, while a non-stationary series appears to have different mean values for different periods of time. A stationary time-series therefore shows very quickly declining autocorrelations, while the autocorrelations for a non-stationary time-series only fall very slowly as the number of lags increases. Therefore, a first way of determining

[361] An investigation into net-savings is unfortunately not possible, because Singapore does not publish capital consumption allowances. National rather than domestic savings are used (following Agrawal, 2001) because the former include net factor income from abroad while the latter do not. GNS is therefore the more appropriate measure in this part of the thesis dealing with savings available to finance domestic capital formation. Contrary to Chapter One, the single-country time-series analysis is not affected by issues of differing concepts and differing data quality between individual nations.

the stationary quality of a given time-series is to visually inspect its correlogram. Graph II.5.1. shows the correlograms of the real per-capita income time-series for Singapore and its corresponding growth series. The graph clearly distinguishes the levels of per-capita income as non-stationary while its growth variation is stationary.

Graphs II.5.1. Correlogram of Stationary and Non-Stationary Time-Series



Unfortunately, correlogram patterns are not always as clear cut as the two examples shown in graph II.5.1. Therefore, more formal ways of testing for stationarity have been devised, generally known as unit-root tests. The best known is the Augmented Dickey-Fuller (ADF) test whose Null-Hypothesis states that the series is non-stationary. The ADF test uses an autoregressive process of level and first-differenced observations, which are regressed on the first-difference of the respective variable, and tests the significance of the resulting coefficients of the autoregressive terms. The optimal number of lags of the autoregressive process is usually determined by maximizing the value of the Akaike Information Criterion (AIC).[362] If the resulting

[362] Depending on how the AIC is calculated the optimal number of lags can either be determined by maximising or minimizing the AIC, see Pesaran and Pesaran (1997, p. 353). For the software package used in this case, Microfit 4.1, the AIC needs to be maximised (Pesaran and Pesaran, 1997, pp.212-16), while Agrawal (2001) minimizes it to derive the appropriate lag structure, suggesting that the AIC in his case was calculated using standard errors while Microfit uses the maximum likelihood estimator.

ADF-statistic at the optimal number of lags lies above the critical value devised for ADF-tests the Null-Hypothesis can be rejected and the series is thus found to be stationary.[363]

Regrettably, the ADF-test is not a completely precise procedure either, particularly in small samples. Simulation studies have shown the test to lack power and thus an actually stationary series might not always be detected as such by the ADF test. In addition, it is sometimes not clear how many differenced terms should be included in the regression equation. Again this can be particularly detrimental in small samples because the inclusion of additional autoregressive terms will lower the degrees of freedom which in turn will widen the confidence intervals of the test and thus make it more difficult to reject the Null-Hypothesis. Therefore, at times different results are obtained depending on the number of lags tested for.

Due to the smallish size of the sample and the problems this can cause for the ADF-test as well as due to the test's general sensitivities, both visual inspection and ADF-tests were employed to determine the stationary quality of the variables in this study. The critical values for the ADF-test were based on a 95% confidence limit. The ADF equation was estimated with and without a trend term. Judging the applicability of the trend term was based on the behaviour of the series over time. The ADF-test was conducted with three as well as four lags and the optimal lag structure within each test was chosen by maximizing the Akaike Information Criterion. For non-stationary variables, the first-differences were also investigated to determine the order of integration. If the first differences are stationary, while the levels are not, the variable is said to be integrated of the order of one, also written as

[363] The exact ADF-regression equation to test whether variable X is stationary at the optimal number of lags r is given by:

$$\Delta X_t = \alpha + \beta_1 * X_{t-1} + \beta_2 * \Delta X_{t-1} + \beta_2 * \Delta X_{t-1} + \ldots + \beta_{r-1} * \Delta X_{t-r-1} + \varepsilon_t$$

The Null-Hypothesis of non-stationarity, i.e. the variable has a unit root, can then be defined as H_0: $\beta_1 = 0$. In other words, if β_1 is found to be significantly different from zero the Null-Hypothesis can be rejected in favour of stationarity of the variable, i.e. no unit root. The equation can also include an additional trend term ($\alpha_1 * t$), depending on whether the series exhibits a time trend. For a more detailed description of the ADF Test see most recent econometrics textbooks, e.g. Thomas (1997,

I(1). If not even the first differences are stationary then the variable is integrated at a higher order.[364]

Dynamic OLS Procedure (DOLS)

As mentioned in the literature review above many of the past attempts at modelling Singapore's saving behaviour have stumbled over methodological issues, particularly the non-stationary quality of many of the variables. In order to avoid similar pitfalls, this chapter will use the Dynamic OLS procedure developed by Saikonnen (1991) and Stock and Watson (1993), taking its methodological inspiration from Agrawal's (2001) investigation.

DOLS is asymptotically equivalent to the maximum likelihood estimator of Johansen (1988) and has been shown to perform well in finite samples (Stock and Watson, 1993).[365] By incorporating the lags and leads of the first differences of the independent I(1) variables into the regression equation, this procedure gains the advantage that endogeneity of any of the regressors has no effect, asymptotically, on the robustness of the estimates and that it allows for direct estimation of a mixture of I(1) and I(0) variables. Moreover, the DOLS estimators have the advantage of being asymptotically normally distributed. Thus, statistical inference on the parameters of the cointegration vector is possible, although some caution needs to be exercised in small samples as ours.

The equation resulting from the DOLS procedure is said to be cointegrating if the residuals of the DOLS regression are stationary. By way of statistical definition, a set of n difference stationary variables is said to be cointegrated if there exists at least one linear combination - i.e. cointegrating vector - of these variables which is itself

pp.405-409) or the original papers by D.A. Dickey and W.F. Fuller, e.g. Dickey and Fuller (1979 or 1981).

[364] The statistical software package used for the ADF-tests was Microfit version 4.1.

stationary, defining their long-run equilibrium relationship(s). Intuitively, cointegrated variables may drift apart temporarily, but must converge systematically over time.[366]

Unfortunately, the DOLS procedure has a number of disadvantages of its own. Firstly and foremost, due to its dynamic components the DOLS regression has an almost innate tendency for multi-collinearity, particularly if variables are included which do not have a high volatility, i.e. tend to change only slowly over time. The advantage of the DOLS procedure to be able to make statistical inferences on the parameters might be impaired by the lacking accuracy of the coefficients because of potential multi-collinearity within the cointegrating vector. Secondly, the high number of independent variables leads to a reduction of the degrees-of-freedom, which makes the construction of an inclusive yet still statistically powerful regression system difficult in medium and small sized samples.

Additive OLS Procedure

In order to counter the problems of the DOLS procedure and other cointegrating methods, the thesis will take advantage of the fact that in Singapore's case the main saving sub-aggregates are stationary and that gross-national saving is nothing but the sum of these sub-aggregates. Therefore, OLS-regression results describing the behavioural traits underlying the saving sub-aggregates can be added together to derive an additive OLS model for GNS based on the accounting identities presented above in section II.4.3. The results from this additive procedure will be contrasted with the reproductions of Agrawal's (2001) DOLS approach.

[365] See Agrawal (2001, p. 505) for an explanation of the methodology as applied to saving behaviour.

[366] For the development of cointegration techniques see the original articles of Engle and Granger (1987), Johansen and Juselius (1990) and Johansen (1995). A recent comprehensive treatment of the methodology is presented by Greene (1997). For a discussion of cointegration methodology as applied to long-run savings see Faruquee and Husain (1998, pp. 204-205).

The additive procedure is likely to be much more informative in revealing the underlying processes behind saving in Singapore, because in essence nobody saves on a gross-national basis and GNS is nothing but an artificial compound of separate and potentially quite different saving patterns. On the other hand, due to the stationary nature of these saving sub-aggregates econometrical considerations only allow for the inclusion of stationary explanatory factors. This leads to the use of largely first-differenced variables and might therefore not appropriately capture the influence of level effects. Statistically, the use of more level variables although not possible from a methodological stand-point could result in yet other conclusions. However, the pre-dominance of transitory factors in the theory of saving behaviour actually asks for the inclusion of dynamic rather than level effects.

Explanatory Dimensions

Based on the theories which try to explain saving behaviour there are essentially four main explanatory dimensions: income, demographics, the quality of the financial system and the influence exercised by the government over the economy's saving.

Income can be potentially important through level but particularly through transitory effects, namely growth and deviations from an assumed income trend. A variety of income series is tested, including real vs. nominal series and wages vs. disposable income vs. per-capita GNP series.[367] The demographic dimension is

[367] A General Note on modelling transitory income: When modelling transitory income, intuitively one could use the residuals of the income variable's own AR-process, e.g. regress last three lags of per-capita income on current per-capita income. However, this process is not admissible because AR processes of non-stationary variables lead to spurious regression results. Furthermore, the coefficients would be ex-post although the consumer makes his decision ex-ante. The coefficient is ex-post because the regression algorithm uses the whole time period as a basis to find these coefficients, in other words the weights for the respective lags is based on the experience of the whole period and not only the past years. This is unrealistic. Therefore, Gupta (1987), for example, defines Transitory Income as the deviation of actual income from a three-year moving average. We estimate transitory income through first differences of the income measures and through a separate income series, which uses the average of the last three years' growth rates to predict the ex-ante expected income (See Data Appendix).

largely captured by the ratio of the active labour force as a percent of total population, alternatively by a dependency ratio which compares those within to those outside of working age.[368] Theoretically, life-expectancy and thus length of retirement should matter as well. However, since life-expectancy changes only very slowly relative to changes in saving ratios, econometric investigations are not likely to pick up any effect from changes in life-expectancy other than those already incorporated into the labour force ratio.[369] The quality of financial institutions, in the literature often referred to as the degree of financial deepening, is best captured by the degree of borrowing constraints inherent in the system. In turn borrowing constraints are empirically captured through estimates of the amount of credit available to the economy and particularly to the private sector as a percent of total GNP.[370] Beyond domestic budget constraints, the negative of the current account balance as a percent of GNP is also used to capture potential foreign borrowing constraints, following a large part of the relevant literature.[371] Interest rates are also tested for. However, due to the controversial theoretical and weak statistical support in past investigations as well as the fact that they are only available from 1968 onwards when the MAS was founded, their potential effect is only investigated in the sensitivity analysis. The government's control over saving behaviour is captured by the sum of the employee's and employer's CPF contribution rates and alternatively by an estimate of the effective contribution rate, i.e. total contributions

[368] Generally, the labour force ratio is the preferable variable because it is not really the age that matters for the saving decision but the chance to earn an income out of which to consume or save. This is true particularly for Singapore, since the country has no social security system for the unemployed. Moreover, labour force statistics are available very regularly, while dependency burdens are often based on interpolations between separate census years.

[369] For completeness' sake the potential effect of life-expectancy is tested within the sensitivity analyses of the respective results. Furthermore, it is important to note that all studies (this one included) suffer from a major drawback when it comes to evaluating demographic effects. Annual population ratios are only interpolations between decennial censuses - possibly somewhat supported by annual surveys. This interpolation procedure will create a strong time-trend and thus make any annual interpretations of the data as needed for regressions with annual observations somewhat questionable, although no better alternative exists.

[370] At times money supply is used instead. However, since Singapore publishes statistics on domestic and private credit the more direct and potentially revealing variable is used here. Moreover, money supply ratios, as shown in section II.4.3., are also considered substitutes for statistics on saving ratios by parts of the literature. The inclusion of money supply as an explanatory variable would then simply have saving aggregates on both sides of the regression equations.

[371] See section I.6. for a critical assessment of current account balances as a measure for foreign borrowing constraints.

made over total remuneration.[372] Given the government's predominant role in Singapore the variables describing domestic borrowing constraints should also be considered largely government driven.[373]

The government's influence and the very likely resulting crowding-out effects of its own saving, i.e. the question of Ricardian Equivalence, also need to be explicitly modelled and thus tested for. This can be achieved by including the public saving ratio (PuNS) in the regression models describing private national saving (PNS) or respectively voluntary private national saving (VPNS). However, it is important to test for this effect in a separate regression step. The first step needs to build the model describing private saving or respectively voluntary private saving behaviour. Only once an acceptable model has been built, should the public saving ratio be added to see whether it can significantly affect the model. Otherwise, the danger exists that the regression equation takes its significance not from its power to model saving behaviour but from the way saving aggregates are calculated. In other words, if for example the public saving ratio is included from the outset, the remaining explanatory variables might model GNS rather than PNS, because PNS is derived at by deducting PuNS from GNS. In this case, a negative coefficient for the public saving ratio and thus a confirmation for - a very likely almost complete degree of - crowding-out is pre-programmed in the regression system. This result is however misleading because all the regression truly shows is that GNS less PuNS does indeed yield PNS. In order to avoid this potential pitfall, a regression system needs to have been built which clearly models PNS or respectively VPNS before it is tested for Ricardian Equivalence effects.

A similar problem applies to the investigation of the likely crowding-out effect of the CPF on voluntary private saving, since the CPFrate is highly correlated with FNS.

[372] Since the CPF might very likely also affect saving behaviour through lagged influences, the lag of the CPF-rate is also included. Moreover, since arguably the government can anticipate its own future changes to the CPF contribution rate, PuNS models will also include the lead of the CPF-rate.

[373] For an exact definition of the individual variables and a description of sources see the Data Appendix.

However, on the other hand, the exclusion of a CPF variable would mean that a major decision factor for the private saving function is not modelled. While the behavioural effects of public saving on private saving are less direct, CPF saving must be considered a main direct component of the private saving decision. Thus, the CPFrate will be included immediately in the regression system. However, the sensitivity analysis will re-estimate the function without the CPF and then add the CPFrate in a separate step to see whether complete models might have been over-identified.

Yet another statistical problem related to many of the variables, including the CPFrate, is their non-stationary quality while VPNS, PNS and PuNS require stationary regression models. Therefore, the non-stationary variables can only be included in first-difference format, which carries a somewhat different analytical value than level variables.[374]

The Model Building Process and a Note on Data-Mining

In an initial stage, single explanatory models are estimated in order to investigate whether a single factor has by itself been driving saving behaviour. The second stage will include variables describing all four main explanatory dimensions. As argued above for different reasons life-expectancy, real interest-rates and Ricardian-Equivalence will not be tested until the sensitivity analysis. The core stationary model will include one of seven transitory income measures, growth of real per-capita income, first-difference of growth, and the first differences of the dependency

[374] One explanatory dimension, macro-economic stability, is not explicitly tested for because the power of the variable usually used to model it, the rate of inflation, is questionable, particularly in single country time-series studies. If inflation falls from say 6% to 3% from one year to the other, does this really mean that macro-economic stability has doubled? In a cross-country study the inclusion might make more sense, because indeed it can be argued that a country with 3 percent inflation appears macro-economically more stable than a country with say 12 percent inflation. Possibly time-series studies which work with countries that experienced hyperinflation could benefit from the inclusion of the inflation rate, particularly if saving behaviour before, during and after the period of hyperinflation is compared. However, overall Singapore has been very stable over the whole period since its

ratio, the labour-force ratio, the negative of the current account balance, the domestic credit ratio, the private credit ratio, the share of private credit as part of total domestic credit, as well as the CPF contribution rate and the lagged CPF contribution rate. Based on joint hypothesis F-tests the initial model will be reduced in a general-to-specific manner to only significant variables on a 90% confidence level. The process is repeated for each of the seven income measures since no clear theoretically preferable income variable exists and the outcome of the model building process is likely to be sensitive to the respective income measure's variance.

The process will by design result in a number of statistical models. Which of these models to chose as the most appropriate is probably also the most subjective step in the whole model-building process. Therefore, all models which offer decent diagnostics, i.e. no serial correlation of the residuals, good adjusted r-squared, and low multi-collinearity, are presented in the results.[375] The choice between these diagnostically acceptable models possibly based on the notion of parsimony or the conformity of its parameters with theory is open to argument. Even if the process should not result in a 'pareto-optimal' model, the differences within the models can be very informative. Moreover, even if the significance of individual variables behaves differently depending on the income variable or the respective saving sub-aggregate used as the dependent variable the overall analytical result might not be too different. From this angle, the wide research design also incorporates many aspects from the start which would necessarily have to be investigated in a sensitivity analysis if the initial regression stages were less inclusive.

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independence, with possibly less anticipated stability at the beginning of the period. Anticipated macro-economic stability, however, is hardly captured in a statistical time-series.

[375] Technically, the problem of serial correlation of the residuals could have been potentially resolved through the use of the Cochrane-Orcutt method. The problem of serial correlation of the residuals is due to a misspecification of the model, which in turn can be either due to a lacking lag structure or missing or wrong independent variables. The former problem can be resolved through the Cochrane-Orcutt method, which is effectively an (iterative) procedure of introducing a specialised lag-structure into a previously static model. However, the purely mathematical tool of the Cochrane-Orchutt method was not applied as long as it could be shown that a model exists with no serial correlation of the residuals and a similar set of variables. In that circumstance, it is not likely that the low Durbin-Watson statistic in the related model was due to a missing lag structure. Instead this points to a misspecification of the set of explanatory variables. Only if such a model does not exist and there is a good argument for the inclusion of lags should the Cochrane-Orcutt algorithm be applied to the regression equation.

Every effort which intends to determine statistically which factors were influential in a given circumstance will include some degree of data-mining, i.e. the sorting of variables into those which prove statistically significant and those which do not. This sorting process can affect the significance levels of the resulting regression equations. In general, the more removal steps the general-to-specific process requires to get to the final model, the lower the 'true' significance.[376] Therefore, the number of regressors in the initial models was kept to a minimum, based on those factors most regularly put forward by theory. Altogether, due to the at times contradictory state of the literature a certain amount of 'data-mining' is not fully preventable.

Granger Causality

Contrary to the concept's everyday use, in econometrics causality refers rather to the ability to predict than to cause. A variable is said to granger-cause another variable if its past and present observations can improve the forecast of the other variable.[377] As Engle and Granger (1987) have shown if two or more variables cointegrate there necessarily exists causality in at least one direction. It is therefore opportune to investigate links of causality here since at least for the non-stationary saving aggregates the DOLS methodology will already have determined cointegration relationships. To do so a standard vector error correction procedure (VECM) for pairs of non-stationary or respectively a vector autoregression procedure (VAR) for pairs of stationary variables is employed.

In case of the VECM, this involves finding a cointegration relationship between a pair of I(1) variables, lets call the dependent variable X and the independent Y, and inserting the residuals derived from this cointegration relationship into an error

[376] See Thomas (1997) pp. 350-354 for a general description of the effects of data-mining on the significance levels and pp. 360-361 on the effects particular to a general-to-specific approach.
[377] See Granger (1969)

correction model. The ECM itself is nothing else than a 'second stage' OLS regression with the first difference of variable X as the dependent variable and using as independent variables n number of lags of the first differences of both variables X and Y as well as the residuals from the 'first-stage' cointegration relationship ('the error-correction term'). The optimal number of lags n is determined by maximizing the Akaike Information Criterion.[378] Using an F-test on the coefficients of the lagged first differences of variable Y will determine whether they are significantly different from zero. If they are, they indeed improve the forecast of X and therefore granger causality running from Y to X is established. Following Agrawal (2001) the 'first-stage' cointegration relationship is established by static OLS regression between X and Y and an ADF-test on the residuals, whose optimal lag structure is chosen by maximizing the Akaike Information Criterion. The VAR procedure follows the same principle but does not require first differences or the use of residuals from a 'first-stage' cointegration relationship.[379] The causality tests are conducted in both directions, i.e. switching Y to become the dependent and X the independent variable, in order to ascertain whether indeed causality is uni-directional.

On a cautionary note it must be said that time series which reflect forward-looking behavior are often found to be excellent predictors of economic time series like income or inflation for example. This clearly does not mean that these series *cause* income or inflation to move up or down. Instead, the values of these series reflect the market's best information as to where GNP or inflation might be headed. Granger-causality tests for such series may be useful for assessing the efficient markets view or investigating whether markets are concerned with or are able to forecast GNP or inflation, but should not be used to infer a direction of causality.[380] Thus, if income is shown to granger-cause savings then this should be interpreted as

[378] Alternatively, the Schwarz Bayesian Criterion (SBC) can be used. The SBC is likely to chose a lower order and thus allow for more degrees of freedom in the subsequent ECM regression. If the SBC resulted in a different lag structure, both models are reported.

[379] For a more formal description of Granger causality tests see any recent advanced econometrics textbook, e.g. Thomas (1997, pp. 461-463) or the original paper by Engle and Granger (1987). For a methodological explanation of the application of Granger causality tests to investigations of saving behaviour see Agrawal (2001).

a reflection of consumer assumptions underlying future saving decisions. In other words, the existence of granger causality will show that consumers anticipate certain income levels and base their saving decision on that. In turn, the existence of granger causality will confirm rather the forward-looking behaviour predicted by the life-cycle and permanent-income hypotheses than show that income causes savings.[381]

Periodisation

The period of observation is restricted to 1965-97 in order to avoid the variance introduced by the Asian crisis including the resulting rebound from affecting the statistical models for the whole period. Since the study is concerned with Singapore's development history and its saving behaviour which financed the substantial amounts of capital accumulation underlying the economic development, the danger that the statistical OLS or DOLS algorithms may be unduly driven by the strong variance of a few years at the very end of this process needs to be avoided. In theory, the period should potentially also be sub-divided into two subsections, namely pre and post 1986's peculiar recession, which only Singapore experienced. The recession can be seen as somewhat of a watershed for Singapore's policies, see the discussions on CPF contribution rates, retirement age or even fertility policies which all took place around this time some of them directly initiated by the recession. However, splitting the period leads to a major statistical problem through a reduction of the degrees of freedom, which particularly affects the DOLS procedure due to its necessarily high number of explanatory components.[382]

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[380] Hamilton (1994, pp. 307-308)

[381] This criticism on the true content of granger-causality can be intuitively summarised as the argument that Christmas Cards do not cause Christmas. Christmas Cards can be used as a tool to forecast Christmas because they are a manifestation of the consumers' forward looking behaviour but can not be seen as the cause for the festive season.

[382] See for example Thomas (1993, pp. 111-112) on the effects of low degrees of freedom on the robustness of the OLS procedure. While this study does still offer a relatively high level of degrees of freedom compared to the earlier literature, it must nevertheless be noted that particularly for equations with a large number of independent variables the resulting low degrees of freedom can have a

II.5.2. Summary Results

The reservations already mentioned in the methodological section about the DOLS procedure and in general about an undifferentiated investigation of Gross-National-Saving are confirmed in the findings. The sub-aggregates of national saving behave quite differently, which is lost in Agrawal's (2001) exercise and other studies of Singapore's GNS-ratio. The effect of the CPF tends to be over-estimated if only GNS is analysed. Studies of the top non-stationary aggregate are not able to adequately model behaviour underlying the individual stationary sub-aggregates. In an econometric analysis, the non-stationary GNS series appears to be largely driven by the non-stationary compulsory saving series.

In fact, contrary to parts of the past literature, all four main explanatory dimensions proposed by theory can be shown to have had a significant impact on the country's savings. Income, particularly its dynamic, i.e. transitory, component is the single strongest and statistically most robust factor, followed by the CPF. While the dynamic effects of changes to the CPF's contribution rate were fully compensated by their negative impact on voluntary and public savings, in the long-term compulsory saving increased by more than these crowding out effects, leaving a positive net contribution to the country's savings. This leaves the conclusion that these positive net-effect must be due to long-term developments in the country's wages, in the fund's coverage and the monthly contribution ceiling since these are the only other factors influencing CPF saving beyond the contribution rate. Falling dependency is shown to have had opposite effects, positively adding to voluntary savings particularly during the early years but reducing public savings for the whole period. The lowering of borrowing constraints over time has led to more consumption and thus lower savings among the private sector, which was however compensated by a

negative effect on the standard errors of the OLS estimators and the relevant critical values for the student's t-distribution. In response, it was always tried to maximise the degrees of freedom given the analytical restrictions and the requirements put forward by theory. Moreover, the study will only report adjusted r-squareds, which take account of the available degrees of freedom in the respective regression equation, see Maddala (2001, pp. 164-168).

positive impact on public savings. Full Ricardian Equivalence has not been present, so that public saving has had a positive net effect on the country's gross national savings.

Since voluntary savings was the driving force behind the early saving transition and voluntary saving in the early years can be shown to having been largely driven by the rising labour force ratio, the favourable demographic environment must be considered central to Singapore's saving 'take-off', supporting the favourable initial situation hypothesis proposed in the first chapter. Moreover, the fact that the positive effect of the CPF was largely due to positive net-contributions to the fund, shows how important this demographic change was even outside of voluntary savings. Singapore, therefore, must be considered to have used the chance to exploit this demographic dividend very well, by both kickstarting a changed voluntary saving pattern and by using the demographic window for the creation of a CPF 'hump-saving'. The government control behind the saving success of the CPF must thus be seen to have exploited the country's demographic transformation very well.

Overall, the main saving theories are supported as they apply and deal with voluntary savings. They do not appear to be able to adequately deal with behaviour in other saving aggregates, which is not surprising since their object of interest is personal savings. Again, top aggregate investigations therefore tend to result in contradictory conclusions.

These findings are robust to a variety of other influences and changes to the statistical procedure, even though not every model is able to survive the sensitivity checks fully intact. The strongest source of sensitivity comes from the choice of income variable. Explained in an intuitive way: the strong income factor basically leaves residual variance to the other potential but statistically weaker explanatory variables, which depending on which income factor has been used is better modelled by one variable or the other. Therefore, a number of models are possible. For a few models it can be argued that they are superior due to better diagnostics,

e.g. higher R-squareds, better Durbin-Watson statistics, less multi-collinearity, or due to parsimony or consistency with theory. But no clear 'pareto-optimal' and thus fully robust model could be found.

While the lacking absolute robustness means that we can not make exact claims about the individual effects, we can nevertheless make claims about reasonable ranges within which the respective effects seem to have operated. Table II.5.2. summarises the main elasticity ranges. However, it must be noted that instead of a single variable one really needs to consider the whole explanatory dimension. Therefore, the detailed discussion of the individual regression results below will use an impact analysis which combines the individual variables into the four main explanatory dimensions.

Table II.5.2. Selected Elasticity Ranges

	VPNS	PuNS
Transitory Income	A one dollar rise from the preceding year in average wages is estimated to have added in average between 5 and 10 basis points to the VPNS-rate	A one dollar rise from the preceding year in real per-capita income is estimated to have added in average between 0.2 and 0.4 basis points to the PuNS-rate
CPF Crowding out	An increase from the preceding year in the CPF contribution rate by one percentage point is estimated to have lowered VPNS by between 0.5 and 2.7 percentage points	An increase from the preceding year in the CPF contribution rate by one percentage point is estimated to have lowered PuNS by between 0.5 and 0.8 percentage points
Demographics	A one percent increase from the preceding year in the labour-ratio is estimated to have added in average between 1.0 and 2.6 percentage points to the VPNS-rate	A one percent fall from the preceding year in the dependency rate is estimated to have in average lowered the PuNS-rate by between 1.5 and 2.3 percentage points
Ricardian Equivalence	An increase from the preceding year in the Public Saving Rate by one percentage point is estimated to have lowered the VPNS-rate by 25 basis points	

II.5.3. Order of Integration

Table II.5.3. offers the results of the visual inspection of the variables' correlograms, as well as the ADF-test statistics for the respective variable's levels and first-differences. The ADF-test used a maximum number of three lags and determined the optimal lag structure by maximizing the Akaike Information Criterion. The data-appendix offers the additional results for ADF-tests conducted with four lags.

Of the variables shared with Agrawal (2001) the tests result in different classifications for two out of five variables. The Current Account Balance and the Dependency Rate, which he finds to be stationary, are both non-stationary in our sample.[383] Additionally, if the ADF test of RYPC was conducted on four lags, the first differences would not be found stationary unless we use the Schwarz-Baysian Criterion instead of the AIC.

However, the most intriguing result of the exercise is the different behaviour of the saving aggregates. Private and public saving ratios are found to be stationary, while the compulsory saving ratio is not. Gross National Savings, in both varieties, is also found non-stationary, although its private and public saving components are clearly stationary, only the forced saving ratio is not. This would indicate that statistically CPF saving has been driving gross national saving, unless the other two sub-aggregates, PuNS and VPNS, by chance add-up together to jointly form a non-stationary drift. The other variables behave as expected. Income levels, both nominal and real, are non-stationary, while growth and transitory income (i.e. AvrGro and the first differences of the income levels) are stationary. All demographic, CPF and borrowing constraint variables are also integrated of the order of one, while the real interest rate is found to be stationary.

[383] Our definition of Dependency also includes those aged 65 and above, while Agrawal (2001) uses only young dependency, i.e. those younger than 15 years. The dependency variable is nevertheless still largely driven by young dependency and even by itself young dependency would be clearly non-stationary in our sample.

Table II.5.3. Results of Stationarity Tests

		Visual Inspection	ADF Statistic	ADF Statistic First Diff.	Order of Integration
Dependent	GNSrat	I 1	-2.73 T	-5.36 *	I 1
	GNSrat2	I 1	-2.35 T	-5.34 *	I 1
	PuNSrat	I 1 (?)	-5.22 * T	-5.67 *	I 0
	PNSrat	I 1 (?)	-3.93 * T	-5.70 *	I 0
	FNSrat	I 1	-1.73	-4.53 *	I 1
	VPNSrat	I 1 (?)	-5.34 * T	-4.93 *	I 0
Income	RYPC	I 1	-0.13 T	-5.28 * T	I 1
	NWage	I 1	1.50 T	-6.81 * T	I 1
	RWage	I 1	1.54 T	-5.01 * T	I 1
	YPC	I 1	-0.93 T	-4.08 * T	I 1
	DispY	I 1	0.13 T	-5.38 * T	I 1
	DispYCPF	I 1	1.07 T	-9.13 * T	I 1
	Growth	I 0	-5.73 *	-5.31 *	I 0
	NWGro	I 1 (?)	-3.36 *	-5.94 *	I 0
	AvrGro	I 0	-6.91 *	-8.65 *	I 0
Demog.	LabRat	I 1	-2.01 T	-4.00 *	I 1
	Dep	I 2 (?)	-1.59 T	-4.20 * T	I 1
	Life	I 1	-2.30 T	-4.42 *	I 1
Financial Inst.	CABal	I 1	-2.5 T	-5.40 *	I 1
	DoCrRat	I 1	-1.54 T	-5.79 *	I 1
	PriDoRat	I 1	-1.78 T	-6.01 *	I 1
	PriCrRat	I 1	-1.48 T	-5.43 *	I 1
	R	I 0	-3.48 *	-4.92 *	I 0
CPF	CPFrat	I 1	-0.88 T	-4.23 *	I 1
	CPFeff	I 1	-0.09 T	-3.52 *	I 1

GNSrat is the officially reported Gross-National-Saving Ratio. GNSrat2 refers to the GNSratio after adjustment of CPF withdrawals for housing purchases. All variables refer to 1965-97, except for the real interest rate R, which is only available from 1968 onwards. For a description of all variables and their sources, as well as the sensitivities of the ADF test for individual series see the Data Appendix.

* denotes that the null hypothesis of a unit root, i.e. of non-stationarity, can be rejected at a 95% critical value. In other words, * denotes that the variable has been found to be stationary.

T denotes that a Dickey-Fuller regression with a time trend was used in the ADF-test.

II.5.4. Reproduction of Agrawal (2001) Models of Gross National Saving

The statistical outcomes of the reproduction of Agrawal's (2001) model for Gross National Savings are shown in the table II.5.4. below. The first column gives Agrawal's (2001) own results. GNSa, GNSb and GNSrat2 refer to reproductions of his approach with our data. GNSa assumes that the current account balance is stationary, notwithstanding our own findings. GNSrat2 uses the adjusted GNS series. The names of first differenced variables start with a capital D, while leads are denoted by a capital L in front of the name and lags by a capital L at the end of the variable's name.

The impact column shows how much changes in the respective factors changed the saving ratio, based on the GNSb model. The impact is measured in percent of GNP. It is calculated by multiplying the difference of the variable's observations between 1968 and 1997 with the econometrically determined coefficient. This way the impact analysis is able to determine how much of the change from the starting position can be attributed to each explanatory dimension.[384] A comparison of these impact figures with Agrawal's (2001) regression results is unfortunately not possible, because a) this study is using different sources for its variables and b) it is not clear from Agrawal's (2001) article exactly how the different variables are denominated, i.e. are percentages given before or after the decimal point (e.g. 30.0 or 0.30), and which deflator he used for his real per-capita income and real interest rate series. In his own calculations, without giving details, Agrawal mentions that increases in real per-capita income and CPF contribution rates resulted in an increase of Singapore's savings by respectively nearly 8% and 6% of GNP between 1966 and 1992. In general, it must be noted however, that these impact figures can substantially change depending on which years are being compared. Therefore, graphs II.5.4. a-b show the development of the impact over time, by comparing each year's respective observation with the base year 1968.

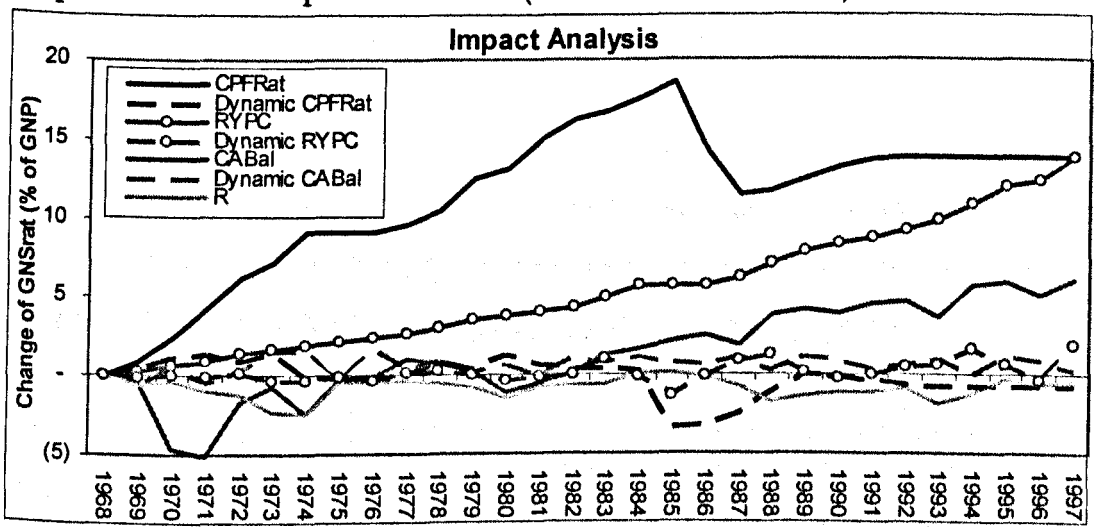
[384] For example, the increase in real per-capita income in the GNSb model between 1968 and 1997 has added 13.88% to the GNSratio according to the regression results. The dynamic effect of real per-capita income in 1997 has only added 1.89%. Overall the GNSratio has risen by 34.6% between 1968, when it stood at 19.66%, and 1999, when it reached 54.25%.

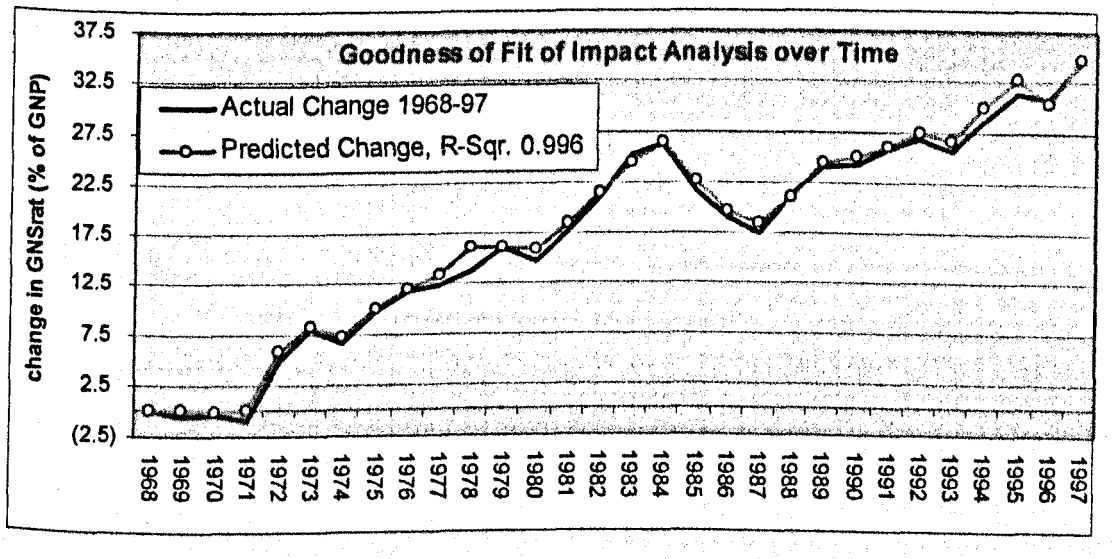
Table II.5.4. Agrawal's Model reproduced

	Coefficients				Impact 1968 vs. 1997
	Agrawal	GNSa	GNSb	GNSrat2	GNSb
Constant	0.089**	10.519 **	11.446 **	10.274 **	
RYPC	0.48E-5**	4.373E-4 **	4.914E-4 **	4.236E-4 **	13.88
CABal	- 0.171**	-0.216 **	-0.223 **	-0.231 **	6.07
CPFrat	0.59E-2**	0.509 **	0.477 **	0.628 **	13.83
R	0.57E-3	0.158 *	0.232 **	0.243 *	-0.43
DRYPC	- 0.73E-5*	7.985E-4	1.021E-3	9.607E-4	
LDRYPC	- 0.33E-05	1.052E-4	3.572E-4	-5.59E-5	1.89
DRYPCL	- 0.73E-05	-1.90E-5	-6.57E-4	3.467E-4	
DCABal	not incl.	not incl.	1.887E-2	3.569E-2	
LDCABal	not incl.	not incl.	-4.58E-2	-2.10E-2	0.32
DCABalL	not incl.	not incl.	-9.32E-2 *	-5.57E-2	
DCPFrat	- 0.11E-2	-1.09E-2	9.198E-2	-0.159	
LDCPFrat	0.19E-2*	0.384 **	0.333 **	0.227	-0.76
DCPFratL	0.41E-4	9.886E-2	0.148	-0.155	
Adj. R^2	0.989	0.992	0.994	0.992	
D/W	2.03	1.949	1.910	1.491	
Cond. Index	n/a	22.256	35.975	35.975	
Residuals ADF Statistic	Stationary -4.09	Stationary -3.96	Stationary -4.33	Stationary -3.80	

Notes:
GNSa assumes that CABal is stationary as it was in Agrawal's sample. By contrast, GNSb considers CABal to be non-stationary as our sample would indicate. GNSrat2 assumes CABal to be non-stationary and uses the adjusted GNS-series.
** denotes significance at 1% level
* denotes significance at 5% level
Agrawal's model refers to 1966-92, while GNSa, GNSb and GNSrat2 cover 1968-97.
Cond. Index stands for Condition Index, a measure of multi-collinearity.
For sources and descriptions of variables see Data Appendix.

Graphs II.5.4. a- b: Impact Over Time (based on GNSb model)





Statistically, on the one hand, the adjusted r-squareds are consistently high, the Durbin-Watson statistics indicate no serial correlation of the residuals except possibly for the GNSrat2 model and all equations cointegrate. The significance levels of the individual variables are very similar, with the exception of the real interest rate which is found to be significant in our sample contrary to Agrawal's model. On the other hand, the inclusion of the dynamic components for the current account balance which becomes necessary due to its non-stationary quality increases the

multi-collinearity in the equation beyond the generally accepted threshold of 30 for the condition index, which casts some doubt over the accuracy of the coefficients.[385]

If we disregard the possibly distorting effect of multi-collinearity for the time being, it becomes clear that the CPF contribution rate was the predominant force behind the rising saving rates in Singapore. Therefore, based on these models the strong transition from low to high gross-national savings must be predominantly attributed to the transformation of the CPF.[386] The availability of foreign savings as measured through the negative current account balance affected Singapore's savings negatively. In the first half of the period, when Singapore had a negative current account balance and was thus dependent on foreign credit, national savings were negatively affected. The opposite is the case in the latter half of the period when Singapore experienced a large current account surplus.[387] Real interest rates are shown to have a positive impact on savings. However, as the impact analysis shows, generally falling real interest rates since 1968 have affected Singapore's savings transition negatively.

However, unfortunately these results can not be considered robust yet. As mentioned already the multi-collinearity problem casts doubt over the accuracy of the parameters. But moreover, potential influences of still missing factors, such as demographics or domestic borrowing constraints, have not yet been determined. Additionally, individual sub-aggregates of savings may have been affected by other determinants. Gross National Savings is after all just an artificial sum of the savings behaviour of very different groups. Particularly in Singapore, the danger exists that

[385] See Kennedy (1998, p. 180) The correlation between RYPC and CABal in our sample is even stronger with -0.905 than the correlation between Dep and RYPC (r = 0.799), which Agrawal refers to as being a problem. The tolerance statistics for CABal and RYPC are as low as 0.1 and fall close to zero once the dynamic components of CABal are also included. The correlation between the CPF contribution rate and RYPC is also quite high at 0.7.

[386] Agrawal's interpretation of his own findings argues that increases in RYPC had the largest impact with 8%, more than CPF with 6%. (Agrawal, 2001, pp.507-8)

[387] Together with the strong correlation between the per-capita income series and the current account balance, this result casts doubt over whether CABal does really capture the effects of foreign borrowing constraints. As already argued in section I.6. it rather appears that the current account balance affects savings through its income effect.

any econometric investigation of Gross National Savings will be largely driven by the substantial degree of forced savings, as the results from the ADF tests already suggested. While this might not be a wrong conclusion per se, it nevertheless prevents us from noticing distinct and potentially very different developments in other saving sub-aggregates, which are just as important for understanding Singapore's unique savings transition.

II.5.5. Gross Voluntary Private Saving

Following the general-to-specific removal process based on joint hypothesis F-tests described in the methodological section, all main influences were tested using different income measures in separate regression algorithms. Not all regressions resulted in significant, i.e. diagnostically acceptable, models. Table II.5.5.a. shows the results of those models, which are able to offer good adjusted R-squareds, low condition indices and decent Durbin-Watson statistics.

The impact analysis shows that the Voluntary Private Saving Ratio was largely driven by transitory income, particularly from the mid-1970s on. This applies for all models. There are only slight differences in the timing aspects. Model D, which only refers to the 1965-86 period, shows demographics to be the strongest influence for the early years of the country's saving transition. Regression equations, which model the whole period up to 1997, are not able to pick up this slight but very important difference. Graphs II.5.5.a-d give a visual inspection of the respective explanatory dimensions' impact on changes in the country's voluntary saving pattern over time.

Table II.5.5.a. Voluntary Private Savings [388]

	Model A 1965-97		Model B 1965-97		Model C 1965-97		Model D 1965-86		Impact 1965-97	Impact 1965-86
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio	Model A	Model D
Constant	5.618	4.295	7.850	8.143	12.422	10.086	7.873	8.077		
Growth	0.371	2.109	not incl.		Not sig.	(1.579)	not sig.	(1.577)	12.84	3.07
DGrowth	-0.573	-4.136	-0.725	-3.579	-0.611	-4.176	-0.318	-1.851		
DNWage	7.677E-2	9.041	7.719E-02	8.087	not incl.		0.116	6.288		
DRWage	not incl.		not incl.		5.019E-02	3.456	not incl.			
AvrGro	not incl.		2.878E-03	2.328	not incl.		not incl.			
DDep	not sig.	(0.293)	not incl.		1.785	3.402	not sig.	(0.667)	1.41	0.34
DLabrat	0.932	1.876	1.211	2.103	2.456	4.333	1.822	3.890		
DCABal	-0.216	-2.840	not incl.		-0.283	-3.533	-0.276	-3.419	0.72	0.32
DDocRat	not sig.	(-1.223)	-0.171	-1.733	-0.151	-2.185	not sig.	-3.649		
DPrDoRat	not sig.	(-1.690)	-4.48E-02	-1.716	Not sig.	(-0.955)	not sig.	(-1.766)		
DPriCrRat	not sig.	(0.815)	not incl.		Not sig.	(0.157)	0.582	2.898		
DCPF	not sig.	(0.567)	not sig.	(0.499)	0.574	2.797	not sig.	(-0.468)	0.00	-4.02
DCPFL	-0.833	-4.720	-0.557	-3.005	-0.910	-4.269	-2.009	-4.755		
Adj. R^2	0.811		0.791		0.789		0.785			
D-W	1.691		1.741		2.277		2.249			
C-I	7.755		5.472		7.005		6.060			

Notes:
For sources and descriptions of variables see Data Appendix.
T-Ratios given in parentheses refer to variables which have been removed from the equation based on joint-hypothesis F-tests. The t-ratio given is the one obtained by the variable in its last stage of the general-to-specific removal process.

Voluntary savings appears to have behaved largely as predicted by the main saving theories. Transitory income has had a (strong) positive impact on savings, which seems to indicate that consumers in Singapore have consistently under-estimated the future development of (permanent) income in their forward-looking behaviour. The somewhat surprising negative coefficient of DGrowth and the frequent insignificance of Growth itself should not be over interpreted, because in practice the three distinct factors (Growth, DGrowth and the first difference of income) can not be clearly separated. Essentially these variables capture similar effects, namely transitory income developments and thus need to be considered one explanatory dimension. The combined effect of all income-effects in the regression models is pro-cyclical as theory would predict, i.e. deviations from the growth path affect savings in the same direction.

[388] Only the statistically significant models are shown. The other regression results are included in the Appendix CD-Rom.

As expected, the rising labour-force ratio has positively helped to raise the country's voluntary saving ratio. On the other hand, the effect of forced savings appears to have been largely driven by the substitution effect, lowering voluntary savings. While same-period changes in the CPF-rate, if found statistically significant, have positively affected voluntary savings, this effect is more than offset by the negative impact of the lagged variable.

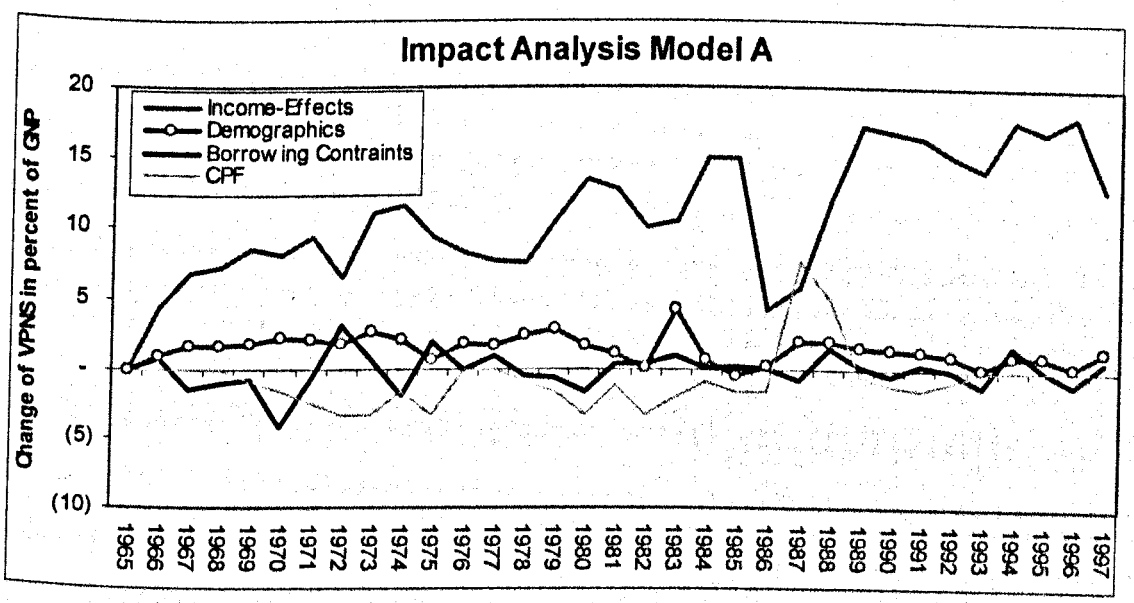
The interpretation of the effects of borrowing constraints, however, is more complicated due to the varied statistical behaviour of the respective variables, which in turn are driven by their distinct developments over time. On the one hand, domestically available credit as a percent of GNP (DocRat) has almost continuously risen, overall by a factor of 4.25 between 1965 and 1997. On the other hand, the share of credit absorbed by the public sector has risen as well and thus the share of credit available to the private sector as a percent of total credit available (PriDoRat) has fallen by over 30%. This means that overall credit available to private individuals as a percent of GNP (PriCrRat) only increased by a factor of 2.6 and less consistently then DocRat. The generally negative parameter for the first differences of DocRat therefore indicate that increases of credit available to the domestic economy in average lowered the savings ratio, or in other words lower borrowing constraints led to lower savings. Given the country's demographic composition this should not be surprising. It makes intuitive sense that a predominantly young population in their early life-cycle stages will use increasing amounts of domestic credit to increase their consumption. The positive coefficient for PrDoRat in Model D and the negative coefficient of PriCrRat in model B, however, seem to contradict this finding.

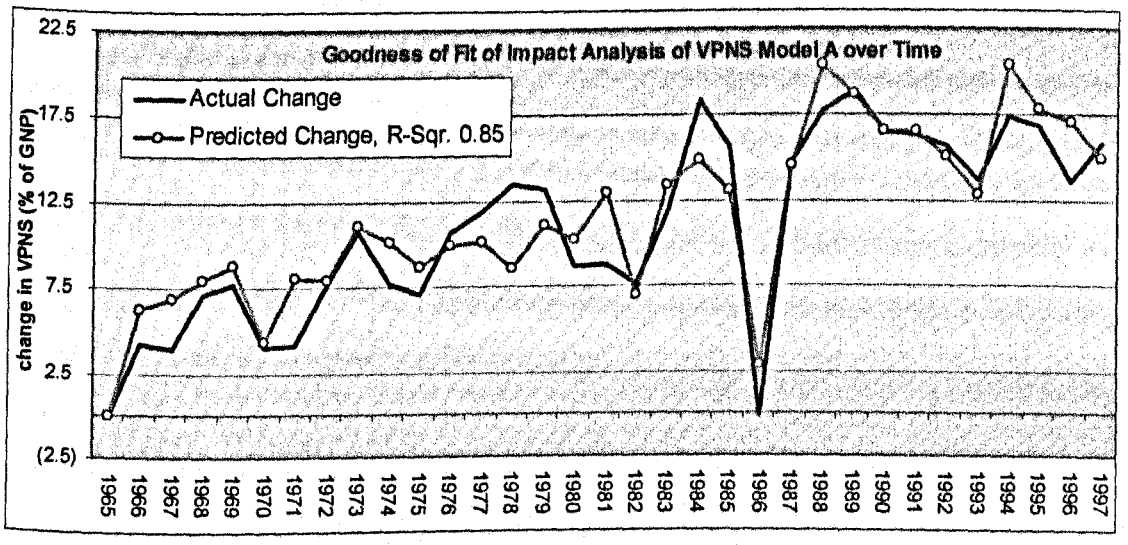
The current account balance is initially falling for Singapore, which indicates the increasing availability of foreign credit. In the latter half of the period, however, the current account becomes strongly positive. The negative coefficient for CABal, which itself is the negative of the current account balance, shows that savings have in average moved parallel to the development of the current account balance. If we accept the current account balance as a measure of foreign borrowing constraints

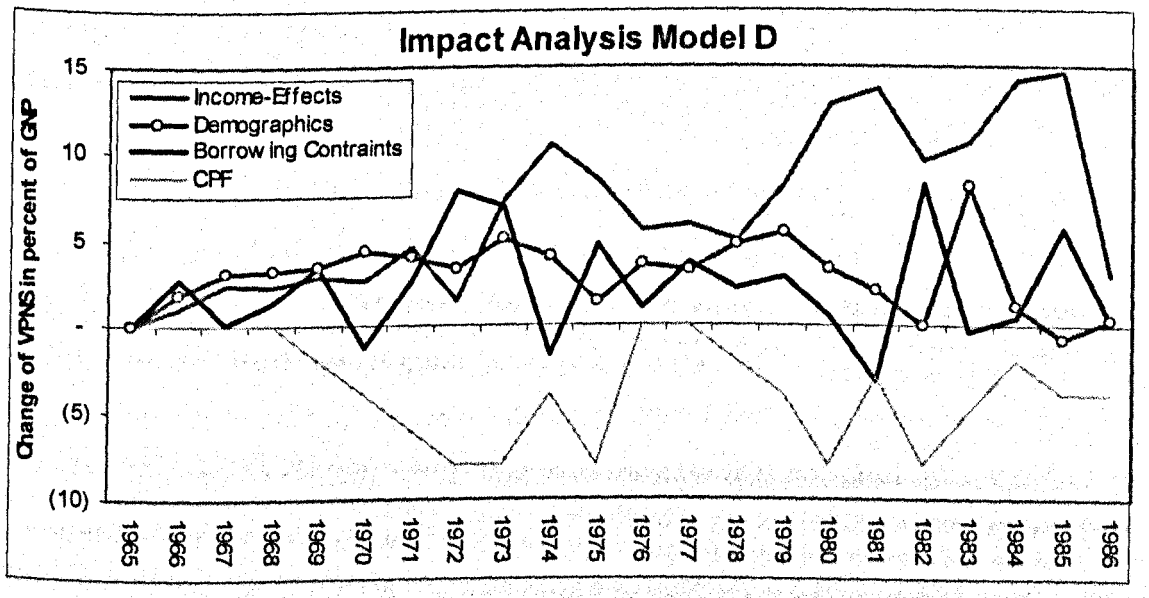
this would indicate that the increasing availability of foreign credit in the 1970s has lowered voluntary savings, while falling foreign credit in the latter half has helped savings.

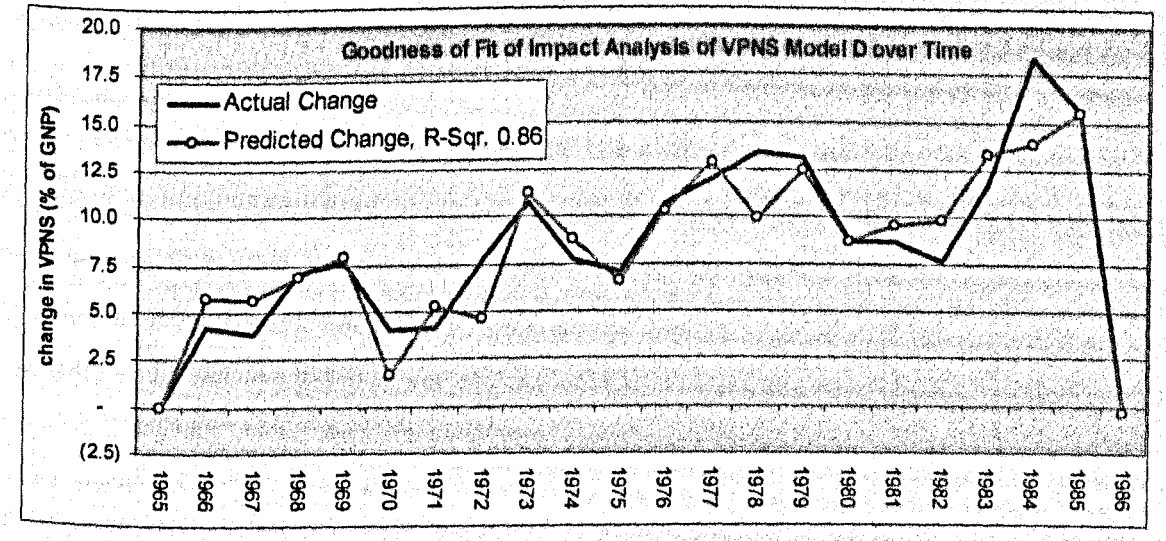
Overall, the effects of domestic and foreign borrowing constraints cannot be determined in a robust manner, since the analysis largely depends on which variable happens to remain in the final general-to-specific model. Based on the impact analysis of the statistically significant models the developments among the different borrowing constraint factors seem to have in balance added positively to the voluntary saving transition in Singapore. However, their developments are not uniform and thus it is impossible to determine with certainty whether increasing borrowing constraints or falling borrowing constraints or even income developments captured possibly by the Current Account Balance have achieved this effect.

Graphs II.5.5. a-d: Impact Analysis




Goodness of Fit of Impact Analysis of VPNS Model A over Time
Actual Change
Predicted Change, R-Sqr. 0.85
change in VPNS (% of GNP)
22.5
17.5
12.5
7.5
2.5
(2.5)
1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997


Impact Analysis Model D
Income-Effects
Demographics
Borrow ing Contraints
CPF
Change of VPNS in percent of GNP
15
10
5
-
(5)
(10)
1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986


Goodness of Fit of Impact Analysis of VPNS Model D over Time
Actual Change
Predicted Change, R-Sqr. 0.86
change in VPNS (% of GNP)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
-
(2.5)
1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986

The sensitivity analysis is not able to contradict these findings. However, it sheds light on a number of other issues. Firstly, the inclusion of other income measures results in weaker models with lower R-squareds and serial correlation of the residuals. However, they also affect the significance of other variables, which is difficult to interpret because there is no a priori best income measure. Generally, for the analysis of voluntary private saving wages seem to be the most appropriate. However, since corporate and household saving can not be separated in Singapore's case, this rationale does not necessarily apply. Nevertheless, statistically they remain the most meaningful variable.

Adding the first differences of the public saving rate (DPuNSRat) to model A in order to test the effect of public on private saving proves to be statistically significant with a negative coefficient of -0.248, i.e. if government saving increases by 1% of GNP then VPNS falls by 0.25%. Therefore, Ricardian Equivalence does not appear to hold fully, but some offsetting behaviour seems to have taken place. In other words, public saving must have had a positive net-effect on Singapore's national saving. However, it must be added that the Public Saving Rate (PuNSRat) itself is not able to add to the model and that even DPuNSRat is not significant for the early part of the period, which seems to indicate that not until the latter half of the period did private individuals take the government's saving pattern into consideration.

Substituting the CPFrate with the effective CPF-rate improves the model for 1966-86 (Model E), but also leads to a higher degree of multi-collinearity and the potential danger of over-identifying the regression equation because CPFeff is very close to the Forced National Saving Rate (FNS). If the effective CPFrate is used for whole period models the serial correlation of the residuals is quite high, which indicates that CPFeff does not seem to capture developments after 1986 very well.

The inclusion of the real interest rate (R) also proves to be significant (Model F) if tested for the whole period 1968-97. Higher interest rates have led to higher

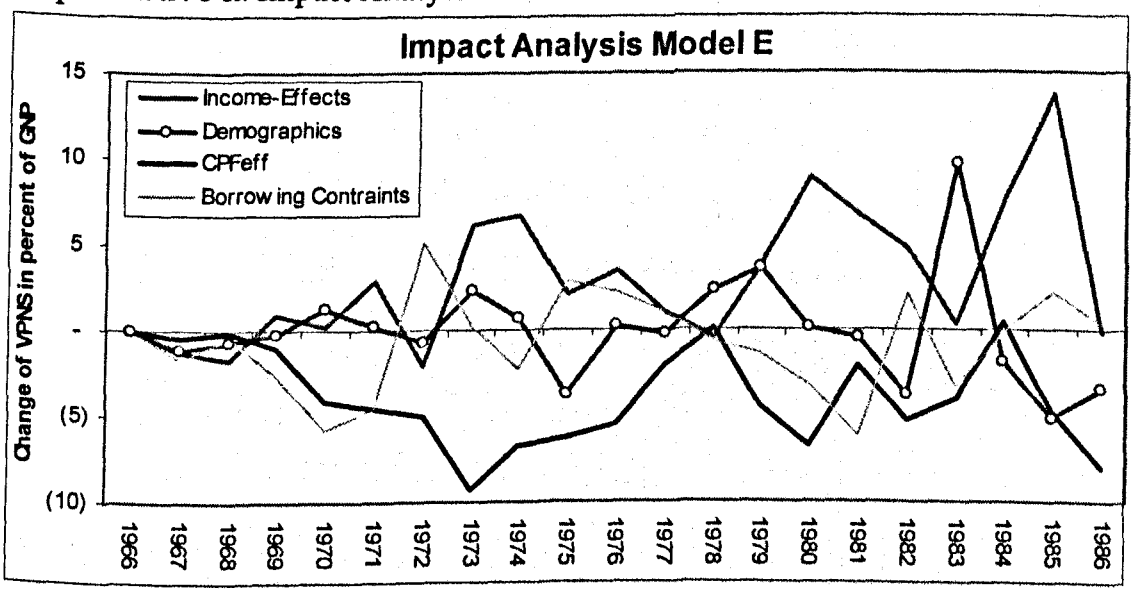
voluntary savings as basic economic theory would predict. However R is not significant in models which relate to 1968-86 only, which seems to indicate that the inclusion in the whole period model must be largely driven by developments in the latter half of the period and thus casts doubt over the inclusion of R in the full period regression in the first place.

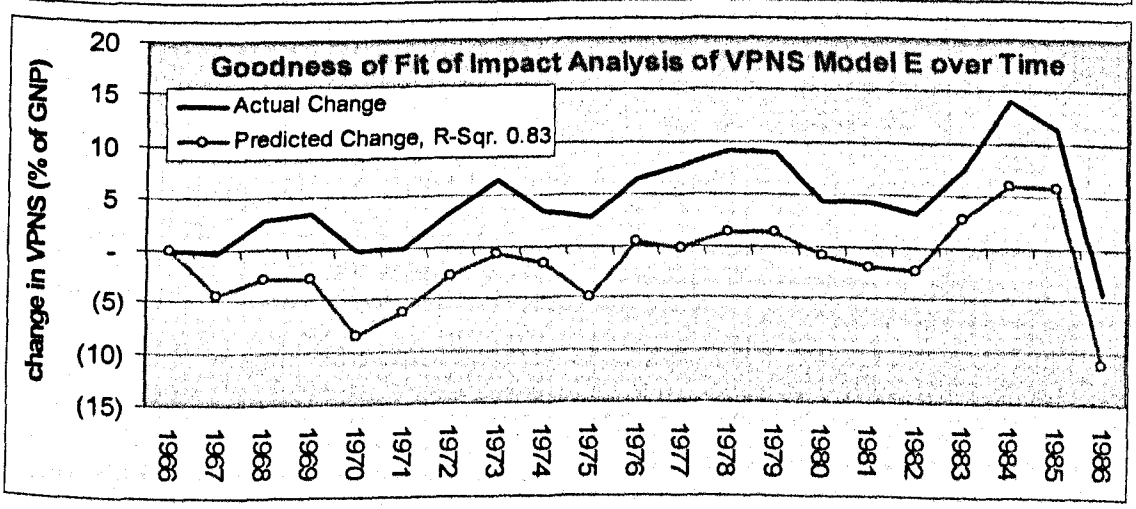
Changes in the population's average life-expectancy were not able to significantly add to the regression.

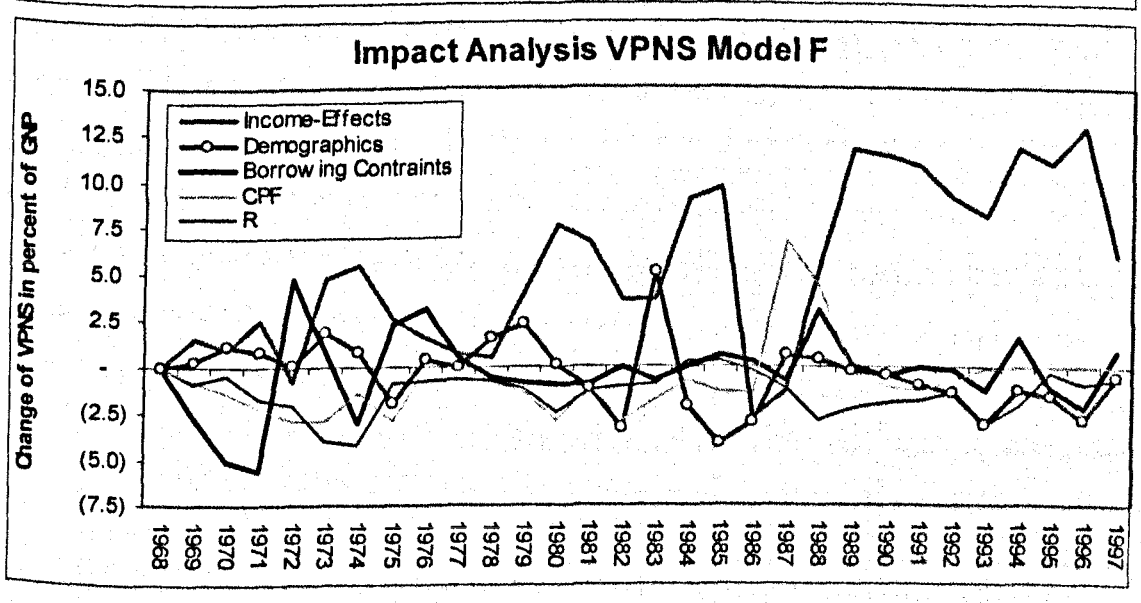
Table II.5.5.b: Voluntary Private Savings

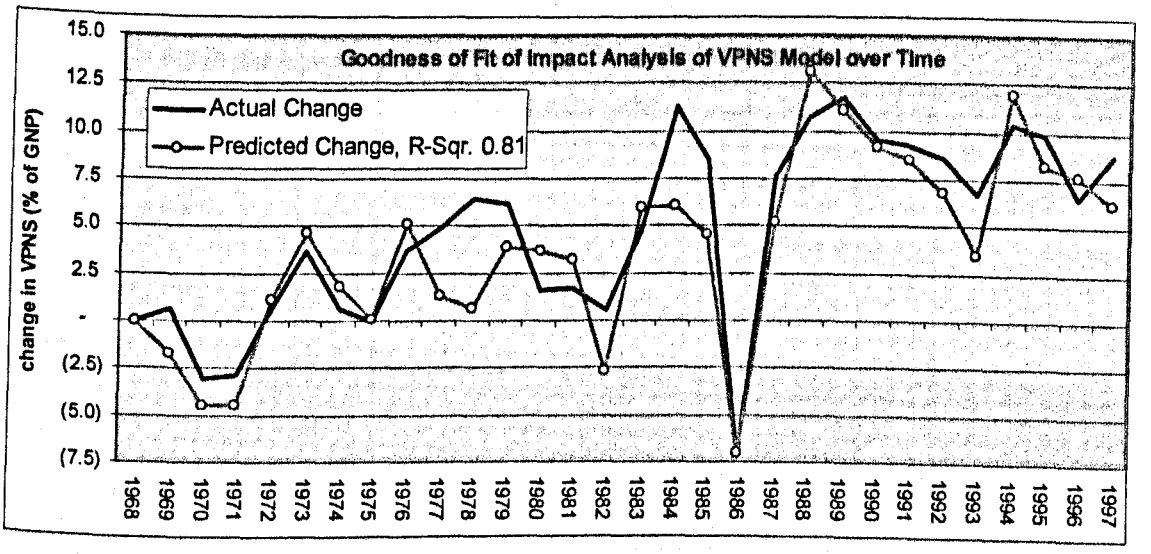
	Model E 1966-86		Model F 1968-97		Impact 1966-86	Impact 1968-97
	Coefficient	T-Ratio	Coefficient	T-Ratio	Model E	Model F
Constant	12.542	6.132	3.999	2.919		
Growth	not sig.	(0.222)	0.358	2.113	-0.14	6.06
DGrowth	-0.937	-5.596	-0.678	-4.810		
DNWage	6.726E-2	4.044	8.559E-2	9.965		-0.72
R	not included		0.391	2.600		
DDep	1.255	1.797	not sig.	(-0.286)	-3.40	-0.55
DLabrat	3.053	6.573	1.890	3.489		
DCaBal	-0.245	-3.918	-0.193	-2.845	0.38	0.78
DDocCrRat	-0.450	-4.920	-0.248	-2.911		
DPrDoRat	-0.103	-4.109	-5.06E-2	-2.155		
DPriCrRat	not sig.	(0.147)	not sig.	(0.726)		
DCPF	not included		not sig.	(1.019)		
DCPFL	not included		-0.736	-4.629	-8.01	0.00
DCPFeff	not sig.	(0.777)	not included			
DCPFeffL	-2.734	-6.740	not included			
DLife	not included		not sig.	(0.520)		
Adj. R^2	0.872		0.897			
D-W	1.977		1.965			
C-I	15.774		9.464			

Graphs II.5.5. e-h: Impact Analysis









As discussed in the methodological section one could argue that the inclusion of the CPF-rate, which is correlated with FNS, leads to an over-identified system. Therefore, the general-to-specific process was re-run with NWage, RWage and RYPC respectively but without CPFrat in the initial set of independent variables. CPFrat was only added after joint-hypothesis F-tests had determined the final equation with significant variables only. This procedure led to a number of very strong models even without CPFrat, but adding the CPF-rate in the final step was always significant. The findings of the full models in respect to the effects of the respective explanatory dimensions were not contradicted. Therefore, potential over-identification does not appear to have affected the findings. Table II.5.5.c. offers the results.[389] Particularly, Model G is of statistical interest due to its combination of parsimony, good diagnostics and yet still the inclusion of all explanatory dimensions.

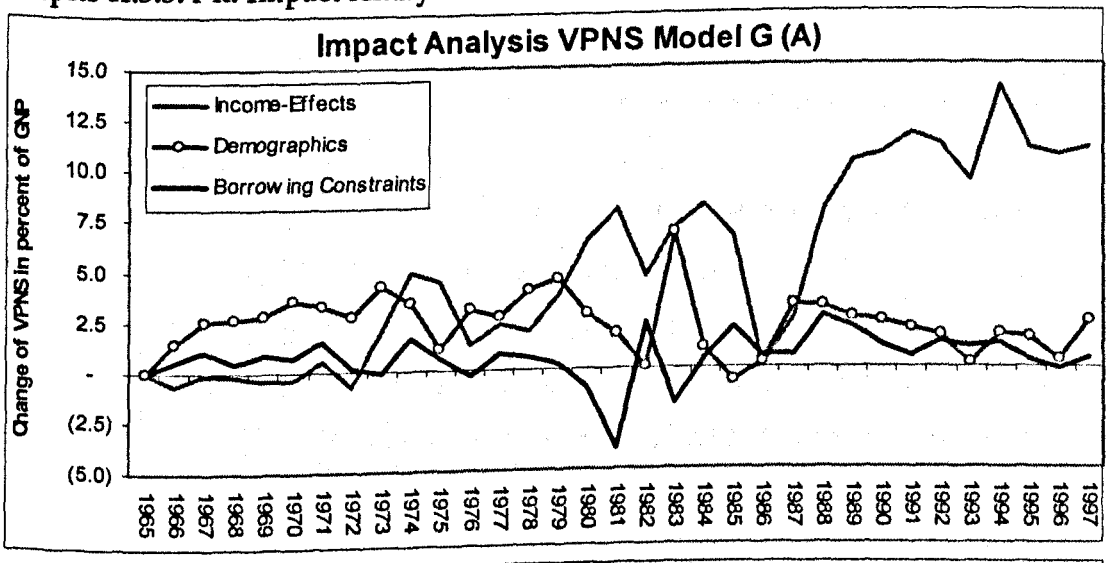
[389] As a side product of this exercise, it also becomes apparent how different income measures can influence the outcome of the general-to-specific selection process.

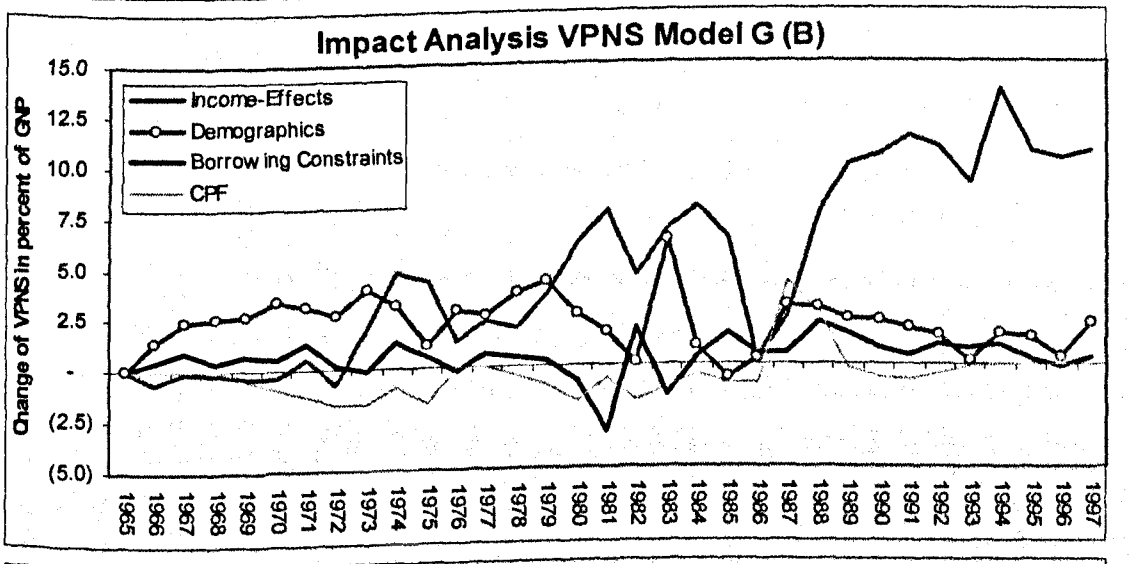
Table II.5.5.c: Voluntary Private Savings

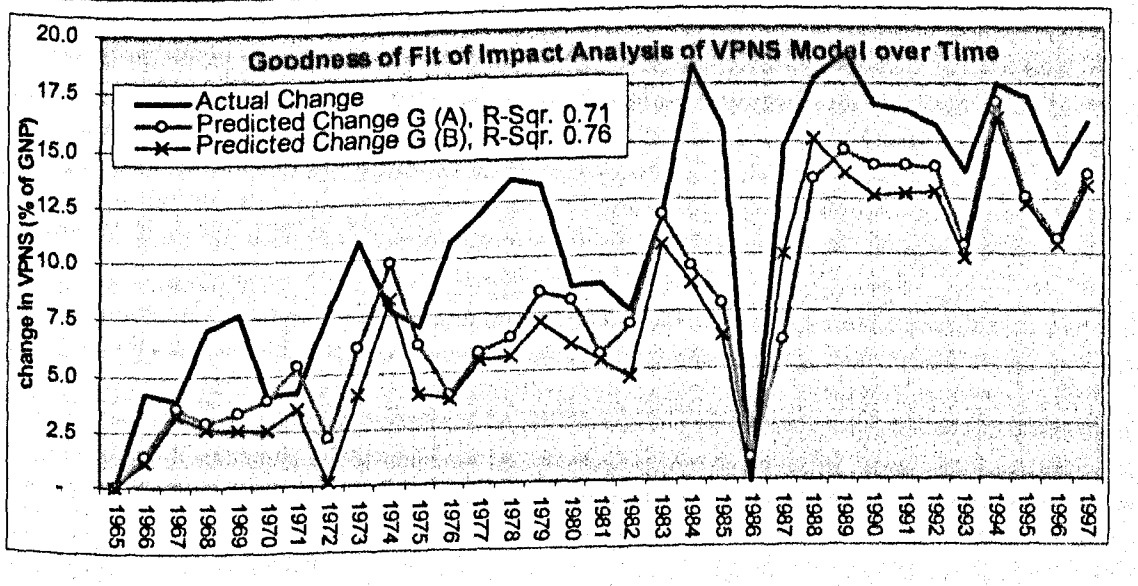
	Model G 1965-97		Model H 1965-97		Model I 1965-86		Model J 1965-97	
	A	B	A	B	A	B	A	B
Constant	6.487	7.032	10.156	12.422	2.584	5.864	11.256	11.561
Growth	not sig.	not incl.	0.438	not sig.	0.548	Not sig.	not sig.	not incl.
DGrowth	not sig.	not incl.	-0.669	-0.611	-0.864	-0.553	-0.939	-0.921
DNWage	8.706E-2	8.50E-2	not incl.	not incl.	not incl.	Not incl.	not incl.	not incl.
DRWage	not incl.	not incl.	4.849E-2	5.019E-2	9.117E-2	8.061E-2	not incl.	not incl.
DRYPC	not incl.	not incl.	not incl.	not incl.	not incl.	Not incl.	4.257E-3	3.797E-3
DDep	not sig.	not incl.	2.407	1.785	not sig.	Not incl.	1.827	1.589
DLabrat	1.493	1.401	2.591	2.456	2.217	2.381	1.830	1.272
DCaBal	not sig.	not incl.	-0.239	-0.283	-0.184	-0.180	-0.223	-0.266
DDocRat	-0.175	-0.141	-0.189	-0.151	-0.247	-0.228	not sig.	not incl.
DPrDoRat	not sig.	not incl.	not sig.	not incl.	-8.24E-2	-5.86E-2	not sig.	not incl.
DPriCrRat	not sig.	not incl.	not sig.	not incl.	not sig.	Not incl.	-0.295	not sig.
DCPF	not incl.	not sig.	not incl.	0.574	not incl.	0.508	not incl.	0.427
DCPFL	not incl.	-0.452	not incl.	-0.910	not incl.	Not sig.	not incl.	-0.906
Adj. R^2	0.684	0.725	0.672	0.789	0.797	0.697	0.699	0.802
D-W	1.946	1.821	1.997	2.277	1.677	1.946	1.969	1.299
C-I	3.657	3.878	8.618	7.005	8.753	4.853	7.128	7.274

Overall, the sensitivity analysis supports the findings about effects of the respective explanatory dimensions derived from the initial general-to-specific regression procedure, even though individual models might not be fully robust, i.e. other significant models with a different set of independent variables can still be found. But in all models short-term dynamic effects, particularly transitory income, can 'explain' over 60% of the variance of voluntary private saving in Singapore between 1965-97. Wages seem to be - at least statistically - the best income measure, resulting in the most significant models. CPF has generally had a negative effect, while demographics have a particular strong positive impact in the early years, where income and CPF are not yet as strong. On the other hand, the effects of borrowing constraints remain more contradictory and less statistically robust.

Graphs II.5.5. i-k: Impact Analysis







II.5.6. Compulsory Private Saving

Modelling the compulsory saving rate only with the CPFrate as a single explanatory dimension results in a very good r-squared but at 0.835 also a very low Durbin Watson statistic, which indicates that the model is yet mispecified. Moreover, the vector does not cointegrate since its residuals are not stationary. Adding the monthly CPF contribution ceiling does not improve the model significantly. A complete model, on the other hand, with the CPF rate, the CPF ceiling, the labour force ratio, domestic credit ratio and real wages results in a model with a condition index of 592 and tolerance indicators of below 0.25 for any of the theoretically independent variables.

The only statistically half-acceptable model incorporates borrowing constraints and real-wages next to the CPF contribution rate (Model A).[390] The static components are all highly significant and the DOLS regression vector cointegrates, at a decent Durbin-Watson statistic but some degree of multi-collinearity. This would suggest that the Singapore government has taken domestic borrowing constraints and wage developments into consideration when setting a specific compulsory saving target. However, this potential finding is highly sensitive due to the multi-collinearity problem, which does not only affect the reliability of the estimates but in this case also substantially affected the model building algorithm.

Graphs II.5.6.a. and b show the impact analysis, which is able to visualise very well the fact that the model is largely driven by the level variables and is thus not as good in picking up short-term variation. Among the level variables the CPF-rate still has the by far dominant impact. Income levels are negative but dynamic effects are positive, in other words transitory income leads not only to more voluntary but also

[390] Neither the dependency nor the Labour Force ratio did prove to be significant and were thus not included in the regression equation of Model A. The CPF ceiling is highly correlated with the CPFrate and needed to be removed in order to reduce the multi-collinearity within the equation to an acceptable level. The correlation is not surprising since the government regularly changed the ceiling in line with changes to the contribtuion rate.

to more compulsory savings and increasing income seems to lower it.[391] The positive coefficient for the share of domestic credit as a percent of GNP (DocRat) seems to indicate that the CPF has absorbed parts of the increase in available credit, which in turn suggests that the government has used the CPF to 'mop-up' parts of the effects from the falling borrowing constraints.

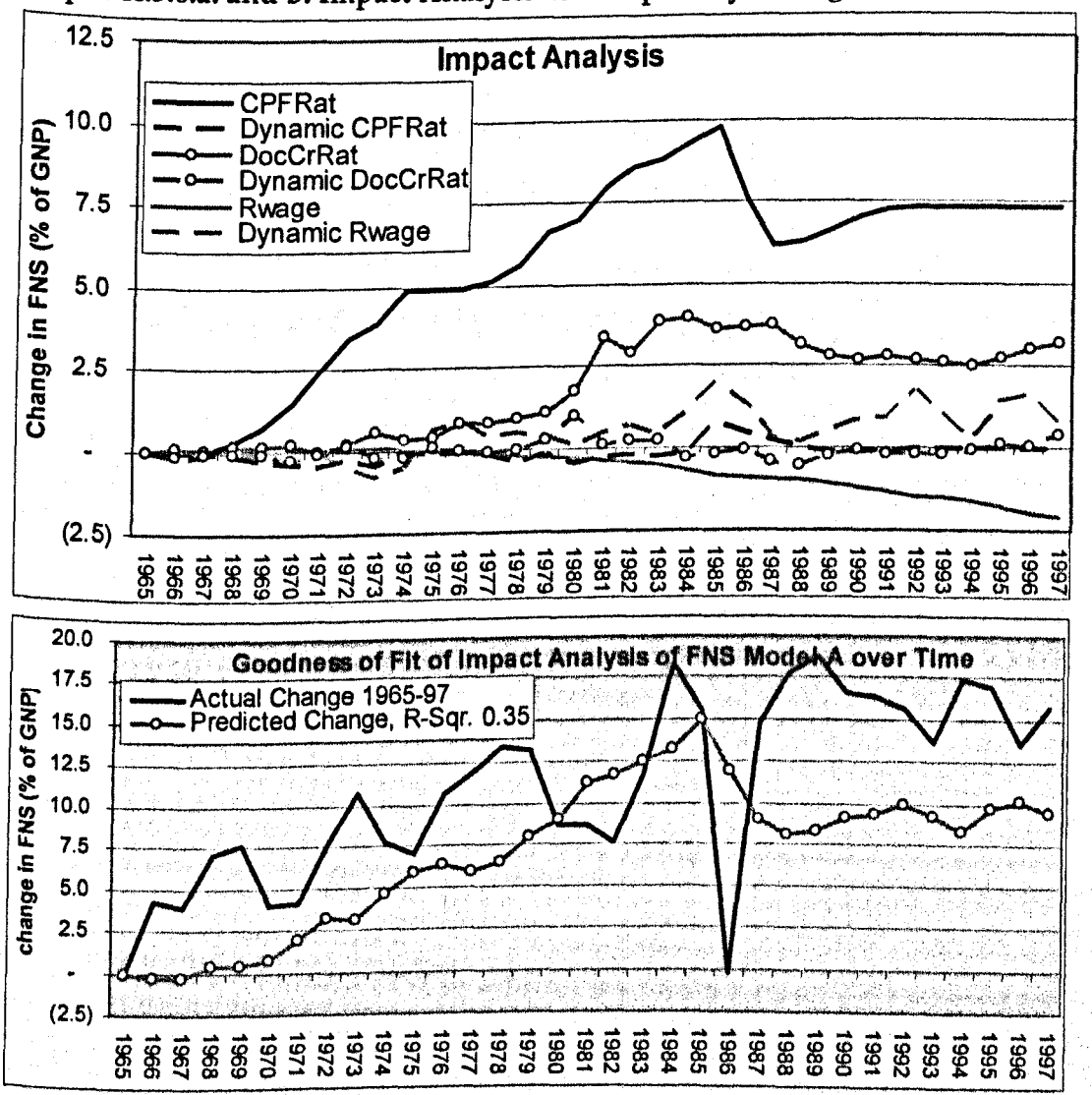
Table II.5.6. Compulsory Private Savings

	Model A 1965-97		Impact 1965-97
	Coefficient	T-Ratio	Model A
Constant	-0.786	-2.015	
CPFrate	0.245	14.351	7.35
DocCrRat	6.100E-02	6.599	3.61
RWage	-1.56E-03	-4.383	-1.43
DCPF	2.863E-03	0.073	
LDCPF	-8.70E-02	-2.061	
DCPFL	-2.59E-02	-0.638	
DDocRat	1.812E-02	0.950	
LDocRat	3.340E-02	2.543	
DDocRatL	-7.28E-04	-0.095	
DRwage	-1.56E-03	2.978	
LDRWage	-3.83E-03	-1.961	
DRWageL	1.143E-02	3.708	
Adj. R^2	0.991		
D-W	2.334		
C-I	28.171		

Notes:
For sources and descriptions of variables see Data Appendix.
The impact figures include the dynamic components of the respective variable.
Residuals are stationary, ADF test statistic = -5.88.

[391] In theory the statistical behaviour of the income components would be in line with the permanent income hypothesis. However, the PIH does not deal with compulsory saving. The negative coefficient for the static income component probably stems from the fact that rising income levels lower the share of forced saving in GNP.

Graphs II.5.6.a. and b: Impact Analysis of Compulsory Saving Rate



In summary, it must be said however that no fully satisfactory econometric model could be derived. But fortunately, the degree of compulsory private saving is by definition not driven by decisions of the private sector. Thus, there is essentially no need for a statistical model because saving for the CPF is fully determined by the rules governing the CPF. Assuming that the private individual or company has only very limited space to evade these rules, there are no behavioural patterns that need to be uncovered through econometrical means. FNSrat is clearly driven by the political decision setting the CPF contribution rules and the development of the

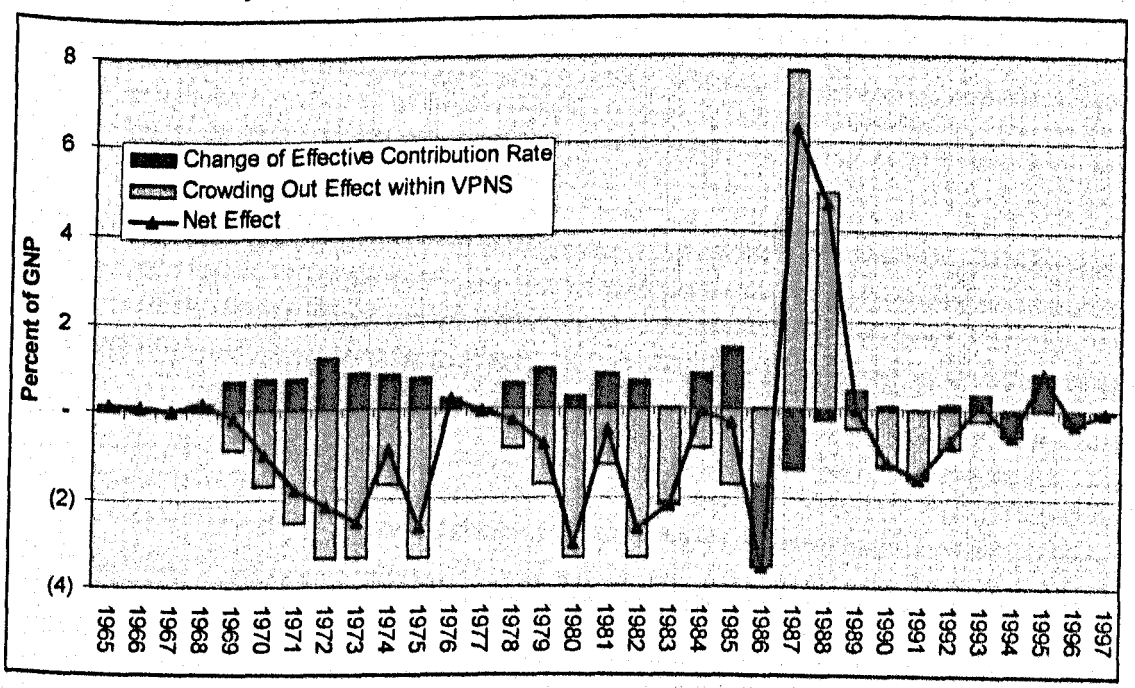
country's wages. Therefore, the compulsory saving rate can be determined by a simple formula:

$$FNSrat = CPFeff \cdot [Total\ Remuneration / GNP]$$

Where
CPFeff is the effective CPF contribution rate, which equals Total CPF Saving divided by Total Remuneration

The annual change in the effective contribution rate weighted by the respective year's wage share then gives us the saving effect achieved in the given year due to changes in the rules governing CPF contributions. Graph II.5.6.c. shows these annual changes in the effective CPF rate as a percent of GNP as well as the resulting crowding-out effects already determined econometricaly within the voluntary private saving aggregate (based on VPNS Model A above).

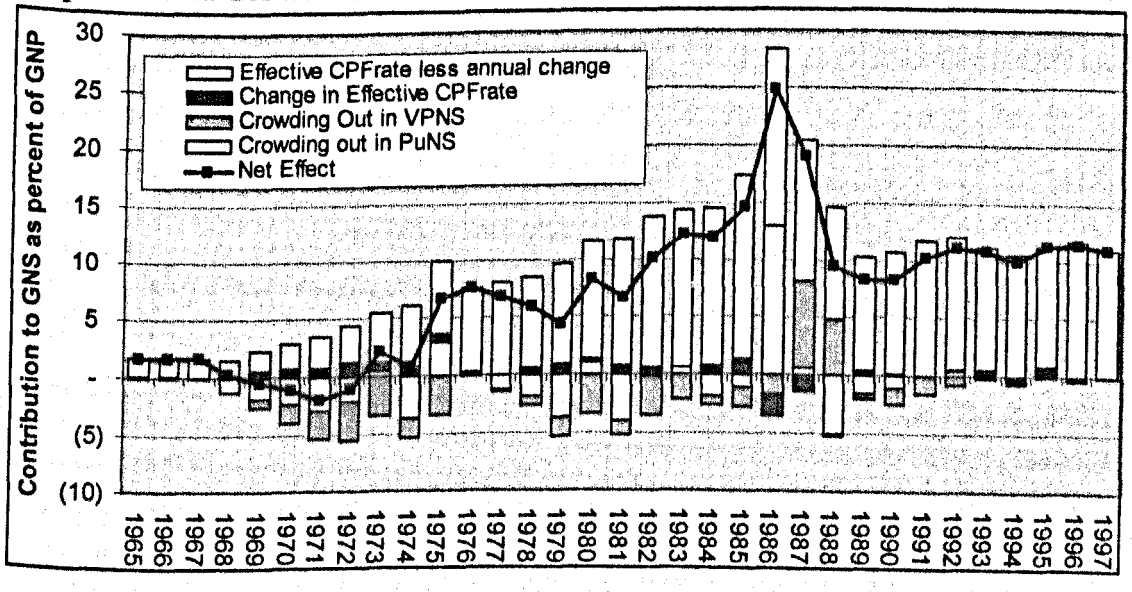
Graph II.5.6.c.: Dynamic CPF Effects on Gross-National Savings



What becomes visible are the negative net-effects of changes in the CPF-contribution rate. Apart from 1987/88, the dynamic CPF effects have generally been (over-) compensated by reductions in voluntary savings. Yet, if we do not only consider the

dynamic effects of the CPF, we can observe that in the long-term the compulsory saving rate increased by more than the crowding-out effects leaving a positive net contribution to the country's savings. Graph II.5.6.a. visualises this development. This positive net-effect must be due to long-term developments driving the CPF's annual contributions, such as the country's wages and employment as well as the fund's coverage and its monthly contribution ceiling. Particularly the fund's coverage developed very strongly due to an increase in waged employment. At independence about half of the labour force were active contributors to the CPF. By 1978 this share had increased to just under eighty percent.[392]

Graph II.5.6.d.: Contribution of CPF to GNS [393]



II.5.7. Gross Private Saving

Approaching the non-stationary Gross Private Saving (PNS) series with the same general-to-specific procedure as VPNS does not result in very good models. This is not too surprising because a large part of the variance of PNS must stem from the

[392] Huff (1994, p. 335)

[393] Based on Additive Model 1, which combines VPNS Model A and PUNS Model B – see section II.5.9.

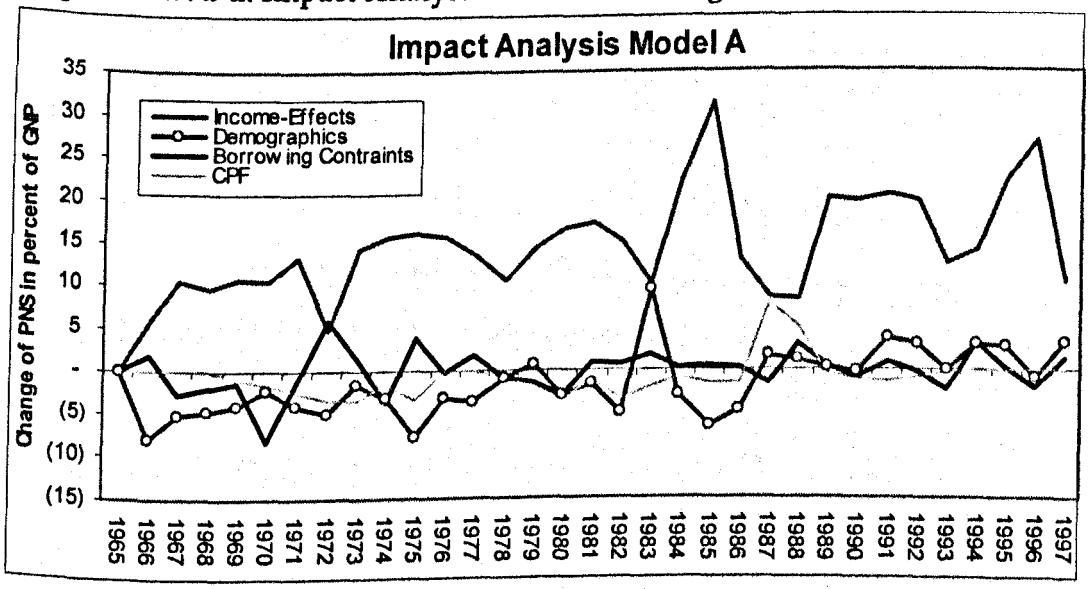
non-stationary FNS series, which as shown above requires the CPFrate to be modelled successfully. The CPFrate, however, can not be included in a stationary model due to its higher order of integration. Potential CPF influences can only be included through first differences, which are not able to adequately model the compulsory saving component in the private saving ratio.

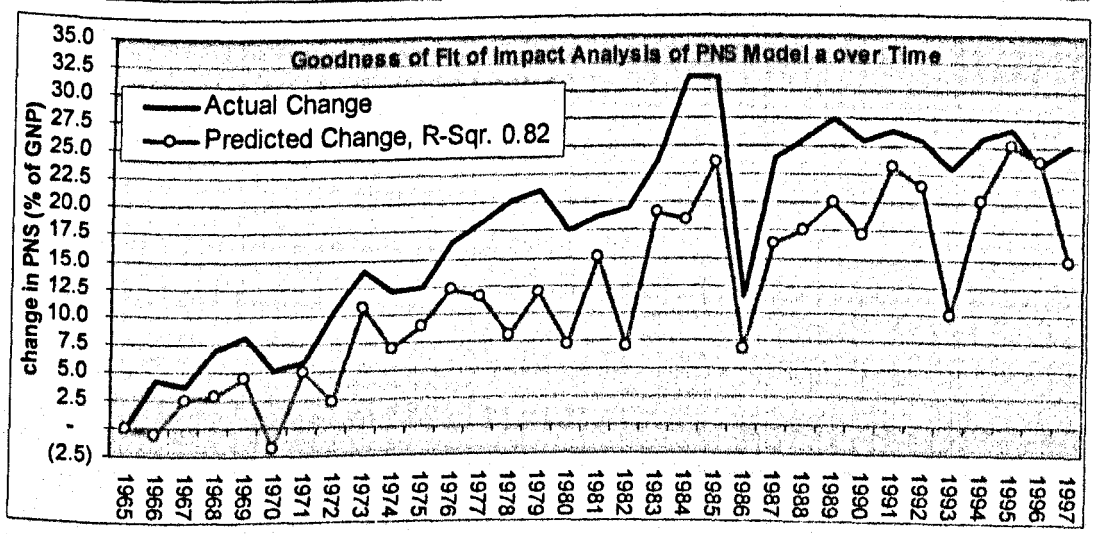
The only decent model for the whole period stemming from the general-to-specific procedure is one in which DCPF is able to survive the joint-hypothesis tests and remain in the final equation (Model A). This in turn is only possible if the influence of income is captured through the real wage series, which again goes to show how much the statistical results might depend on the choice made about the appropriate income variable. The only other statistically acceptable regression model incorporates the interest rates, restricts itself to the first part of the period and uses nominal wages as its income measure (Model B).

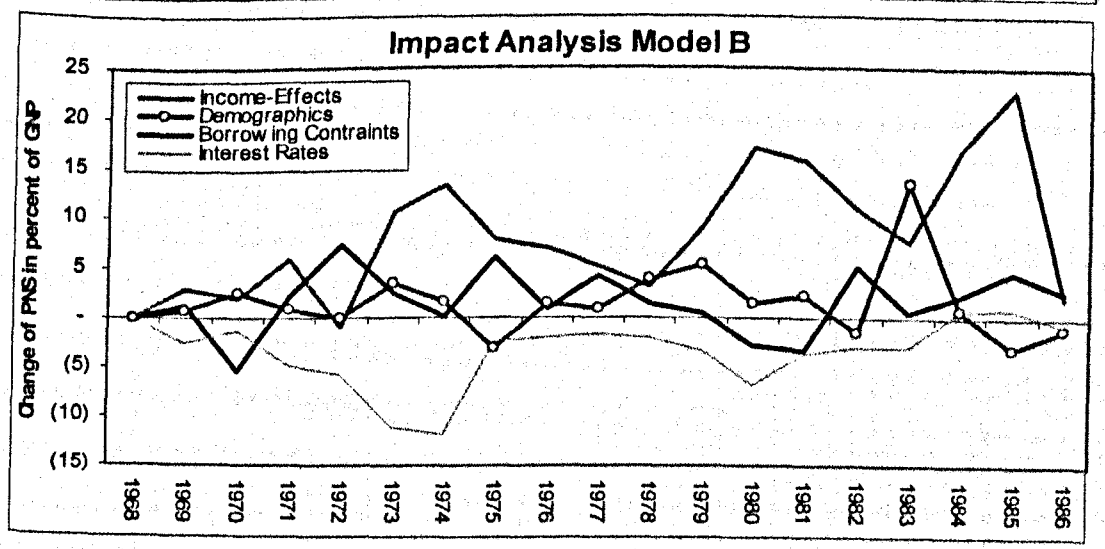
Table II.5.7. Gross Private Savings

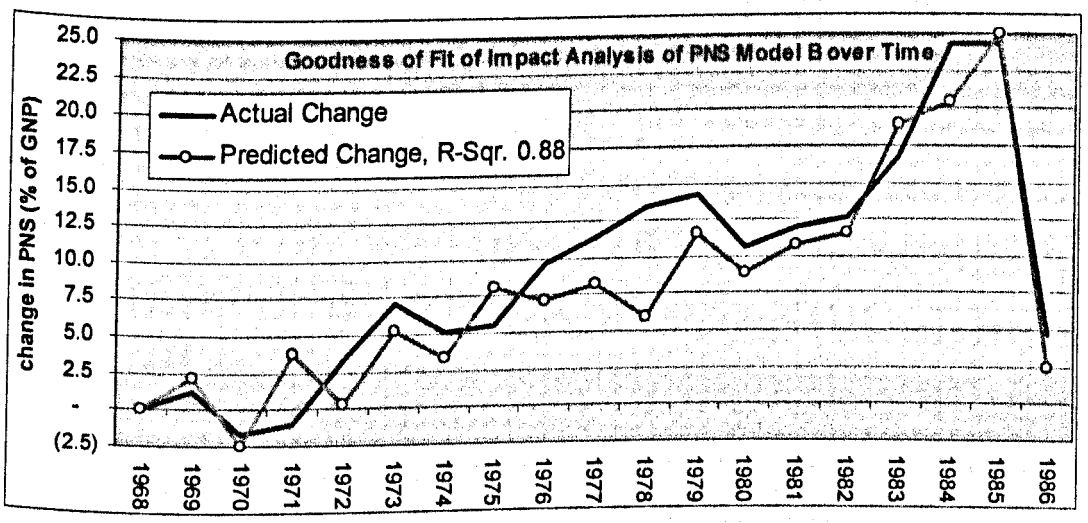
	Model A 1965-97		**Model B 1968-86**		**Impact 1965-97**	**Impact 1968-86**
	Coefficient	T-Ratio	Coefficient	T-Ratio	Model A	Model B
Constant	20.849	10.113	12.868	3.857		
Growth	not. sig.	(-0.276)	not. sig.	(0.013)		
DGrowth	-1.149	-4.767	-1.075	-3.482	10.41	1.94
DRWage	9.219E-2	3.792	not. included			
DNWage	not. included		0.144	4.555		
R	not. included		1.098	3.946	Not. incl.	-0.76
DDep	2.959	3.391	2.390	1.817	3.16	-1.24
DLabrat	3.282	3.762	3.417	3.396		
DCaBal	-0.427	-3.185	-0.401	-3.295	1.42	2.53
DDocCrRat	not. sig.	(-1.169)	-0.224	-1.868		
DPrDoRat	not. sig.	(0.260)	not. sig.	(0.561)		
DPriCrRat	not. sig.	(0.066)	not. sig.	(0.764)		
DCPF	not. sig.	(0.611)	not. sig.	(-0.824)	0.00	not. sig.
DCPFL	9.219E-2	3.792	not. sig.	(-1.093)		
Adj. R^2	0.775		0.840			
D-W	1.840		2.011			
C-I	6.470		11.713			

Graphs II.5.7. a-d: Impact Analysis of Private Saving Rate









If Public Saving rates are added to Model A in order to capture possible Ricardian Equivalence effects, DCPF drops out of the equation and the model's Durbin-Watson statistic indicates serial correlation of its residuals. Replacing the CPF-rate with the effective CPF contribution rate does not result in significant models.

Overall, the results are not too encouraging due to their high degree of sensitivity, which goes to show how weak and potentially misleading statistical models can be if sub-aggregates of the dependent variable have very distinct behavioural traits, which can not be incorporated into one regression equation. Fortunately, however, private saving is but the sum of voluntary and compulsory saving, which itself can be expressed in a simple formula. Therefore, another option to model private saving is available, which will not require us to model a non-stationary sub-aggregate with stationary means.

The investigation into the voluntary saving rate has yielded a number of acceptable and in their findings robust models, which combined with the compulsory saving rate should be able to adequately model Private Saving without the statistical pitfalls of a separate regression analysis of PNS. Graphs II.5.7. e through h offer a visual inspection of the 'additive' procedure to build a PNS model, using alternatively

models F and G (B) to capture the developments underlying the voluntary saving rate. Both VPNS-models are able to include all explanatory dimensions, have good diagnostics and cover the whole period.[394] G(B) could be considered the slightly superior model - at least from a statistical point-of-view - because it is able to do so with fewer independent variables. The effects of forced savings were split between effects stemming from the change in the effective CPF contribution rate and changes in income.[395]

The resulting models offer a very good fit. In fact, Model C's predicted change series has an R-squared of 0.93 with the actual change series and Model D an R-squared of 0.91, i.e. the additive equations are able to 'explain' over 90% of the variance in the change of the compulsory saving rate since 1965. As should be expected, after the inclusion of forced saving the CPF has overall added to private savings due to the CPF's level effects and because the crowding-out effects found in the voluntary saving aggregate were not complete. As a result, income has lost its dominant role and is overshadowed almost during the whole period by the CPF. Moreover, Model D would also consider demographics to have had a stronger influence in the saving transition than income until the early 1980s and even stronger then the CPF until the early 1970s. As a slight word of caution, it must be noted that both models almost constantly under-estimate the change in private national saving, although not by much and to varying degrees over time.

[394] Due to the inclusion of the real interest rate, which is not available before 1968, Model F loses the first three years.

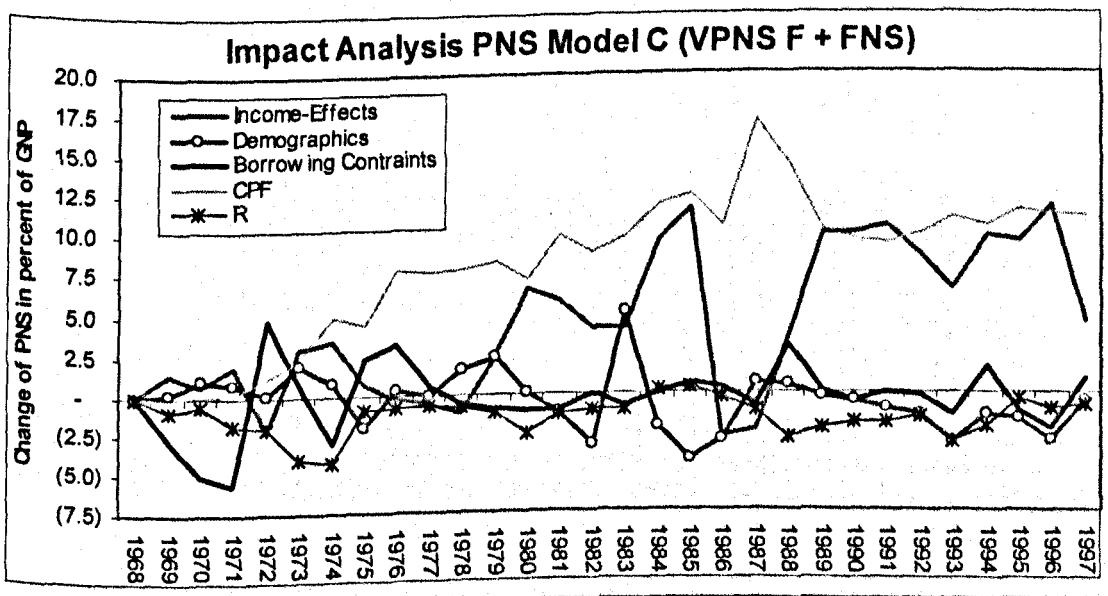
[395] Splitting the effect of changes in the forced saving ratio was accomplished by weighting the increase in the effective CPF contribution rate by the base year's share of remuneration in GNP. The remaining change in FNS must have been due to changes in income, either GNP or total remuneration. Mathematically:

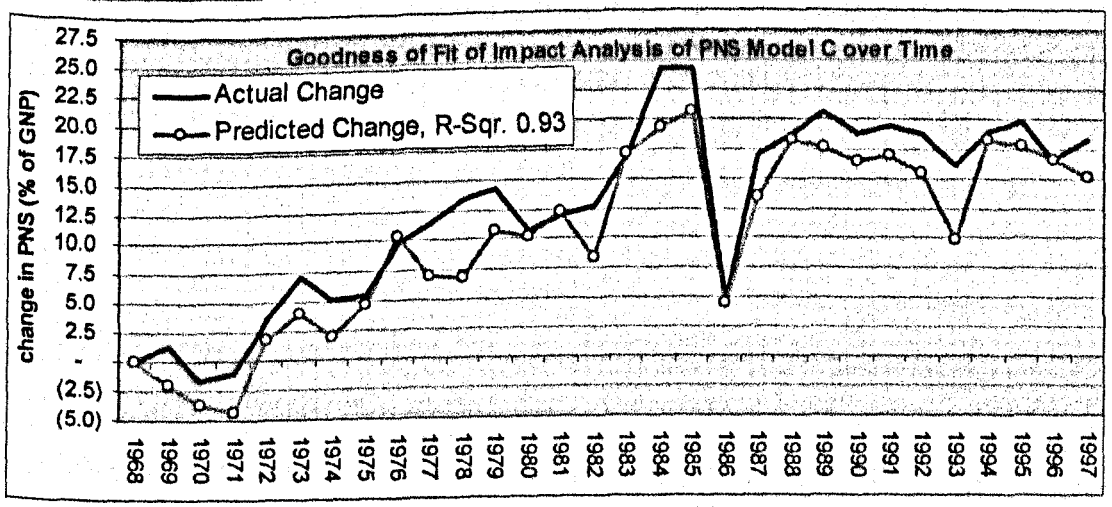
$$\text{Impact due to CPF} = [\text{CPFeff}(t) - \text{CPFeff}(t\text{-}1)] * \text{Share of Remuneration in GNP}(t_0)$$

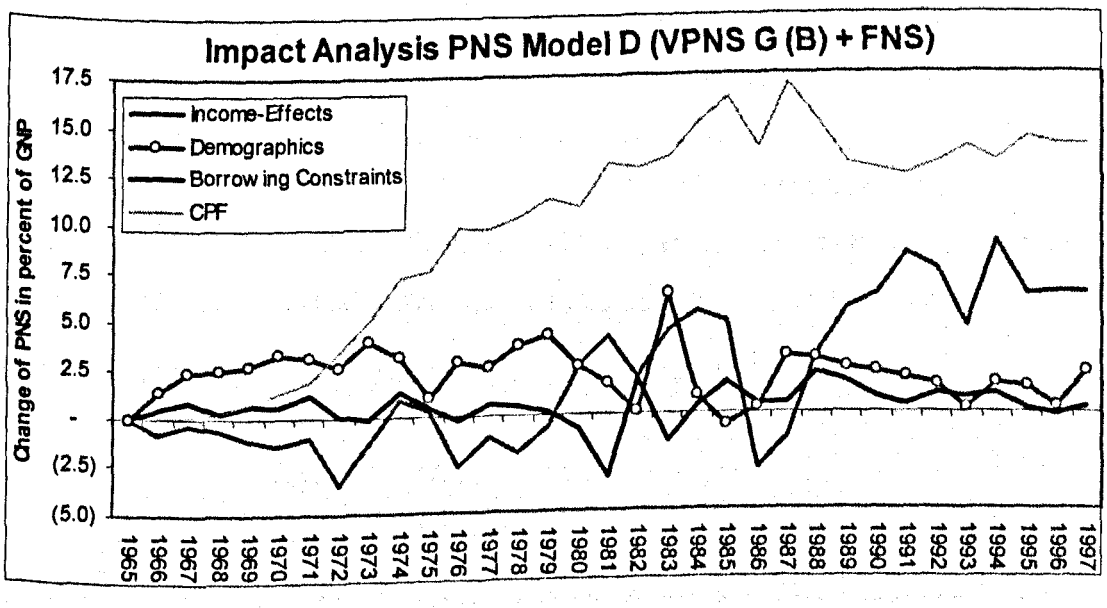
This exercise shows again that rising income has actually lowered the FNS-ratio, which was compensated by strong increases in the effective CPF-ratio. For example, in 1997 increases in the effective contribution rate have added the equivalent of 13.79% of GNP to FNS since 1965, while increases in income have lowered the share of compulsory savings in GNP by 4.42%, leaving a net-increase of FNS by 9.36% of GNP.

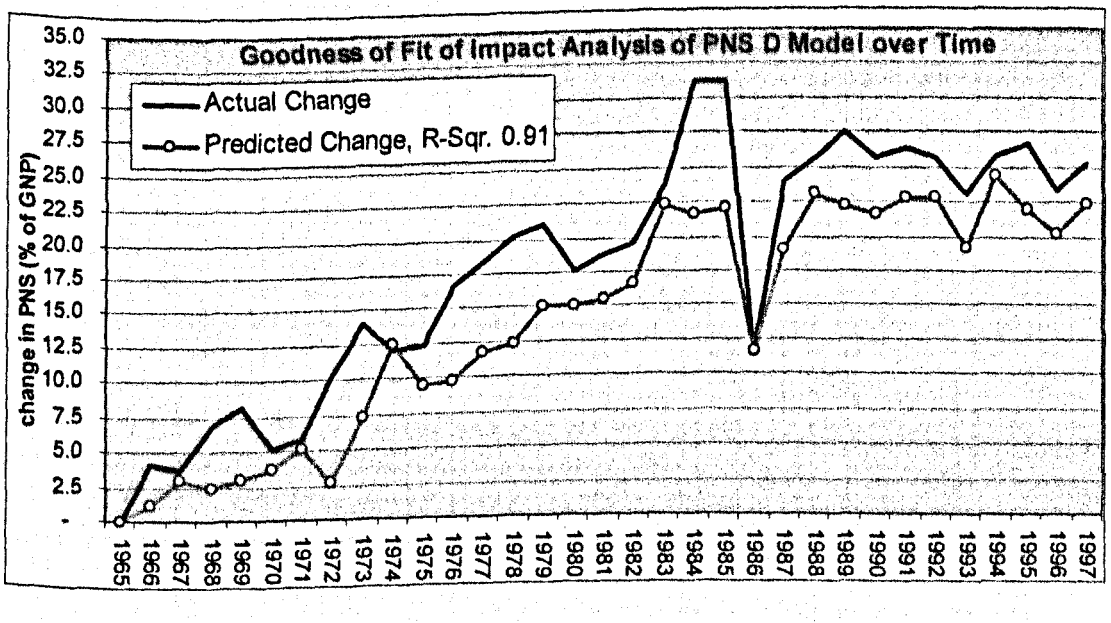
Compared to the DOLS regression analysis discussed above the additive models must be considered preferable because of their statistically more robust nature and because of their simple but mathematically correct way of dealing with a mix of stationary and non-stationary influences, which regression analysis struggles to capture.

Graphs II.5.7. e-h: Impact Analysis of Private Saving Rate









II.5.8. Gross Public Saving

The single dimension models, which were estimated in an initial stage and are described in this chapter's appendix (section II.7.) have shown that income developments by themselves can potentially 'explain' over seventy percent of the variance in the Public Saving Ratio. Based on the criterion of parsimony, these

models would be the most preferable. Yet analytically they are not necessarily the most 'true' because they do not consider a number of potentially influential factors. Therefore, it is necessary to investigate whether other dimensions in combination with each other could have together driven PuNS. Following the general-to-specific procedure already employed for VPNS and described in the methodological section, we find three statistically acceptable and rather robust models covering the whole period.

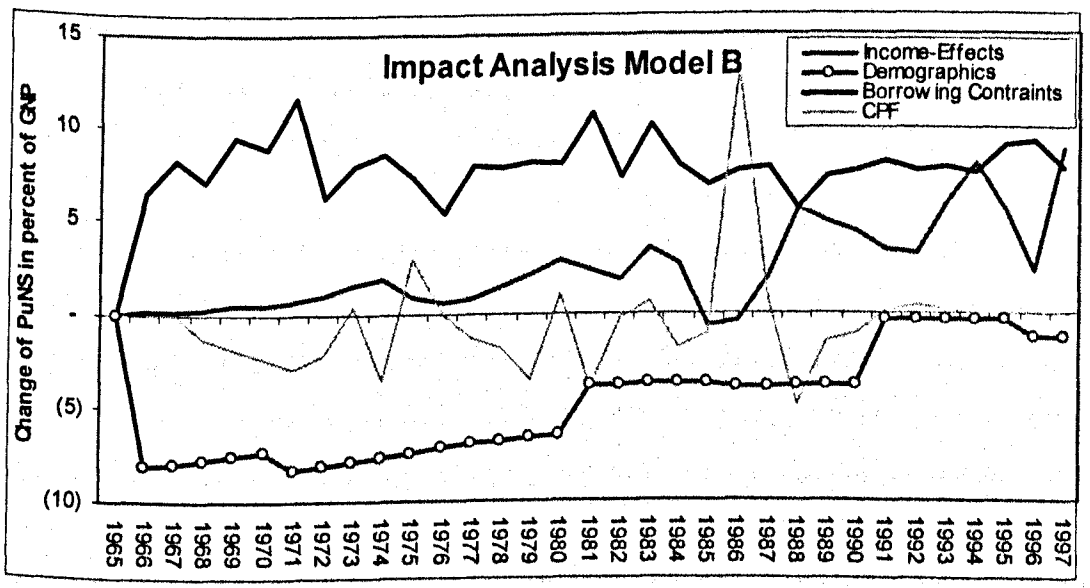
Table II.5.8.a. Gross Public Savings

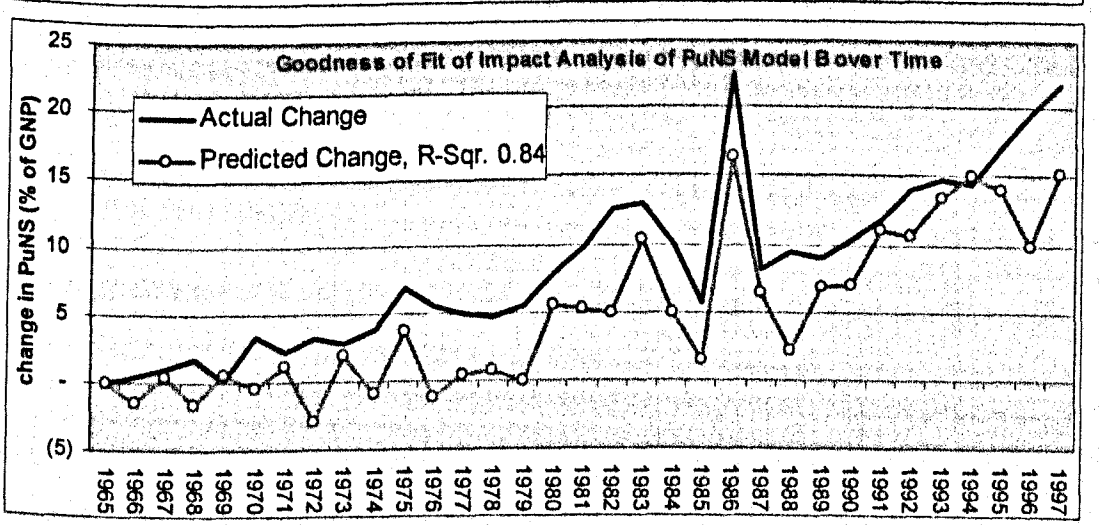
	Model A 1965-97		Model B 1965-97		Model C 1965-97		Impact 1965-97
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio	Model B
Constant	15.094	6.521	16.831	11.626	15.694	10.757	
Growth	not. sig.	(-0.045)	not. sig.	(-1.483)	-0.607	-3.206	
DGrowth	not. sig.	(0.848)	not. sig.	(-0.001)	not. sig.	(0.753)	8.72
DNWage	5.355E-2	2.720	not included		not included		
DYPC	not included		2.227E-3	3.355	4.243E-3	7.898	
DDep	1.478	1.864	2.138	4.064	Not included		-1.29
DLabrat	not. sig.	(-0.210)	not. sig.	(-0.391)	not. sig.	(-1.575)	
DCaBal	not. sig.	(-0.113)	not. sig.	(-0.339)	not. sig.	(0.172)	
DDocRat	0.241	2.245	0.283	2.908	0.247	2.363	7.70
DPrDoRat	7.254E-2	2.412	8.798E-2	3.434	6.537E-2	2.462	
DPriCrRat	not. sig.	(0.408)	not. sig.	(0.251)	not. sig.	(0.476)	
DCPF	-1.301	-5.136	-1.266	-5.469	-1.278	-5.023	
LDCPF	not. sig.	(-0.424)	not. sig.	(-0.814)	not. sig.	(-0.895)	0.00
DCPFL	0.575	2.473	0.738	3.257	0.607	2.412	
Adj. R^2	0.778		0.801		0.766		
D-W	1.825		1.822		1.925		
C-I	10.659		6.810		6.565		

The immediate result is that all main explanatory dimensions are found to be significant in a robust manner, i.e. contrary to our finding in the VPNS investigation it does not appear to matter which income measure is used for the significance of the other explanatory variables. However, with respect to the findings of the single dimension models different income measures are found to yield the best statistical outcomes if combined with further potential influences on public saving. The Single dimension investigation has found real per-capita income (RYPC) and real disposable per-capita income (Dispy) to be the statistically strongest income

variable. Yet, in the general-to-specific regression procedure these income measures lead to models with high Durbin Watson statistics, which suggest yet unmodelled influences.

Graphs II.5.8. a and b: Impact Analysis of Public Saving Rate





No matter which income measure is used, the developments of foreign borrowing constraints as captured by CABal and changes in the labour force ratio (LabRat) are never found to significantly contribute to the model. In contrast to regressions of the other saving aggregates, in case of public saving the dependency ratio is always the stronger variable. Additionally, once dependency is not included in the set of

variables growth becomes significant (Model C), while the labour force ratio is not able to take the place of the dependency ratio.

In terms of impact on the saving transition in Singapore, the separate investigation of public saving yields a number of striking results. Falling dependency is predicted to have actually lowered the government's saving, while falling borrowing constraints have raised it and rising CPF rates have had a negative impact. These results are consistent across the different models.

The negative impact of falling dependency burdens on public saving is difficult to explain. According to dependency theory, see for example Leff (1980), fewer younger and older age cohorts should lower the consumptive expenditures for education and social services and thus leave more government funds for investment purposes. On the other hand, a falling dependency burden might require higher consumptive expenses by the government in order to provide jobs for the rising labour force. Potentially, the negative impact of the falling dependency ratio can only be explained in connection with the similarly negative effect of the CPF. The government appears to have used CPF saving as an alternative source of funding for its investment decisions. In this line of argument, falling dependency burdens would have given the government a chance to raise compulsory saving through the CPF even further.

The positive impact of falling borrowing constraints is also very striking. Increases in credit available to the economy raised government savings, somewhat offset by a negative impact from a lower share of credit available to the private sector. This finding supports the story already included in the development of the private credit ratios. The government seems to have been able to absorb parts of the increasing amounts of credit injected into the economy into the government's own savings, for example through taxes and fees on consumptive economic activity which - as the VPNS investigation suggested - would have been stimulated by increasing amounts of domestic credit. In other words, while overall lower domestic borrowing

constraints have lowered voluntary savings, the government's own saving has been able to benefit from the increased consumption. This feedback effect can be found in both saving aggregates directly controlled by the government: public savings and private compulsory savings.

The sensitivity analysis does not alter these findings. Real interest rates and changes in life-expectancy are not statistically significant. The restriction of the time period to 1965-86 results in generally weaker models, except for B whose short period version (Model B2) is able to retain all its explanatory variables at roughly the same coefficients and with good diagnostics.[396] Therefore, Model B appears to be the strongest of the public saving models. The exclusion of the CPF-rate from Model B leads to growth taking CPF's place in the regression equation (Model B3) but at a substantially lower adjusted r-squared, which suggests that CPF is the stronger of the two variables and Model B the more appropriate replication of public saving.

Table II.5.8.b. Gross Public Savings

	Model B2 1965-86		Model B3 1965-97		Impact 1965-86	Impact 1965-97
	Coefficient	T-Ratio	Coefficient	T-Ratio	Model B2	Model B3
Constant	16.521	8.779	19.974	10.319		
Growth	not included		-0.559	-2.045	-0.67	5.09
DGrowth			not. sig.	(1.199)		
DNWage			not included			
DYPC	3.578E-3	2.081	2.202E-3	2.171		
DDep	2.333	3.522	2.046	2.459	-4.30	-1.24
DLabrat	not included		not. sig.	(-0.984)		
DCaBal			not. sig.	(-0.650)		
DDocRat	0.218	1.811	0.279	2.179	7.54	7.34
DPrDoRat	8.497	3.094	8.415E-2	2.454		
DPriCrRat	not included		not. sig.	(0.304)		
DCPF	-1.394	-5.903	not included		4.68	
LDCPF	not included					
DCPFL	0.884	2.110				
Adj. R^2	0.770		0.638			
D-W	2.309		2.131			
C-I	9.148		7.435			

[396] Model C loses the significance of some of its variables but still results in a diagnostically good model. Model A keeps all its variables but at a Durbin Watson statistic, which indicates unmodelled influences visible through the serial correlation of its residuals.

Generally, the fact that income alone is a good 'predictor' of PuNS can potentially hurt the robustness of the multiple-dimension models the most. If all is due to income, this will naturally change the results derived as an explanation for the saving transition substantially - particularly since income is not found insignificant in the general-to-specific approach, i.e. can't be proven to lose its importance once other influences are modelled as well. If indeed the answer that public saving was solely driven by income effects is the 'true' answer, the conclusions derived from the multiple dimension models will be wrong.

II.5.9. Additive OLS for Gross National Saving

The investigations into the underlying influences of separate saving sub-aggregates have shown that the same factor can have opposite effects in different segments of national saving. Therefore, running one regression, which averages these effects across the whole economy, might not be too sensible. In the worst case the regression will find the factor not to have had an effect significantly different from zero and thus conclude that it was not an important factor although the opposite is true. Additionally, given the fact that one of the sub-aggregates is non-stationary while the others are stationary, it is not likely that one GNS-regression will be able to statistically differentiate the various effects very well. Moreover, the innate multi-collinearity problem in the DOLS procedure, casts doubt over the accuracy of the obtained parameters. The additive procedure, if based on significant models of the individual sub-aggregates, must therefore be considered the more revealing and accurate approach.

The three strongest VPNS models, namely Model A, D and G(B), are combined to form the three respective additive models 1, 2 and 3 with the strongest models for the public saving ratio, Model B and B(2), and the mathematical derivation of the respective influences within the compulsory saving rate of the CPF-rate and income

developments.[397] Graphs II.5.9. a - d offer a visual assessment of the thus derived impacts of the individual explanatory dimensions. The additive models offer a very good fit. All three are able to 'explain' over ninety percent of the transition of the (adjusted) GNS-ratio since 1965.

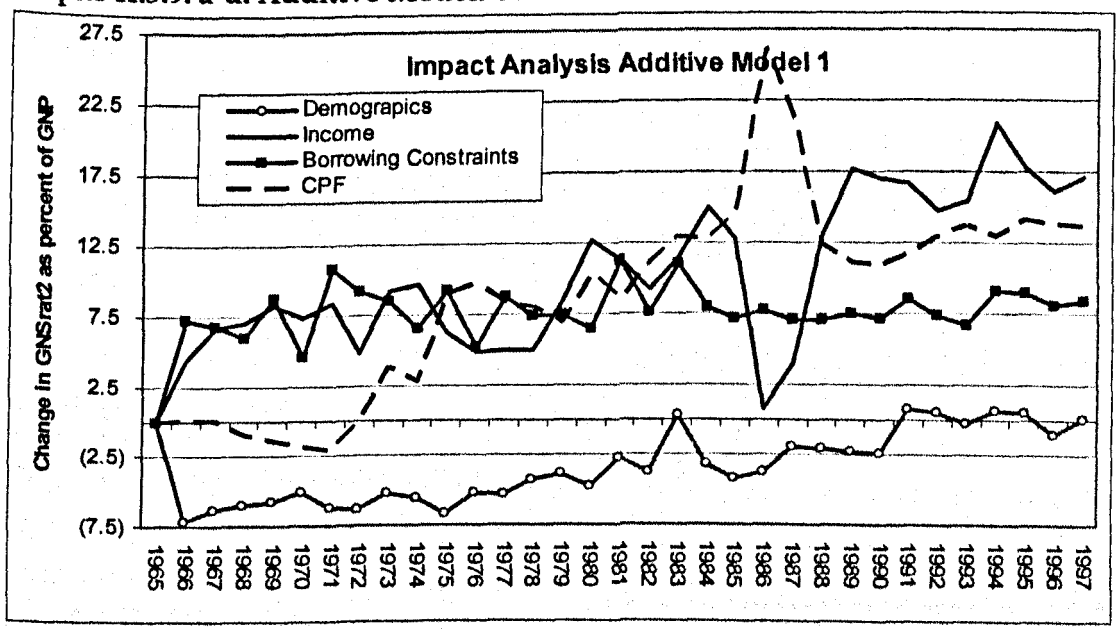
Most interestingly, the models offer quite separate and more differentiated insights into Singapore's national saving behaviour as compared to Agrawal's (2001) DOLS results, where the CPF rate was for the whole period the by far dominant force and the impact of income was almost linearly rising - see graph II.5.4.a. above. The additive models on the other hand, show much more fluctuation from year to year and a less than clear dominance by the CPF. At the end of the period the CPF and the country's income developments have done most about transforming Singapore's savings, followed by falling borrowing constraints and a more or less neutral overall effect of lower dependency burdens. However, over the whole length of the period this picture changes. Early on the CPF is predicted to have had a negative impact, which did not turn substantially positive until the mid-1970s. Falling dependency is also shown to have had a negative effect. While, on the other hand, falling borrowing constraints have had a rather constant positive effect from the very beginning of the period.

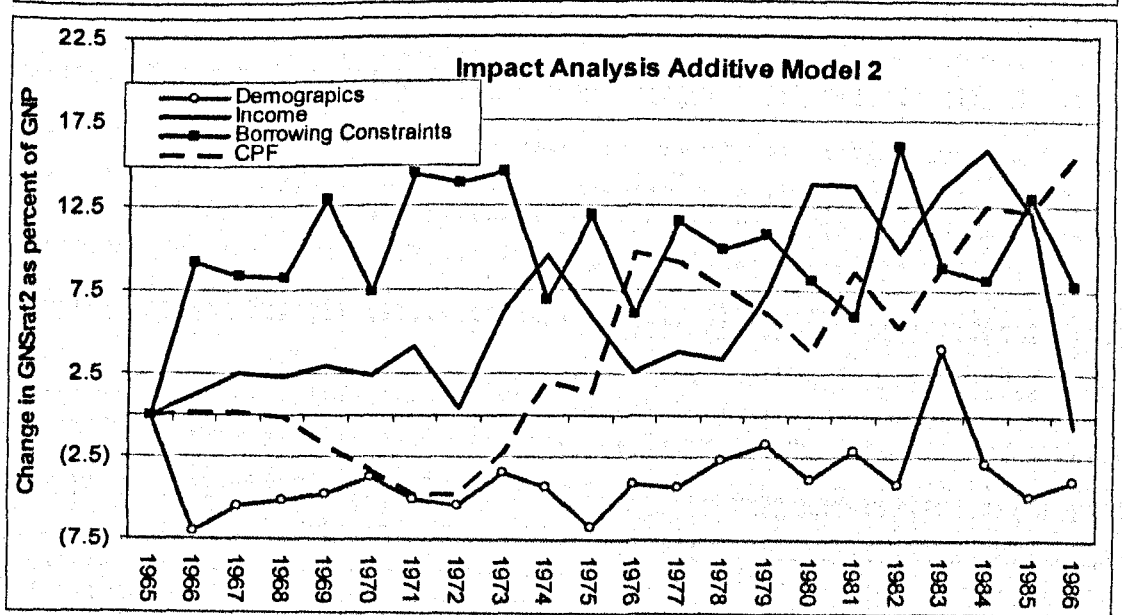
However, even within the additive model important individual developments can be over-shadowed. As Chapter One has argued, particularly the early transition appears vital to the understanding of Singapore's saving behaviour. During the late 1960s, voluntary private saving showed the strongest transformation, while public and compulsory savings remained largely the same (see graph II.4.3.b. above). As the VPNS investigation has shown this transformation within VPNS has largely

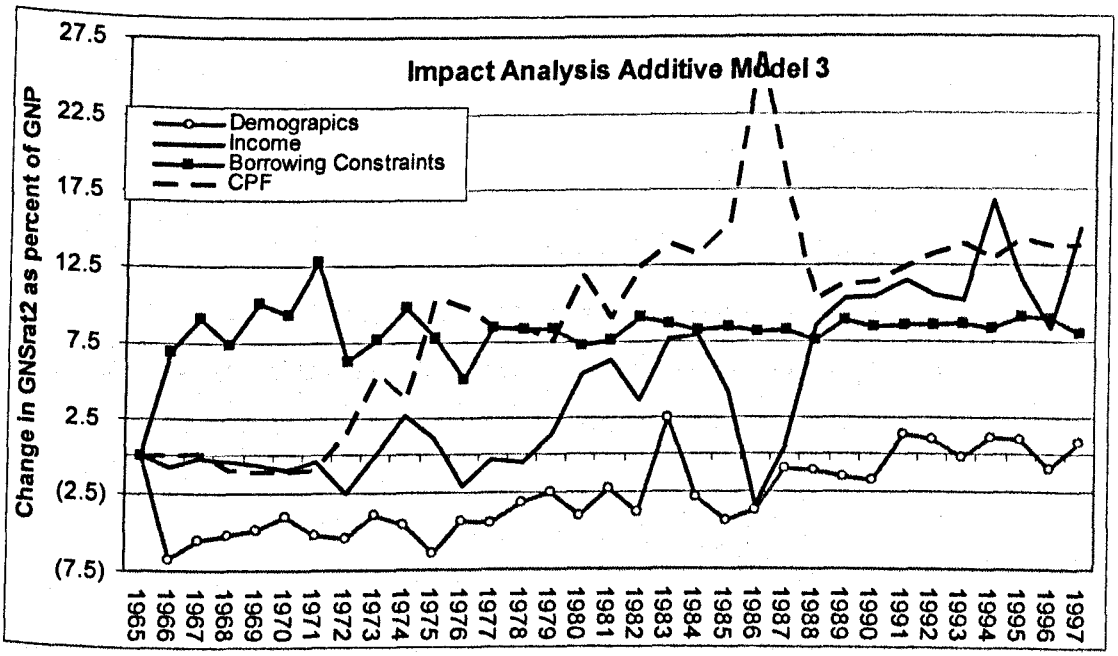
[397] Models E and F for the VPNS-ratio would also be an option. However, the investigation into the public saving rate has not yielded a significant model for the same time periods, namely 1966-86 and 1968-97, so that the additive partner is missing. Yet, with the possible exception of the influence of the real interest rate captured in model F, the relative impact of the individual factors is not too different. Before adding the models together their residuals were plotted against each independent variable in order to ascertain that each regression was not affected by heteroskedasticity. See Section I.4.5.5. for a discussion of heteroskedasticity.

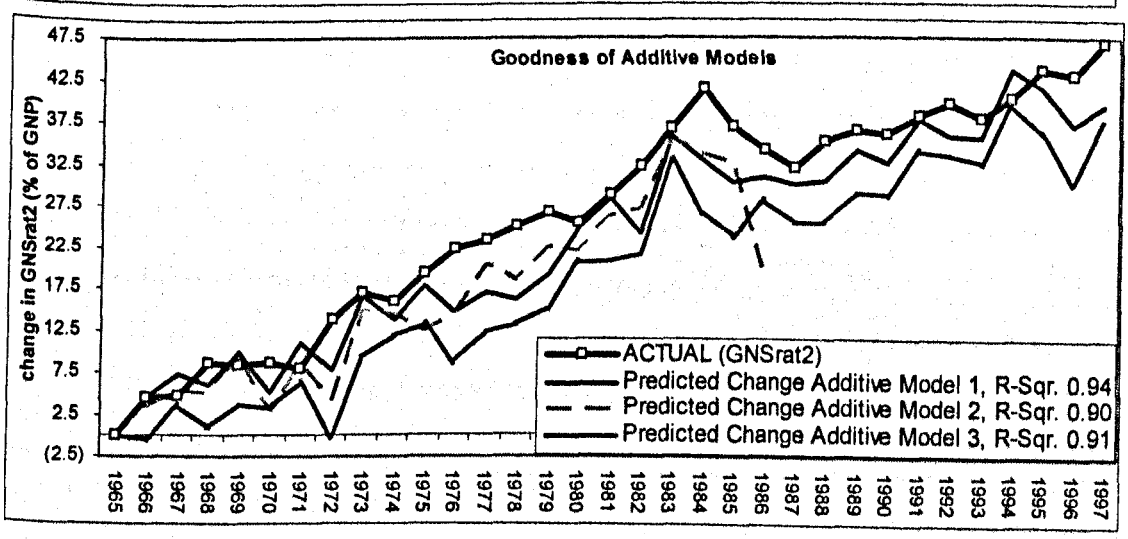
been driven by demographic and income factors. Once all three saving aggregates are added into one GNS-model this effect is again lost, due to the highly negative impact of falling dependency burdens on public saving. Nevertheless, it should not be forgotten that voluntary savings started the transition. Further increases were then derived by income and CPF effects, but mainly in form of Public and Compulsory savings.

Graphs II.5.9. a-d: Additive Models for GNSrat2






Impact Analysis Additive Model 3
Change in GNSrat2 as percent of GNP
Demograpics
Income
Borrowing Constraints
CPF
27.5
22.5
17.5
12.5
7.5
2.5
(2.5)
(7.5)
1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997


Goodness of Additive Models
change in GNSrat2 (% of GNP)
47.5
42.5
37.5
32.5
27.5
22.5
17.5
12.5
7.5
2.5
(2.5)
ACTUAL (GNSrat2)
Predicted Change Additive Model 1, R-Sqr. 0.94
Predicted Change Additive Model 2, R-Sqr. 0.90
Predicted Change Additive Model 3, R-Sqr. 0.91
1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997

II. 6. Conclusions

Chapter One dealt with the cross-country assessment of the influence of Singapore's circumstances, establishing that Singapore's saving performance although outstanding in absolute terms, was far less extraordinary once we controlled for Singapore's situation. Consequently, lessons from Singapore's saving history must be considered transferable - at least to countries in similar environments. This chapter has tried to establish what these lessons are, beyond the favourable circumstances.

In the early years right after the country's independence, favourable demographic developments seem to have helped initiate the saving transition, which was then further fed by compulsory savings and increasingly by positive income developments. The effect of the compulsory saving regime, however, was only made possible through the underlying demographic development of the country, which allowed for the chance to built a 'hump-saving', which at the completion of the demographic change will simply be passed on from generation to generation. Nevertheless, the government has spotted this chance and has exploited it very well. In other words, the government has very successfully jumped on a moving train and made it go faster and further than the initial situation would have made possible by itself.

If the effects of borrowing constraints are interpreted very generally, we can conclude that an improved financial system has helped savings in Singapore, but through positive effects on public savings while it appears to have lowered voluntary private saving due to increased availability of consumption smoothing, which again is not surprising for a population undergoing a substantial demographic transition. The potentially positive effect of Public Saving is supported in Singapore's case, since Ricardian Equivalence is shown not to have been present in full force.

Statistically, the results also advise a very substantial amount of caution when dealing with a mix of stationary and non-stationary data, particularly if stationary series incorporate non-stationary sub-aggregates. Moreover, investigating the top aggregate, Gross-National-Saving, by itself is likely to yield misleading results.

In comparison to the existing literature on Singapore's saving behaviour, this study is able to offer a much more differentiated and robust insight. Beyond simply avoiding a number of statistical flaws inherent in many other studies, the exercise does away with mono-causal explanations, e.g. MAS (1991), and is also able to show the interactive effects of individual factors among the separate saving aggregates, which earlier investigations focusing on one such aggregate have not been able to take into consideration. Therefore, for example, demographics have so far either been shown to have had a direct or no effect, while its more indirect, catalytic influence argued for by this study has gone unnoticed. Similarly, the crowding out controversy regarding the CPF's impact has so far not been able to get at the full picture and consider both dynamic and long-term effects as well as the CPF's separate impact on the different saving aggregates.

Applying the findings to give an outlook on Singapore's future savings would suggest that the saving rate will necessarily have to fall. The end of the demographic transition will particularly affect CPF-saving, as the by now accumulated hump-saving will be transferred from one generation to the other without additions on the earlier scale. The positive CPF-effects must be considered to having been limited to one generation. Additionally, since the country's fast catch-up growth will be slowing income effects on savings will be less positive. Government saving is also likely to become weaker due to higher pressures on the government to provide a more pronounced welfare system more in line with other industrialised nations.

II.7. Appendix: Single Explanatory Dimension Models

The following section is presented in the form of an appendix, because notwithstanding its substantiality its results can only be considered a preliminary stage for the multiple dimension investigation. By themselves the single dimension models are only able to show that a single factor is not able to explain Singapore's saving behaviour by itself, except for possibly income predominantly driving public savings. Overall, the income dimension appears to be the strongest individual effect on savings. However, due to the lacking robustness of the results, this can not be established in full force. Even the Granger Causality tests of the income effect remain by themselves inconclusive because a unidirectional causality can not be established in a robust manner across different varieties of income measures, with the possible exception of VPNS being granger-caused by transitory income. Moreover, none of the DOLS models for adjusted or unadjusted GNS or FNS cointegrate.

II.7.1. The Income Effect

As becomes evident from the models presented below income factors are very strong. They are able to 'explain' a considerable amount of the variance of all saving aggregates, in some models as much as eighty percent. However, inconclusive Durbin-Watson statistics indicate that these models are not yet fully satisfactory, except the highlighted PuNS models.[398] Multi-Collinearity does not seem to affect the stationary models. However, due to the at times strong correlations between the dynamic components required by the DOLS procedure, multi-collinearity is a serious problem in some of the non-stationary regressions. Moreover, the residuals

[398] The Cochrane-Orcutt procedure if applied to the stationary models does generally improve the D-W statistic, but also results in substantially lower r-squareds. This suggests that even with an 'optimised' lag-structure the models are still not yet fully specified.

can not be shown to behave in a stationary manner and thus the DOLS vectors do not appear to cointegrate, which in turn points to spurious regression results. Therefore, the statistical results indicate that even though income is likely to have been a very strong driving force behind the development of Singapore's saving aggregates, it can not by itself 'explain' the country's saving behaviour.

Since the models are not yet fully robust, it is not really helpful to discuss potential differences of the income effect between the individual saving aggregates. The power of interpretation of the signs of coefficients is also still somewhat vague. Beyond the statistical weaknesses of the regressions, it should also be noted that the individual variables need to be interpreted as referring all to one explanatory dimension, i.e. it is necessary to see all income variables together. Therefore, the generally negative parameter for growth should not be over interpreted.[399]

Table II.7.1.a. The Income Effect in Stationary Models

	VPNS		PNS		PuNS	
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio
Constant	9.305	6.067	21.137	9.284	18.361	12.307
Growth	-0.388	-1.736	-1.450	-4.371	-1.431	-6.390
Dgrowth	-0.591	-3.372	-0.820	-3.152	not sig.	(-0.026)
DRYPC	7.171E-03	7.116	1.167E-02	7.802	7.944E-03	7.663
Adj. R^2	0.613		0.676		0.678	
D-W	1.507		1.052		2.071	
C-I	6.107		6.107		5.548	
Constant	5.011	2.910	12.427	8.639	10.439	8.045
Growth	0.328	1.723	not sig.	(-0.270)	not sig.	(-1.341)
Dgrowth	not sig.	(-1.519)	not sig.	(-1.277)	not sig.	(1.640)
DNWage	8.560E-02	7.494	0.138	8.042	8.316E-02	5.387
Adj. R^2	0.629		0.666		0.467	
D-W	1.442		0.820		1.586	
C-I	6.154		2.926		2.926	
Constant	7.505	7.793	12.427	8.639	12.098	8.294
NW_Gro	not sig.	(-0.513)	not sig.	(-0.079)	-0.448	-2.117
DNW_Gro	not sig.	(0.286)	not sig.	(-0.584)	not sig.	(-0.81)
DNWage	8.103E-02	7.072	0.138	8.042	0.104	5.886
Adj. R^2	0.605		0.666		0.521	
D-W	1.501		0.820		1.559	
C-I	2.926		2.926		4.518	

[399] Growth was also regressed separately on the stationary saving aggregates. However, by itself it did not prove to be significant.

Constant	9.604	9.428	15.287	10.821	12.173	10.271
Growth	not sig.	(1.501)	not sig.	(-1.270)	not sig.	(-1.012)
Dgrowth	not sig.	(-1.511)	not sig.	(-1.220)	not sig.	(1.249)
DRWage	7.969E-02	4.640	0.152	6.399	9.200E-02	4.604
Adj. R^2	0.391		0.555		0.387	
D-W	1.290		1.071		1.618	
C-I	2.360		2.360		2.360	

Constant	8.862	7.279	21.323	7.193	18.407	13.717
Growth	not sig.	(-0.445)	-1.051	-2.543	-1.328	-6.804
Dgrowth	-0.680	-3.082	-0.947	-2.724	not sig.	(-1.194)
DDispyCPF	5.945E-03	4.340	1.055E-02	5.010	8.765E-03	8.903
Adj. R^2	0.365		0.462		0.739	
D-W	1.434		1.245		1.323	
C-I	3.210		6.057		5.430	

Constant	7.872	7.030	20.967	8.363	18.057	12.970
Growth	not sig.	(-1.068)	-1.275	-3.572	-1.365	-6.708
Dgrowth	-0.648	-3.460	-0.815	-2.854	not sig.	(-0.168)
Ddispy	6.450E-03	5.709	1.151E-02	6.781	8.496E-03	8.522
Adj. R^2	0.504		0.612		0.722	
D-W	1.379		1.198		2.032	
C-I	3.278		6.073		5.470	

Constant	8.556	9.254	19.989	7.405	17.272	9.582
Growth	not sig.	(0.072)	-0.782	-2.164	-0.917	-3.843
Dgrowth	-0.497	-2.993	-0.663	-2.236	not sig.	(0.493)
DYPC	3.982E-03	6.497	6.209E-03	6.196	4.192E-03	5.863
Adj. R^2	0.570		0.568		0.556	
D-W	1.541		1.087		1.614	
C-I	2.736		6.006		5.306	

Constant	19.357	7.892	37.247	9.704	24.878	7.630
Growth	-0.920	-2.619	-2.280	-4.144	-1.350	-2.869
Dgrowth	-1.122	-4.036	-1.656	-3.807	not sig.	(-0.258)
Avr_Gro	1.018E-02	4.636	1.621E-02	4.720	4.665E-03	2.032
Adj. R^2	0.390		0.433		0.163	
D-W	1.198		1.024		0.773	
C-I	7.477		7.477		6.823	

Notes:
All models refer to 1965-97.
GNS2 refers to the adjusted GNS-series
C-I refers to the Condition Index measuring the degree of multicollinearity in the model. Numbers above 30 indicate a serious multi-collinearity problem.
Not sig. refers to the fact that the variable did not prove significant based on a joint-hypothesis F-test and was removed from the model. The t-ratio of the variable before its removal is reported as an illustration of its lacking statistical significance.

Table II.7.1.b. The Income Effect in Non-Stationary DOLS Models

	GNS_2		GNS		FNS	
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio
Constant	23.596	3.688	22.515	4.315	9.646	2.917
RYPC	1.101E-03	2.308	8.679E-04	2.230	1.937E-04	0.785
DRYPC	7.290E-03	1.183	7.713E-03	1.534	2.888E-03	0.905
LRYPC	5.161E-04	0.302	7.195E-04	0.516	-1.34E-04	-0.151
RYPCL	-3.18E-03	-0.778	-2.30E-03	-0.691	-1.43E-03	-0.678
Growth	-1.068	-1.318	-0.965	-1.462	-0.768	-1.832
DGrowth	-0.758	-1.372	-0.688	-1.527	-0.330	-1.155
Adj. R^2	0.846		0,866		0.598	
D-W	0.638		0.736		0.477	
C-I	32.006		32.006		32.006	
Constant	23.969	6.510	21.596	7.518	8.500	4.946
NWage	5.389E-03	1.146	2.947E-03	0.803	-1.12E-03	-0.510
DNWage	3.601E-02	0.693	3.43E-02	0.848	1.587E-02	0.654
LDNWage	5.938E-02	1.049	6.716E-02	1.520	3.260E-02	1.234
DNWageL	6.682E-02	1.630	7.007E-02	2.205	1.889E-02	0.994
Growth	-0.401	-0.945	-0.184	-0.555	-0.477	-2.408
DGrowth	-0.236	-0.711	-0.229	-0.885	-4.80E-02	-0.310
Adj. R^2	0.798		0.839		0.572	
D-W	0.501		0.584		0.374	
C-I	14.805		14.805		14.805	
Constant	29.878	6.378	25.610	6.906	11.093	4.966
NGro	-0.697	-2.034	-0.417	-1.539	-0.488	-2.991
DNGro	-0.329	-0.979	-0.307	-1.153	-7.50E-02	-0.468
NWage	7.229E-04	0.133	5.073E-04	0.118	-4.98E-03	-1.928
DNWage	7.991E-02	1.417	5.920E-02	1.326	4.834E-02	1.798
DNWageL	-2.62E-03	-0.038	1.787E-02	0.331	1.271E-02	0.390
LDNWage	0.125	2.495	0.111	2.788	4.912E-02	2.055
Adj. R^2	0.818		0.851		0.598	
D-W	0.553		0.626		0.383	
C-I	19.361		19.361		19.361	
Constant	28.600	6.898	26.150	7.740	10.230	5.348
Growth	-0.758	-1.503	-0.592	-1.442	-0.643	-2.766
DGrowth	-0.411	-0.969	-0.359	-1.039	-0.142	-0.724
YPC	8.774E-04	3.491	7.083E-04	3.459	1.638E-04	1.412
DYPC	2.512E-03	0.995	2.707E-03	1.316	8.284E-04	0.711
LDYPC	-1.77E-04	-0.158	-1.65E-04	-0.181	-3.35E-04	-0.650
DYPCL	-4.76E-04	-0.195	1.963E-04	0.098	-5.63E-06	-0.005
Adj. R^2	0.764		0.794		0.511	
D-W	0.576		0.623		0.450	
C-I	12.684		12.684		12.684	

Constant	24.108	4.335	19.930	4.259	10.789	3.934
Growth	-1.074	-1.623	-0.551	-0.989	-0.896	-2.747
DGrowth	-0.919	-1.734	-0.855	-1.916	-0.442	-1.688
Dispy	1.134E-03	2.511	1.207E-03	3.177	7.637E-05	0.343
Ddispy	9.087E-03	1.671	5.985E-03	1.308	5.031E-03	1.876
LDDispy	1.441E-03	0.788	9.464E-04	0.615	5.961E-04	0.661
DDispyL	-4.81E-03	-1.106	-4.98E-03	-1.361	-2.20E-03	-1.023
Adj. R^2	0.834		0.846		0.608	
D-W	0.713		0.693		0.628	
C-I	25.450		25.450		25.450	

Constant	20.696	3.857	16.644	3.739	8.803	3.379
Growth	-0.701	-1.206	-0.213	-0.441	-0.648	-2.295
DGrowth	-0.546	-1.173	-0.522	-1.352	-0.255	-1.130
DispyCPF	1.649E-03	4.044	1.709E-03	5.053	2.958E-04	1.495
DDispyCPF	3.351E-03	0.773	8.153E-04	0.227	1.857E-03	0.883
LDDsipyCPF	-5.53E-04	-0.303	-7.21E-04	-0.476	-3.07E-04	-0.346
DDispyCPFL	-2.03E-03	-0.553	-3.15E-03	-1.031	-9.18E-04	-0.514
Adj. R^2	0.800		0.820		0.542	
D-W	0.529		0.522		0.509	
C-I	18.769		18.769		18.769	

Constant	16.193	2.276	15.370	3.753	8.180	3.946
Growth	-0.113	-0.256	-1.53E-02	-0.41	-0.334	-1.760
DGrowth	-0.392	-1.259	-0.407	-1.529	-0.104	-0.773
RWage	1.257E-02	2.682	1.130E-02	2.824	-6.22E-04	-0.307
DRWage	7.144E-02	1.929	5.898E-02	1.865	3.686E-02	2.303
LDRWage	5.824E-02	2.159	5.983E-02	2.597	1.827E-02	1.567
DRWageL	4.709E-02	1.106	3.123E-02	0.859	2.852E-02	1.550
Adj. R^2	0.807		0.816		0.649	
D-W	0.545		0.625		0.427	
C-I	14.716		14.716		14.716	

Constant	63.982	9.695	56.996	9.748	18.023	9.254
Growth	-3.922	-4.104	-3.284	-3.879	-1.386	-4.914
DGrowth	-2.584	-2.290	-2.324	-2.325	-0.700	-2.101
AvrGro	3.361E-02	2.345	3.023E-02	2.380	6.905E-03	1.632
DAvrGro	-3.47E-03	-0.575	-3.40E-03	-0.635	-8.80E-06	-0.005
LDAvrGro	-9.08E-03	-1.431	-8.64E-03	-1.537	-1.29E-03	-0.687
DAvrGroL	4.699E-04	0.138	5.462E-04	0.180	-3.38E-04	-0.335
Adj. R^2	0.365		0.346		0.461	
D-W	1.093		1.083		0.972	
C-I	11.902		11.902		11.902	

Notes:
Same as table II.7.1.1.a.
The removal of insignificant Lead or Lag variables is not possible since they are required for the DOLS procedure. Consequently, removal based on joint-hypothesis F-tests was not possible.

II.7.2. Granger Causality between Income and Savings

One variable granger-causes another if observations of the first variable help predict subsequent movements in the second, after taking into account the predictive value of the second variable's own history. For the non-stationary saving aggregates Granger Causality tests (VARs with three lags) suggest causality running in both directions with one exception. Past values of VPNS do not statistically affect present values of the first differenced series of per-capita income while the opposite is true if the variables swap sides, which in turn would argue for causality running from (transitory) income to voluntary savings but not the other way around.

VECMs for the non-stationary saving aggregates were not undertaken since none of the single dimension models cointegrate. Agrawal's (2001) causality relationship running from RYPC to GNS was remodelled. But also here cointegration could not be established, even if RYPC was replaced by other income variables. Thus Granger causality tests could not be undertaken, which contrasts Agrawal (2001), who finds cointegration between the two variables and uni-directional causality.

II.7.3. The Demographic Effect

Table II.7.3.a. The Demographic Effect in Stationary Models

	VPNS		PNS		PuNS	
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio
Constant	12.748	11.399	22.133	12.249	17.133	13.868
DLabrat	0.230	0.242	-0.905	-0.589	-1.888	-1.798
R^2	0.02		0.011		0.094	
D-W	0.736		0.354		0.655	
C-I	1.792		1.792		1.792	
Constant	15.510	12.898	26.761	14.828	20.488	18.370
DDep	1.908	3.033	3.778	4.002	3.293	5.644
R^2	0.229		0.341		0.507	
D-W	1.141		0.685		1.285	
C-I	2.469		2.469		2.469	

In single-dimension models, demographics appear to be a weak explanation for savings. Overall, the dependency ratio appears to be a somewhat better predictor

than the labour force ratio. Within the DOLS models multi-collinearity seems to be present, although not yet at dangerous levels.

Table II.7.3.b. The Demographic Effect in Non-Stationary Models

	GNS_2		GNS		FNS	
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio
Constant	-31.144	-7.211	-25.273	-5.779	-11.170	-4.046
Labrat	1.710	17.924	1.491	15.436	0.497	8.152
DLabrat	-1.635	-1.988	-1.072	-1.287	-0.632	-1.202
LDLabrat	-0.418	-0.702	-0.338	-0.560	-3.75E-02	-0.098
DLabratL	0.102	0.245	-2.43E-02	-0.058	-0.382	-1.439
Adj. R^2	0.944		0.924		0.788	
D-W	0.835		0.725		0.242	
C-I	17.752		17.752		17.752	
Constant	77.642	23.985	67.364	20.884	24.167	13.350
Dep	-0.692	-8.910	-0.542	-7.001	-0.305	-7.037
DDep	8.019E-03	0.008	-0.150	-0.146	0.356	0.616
LDDep	1.261	0.993	2.128	1.681	-1.164	-1.639
DDepL	1.307	1.612	0.844	1.045	0.345	0.760
Adj. R^2	0.944		0.927		0.829	
D-W	0.828		0.782		0.533	
C-I	21.107		21.107		21.107	

Notes:
DOLS models using Labrat refer to 1967-1997 due to the requirement of leads and lags of the first differences, which necessitates observations from before 1965 which were not available. Dep models refer to 1965-97

II.7.4. The Effect of Borrowing Constraints

Borrowing constraints exhibit a surprisingly dichotomous performance: weak among the stationary models, but strong for the non-stationary models. This appears to indicate that it was not so much the changes from year to year but the level, which might have affected saving behaviour. However, autocorrelation among the residuals in the DOLS regressions also indicate that the regressions can not be considered robust yet. Moreover, a strong correlation between the current account balance and income casts doubt over whether CaBal really captures foreign borrowing constraints.[400]

[400] See also the discussion in section II.5.4.

Table II.7.4.a. The Effect of Borrowing Constraints in Stationary Models

	VPNS		PNS		PuNS	
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio
Constant	13.059	14.233	21.574	14.174	15.967	14.681
DCabal	-0.268	-1.726	not. sig.	(-1.361)	not. sig.	(-0.886)
DDoCrRat	not. sig.	(-0.03)	not. sig.	(0.653)	not. sig.	(1.134)
DPriCrRat	not. sig.	(0.303)	not. sig.	(0.013)	not. sig.	(-0.739)
DPrDoRat	6.308E-02	1.833	not. sig.	(1.621)	not. sig.	(0.855)
Adj. R^2	0.090		0.000		0.000	
D-W	1.071		-		-	
C-I	1.379		1.000		1.000	

Notes:
The Condition index of the model with all borrowing constraints variables is 3.083. This indicates that the disappointing result cannot be due to multi-collinearity between the three domestic borrowing constraints.

Table II.7.4.b. The Effect of Borrowing Constraints in Non-Stationary Models

	GNS_2		GNS		FNS	
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio
Constant	22.286	7.959	23.308	8.568	-0.115	-0.113
Cabal	-0.384	-3.872	-0.390	-4.040	5.233E-02	1.459
Dcabal	-9.82E-03	-0.068	-1.13E-02	-0.080	-5.07E-02	-0.965
Lcabal	-0.263	-1.672	-0.276	-1.805	-2.68E-02	-0.472
CabalL	-0.140	-0.936	-0.129	-0.887	-9.65E-02	-1.783
DocCrRat	0.346	6.486	0.262	5.058	0.180	9.360
DdocCrRat	0.267	1.572	0.364	2.204	9.760E-02	1.589
LDDocCrRat	0.258	2.230	0.279	2.486	0.127	3.047
DdocCrRatL	4.402E-02	0.523	4.219E-02	0.516	-5.23E-03	-0.175
Adj. R^2	0.874		0.843		0.847	
D-W	0.616		0.959		0.975	
C-I	7.372		7.372		7.372	
Constant	63.552	13.765	55.127	12.302	22.057	13.325
Cabal	-0.354	-2.932	-0.355	-3.031	7.312E-02	1.690
Dcabal	-0.142	-0.756	-0.112	-0.613	-8.98E-02	-1.331
Lcabal	-0.377	-2.118	-0.329	-1.904	-9.07E-02	-1.422
CabalL	-0.309	-1.648	-0.257	-1.412	-0.157	-2.336
PriDoRat	-0.140	-5.096	-0.107	-4.025	-7.85E-02	-7.982
DpriDoRat	7.206E-02	1.681	5.570E-02	1.339	2.658E-02	1.730
LDPriDoRat	-5.92E-02	-1.107	-5.45E-02	-1.050	-5.61E-02	-2.929
DpriDoRatL	0.102	3.277	9.632E-02	3.188	1.802E-02	1.615
Adj. R^2	0.834		0.796		0.793	
D-W	0.886		0.784		1.044	
C-I	11.301		11.301		11.301	

Constant	-6.392	-2.711	-1.818	-0.694	-9.175	-6.191
Cabal	-0.109	-1.956	-0.151	-2.442	0.119	3.400
Dcabal	7.412E-02	0.991	5.752E-02	0.694	-3.55E-02	-0.756
Lcabal	8.025E-02	0.970	2.289E-02	0.250	6.076E-02	1.168
CabalL	-7.26E-02	-0.876	-5.65E-02	-0.615	-5.38E-02	-1.032
PriCrRat	0.639	19.268	0.524	14.258	0.258	12.376
DpriCrRat	-0.233	-1.794	-2.22E-02	-0.154	-0.138	-1.690
LDPriCrRat	-0.267	-2.059	-0.116	-0.810	-0.119	-1.466
DpriCrRatL	0.407	3.329	0.450	3.320	1.946E-02	0.253
Adj. R^2	0.972		0.955		0.893	
D-W	1.012		0.826		0.829	
C-I	15.141		15.141		15.141	

Notes:
DocCrRat model refers to 1966-1997, others to 1965-1997
Contrary to the stationary models, it was not possible to test all domestic credit variables in one equation, because once the required dynamic effects are included the multicollinearity becomes very serious with a condition index of 129.

II.7.5. The Effect of the Central Provident Fund

Table II.7.5.a. The Effect of the CPF in Stationary Models

	VPNS		PNS		PuNS	
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio
Constant	13.167	13.899	22.346	14.081	16.960	16.259
DCPF	0.668	1.727	not sig.	(1.243)	-1.092	-2.854
LDCPF	not sig.	(-1.099)	not sig.	(-1.372)	not sig.	(-1.030)
DCPFL	-0.971	-2.513	not sig.	(-1.458)	not sig.	(0.779)
Adj. R^2	0.128		0.000		0.182	
D-W	0.464		-		0.335	
C-I	1.962		1.000		1.415	
Constant	14.370	16.412	23.416	15.270	18.106	17.025
DCPFeff	not sig.	(1.191)	not sig.	(0.703)	-1.477	-2.420
LDCPFeff	not sig.	(-0.696)	not sig.	(-1.606)	-1.096	-1.797
DCPFeffL	-1.537	-3.113	-1.732	-2.003	not sig.	(0.377)
Adj. R^2	0.219		0.089		0.269	
D-W	0.735		0.317		0.476	
C-I	1.559		1.559		1.820	

Note:
Models using CPFeff refer to 1966-97

The dynamic effects of the CPF - even after inclusion of lag or lead values - appears weak in single-dimension models.[401] Once level variables can be included in the stationary models the CPF's explanatory power increases substantially. However, low Durbin-Watson statistics again indicate a not yet fully robust model.

Table II.7.5.b. The Effect of the CPF in Non-Stationary Models

	GNS_2		GNS		FNS	
	Coefficient	T-Ratio	Coefficient	T-Ratio	Coefficient	T-Ratio
Constant	4.248	1.501	5.272	1.873	-21.235	-5.319
CPFrate	1.059	13.344	0.929	11.761	0.343	30.594
DCPF	-0.458	-1.040	-0.327	-0.745	-7.82E-02	-1.257
LDCPF	0.240	0.583	0.392	0.955	-0.184	-3.156
DCPFL	-0.855	-2.196	-0.599	-1.546	-4.91E-02	-0.893
Adj. R^2	0.865		0.825		0.974	
D-W	0.420		0.352		0.835	
C-I	7.301		7.301		7.301	
Constant	12.376	5.120	12.418	5.005	-0.161	-0.305
CPFeff	1.358	13.356	1.188	11.388	0.459	20.688
DCPFeff	-0.602	-1.107	-0.399	-0.714	2.144E-02	0.180
LDCPFeff	0.175	-2.319	0.415	0.728	-0.243	0.389
DCPFeffL	-1.197	0.316	-0.878	-1.657	4.388E-02	-2.005
Adj. R^2	0.882		0.836		0.948	
D-W	0.422		0.349		0.495	
C-I	6.818		6.818		6.818	

Note:
Models using CPFeff refer to 1966-97

II.7.6. The Effect of Interest Rates and Life-Expectancy

Interest rates do not prove statistically significant if regressed on saving by themselves. Life-Expectancy, on the other hand, proves statistically significant at least in the non-stationary models, which also attract high R-squareds but are highly affected by multi-collinearity between the dynamic and level variables resulting in a condition index of 72.

[401] The inclusion of lag or lead variables appears opportune even within stationary models, because a forward looking consumer is likely to incorporate past and anticipate announced future changes of the compulsory saving regime in his saving behaviour. Agrawal (2001) has found the lead of the CPFrate to be statistically significant in his DOLS model for gross-national-savings.

Chapter Three

With All Diligence Due:

Where did all the savings go?

Singapore's Investment Pattern 1965-99

TABLE OF CONTENTS

III. With all Diligence Due: Where did all the Savings go?

Investment behaviour is the essential link running from saving to growth, but has rarely and if at all only to a limited degree been investigated in Singapore's case. This has largely been due to the lack of a readily accessible data source. In an attempt to close this gap, a large variety of government and private sources have been combined into a new database, which allows a much more revealing investigation into Singapore's investment pattern than hitherto possible and leads to a number of new insights about Singapore's recent economic history.

Chapter One has shown that Singapore can be compared to a child with a good athletic built growing up in a family environment of sports enthusiasts. The odds that the child will become a successful sports person are in its favour. Chapter Two has shown what the child did to realise its potential. If we wanted to extend this metaphor further, this chapter will now finally look at the training and competition schedule of the child, at how much it was able to set the schedule itself and how much was determined by its trainers and at where it invested most of its energies to reap the gains it did.

Using a variety of sources, the following accounting exercise is trying to determine which agency controlled what portion of the total saving pool and where did it decide to invest it. The exercises offer insights into the literature on the country's saving performance and growth.

Contrary to the earlier chapters, the accounting exercise does not test any hypothesis in its own right. Instead by purely compiling the numbers it offers upper and/or lower limits for a number of common speculations about Singapore's economic history. The exercise is able to show that Singapore's government was in control of the equivalent of eighty percent of the country's savings. However, the analysis also shows that the government only made final

investment decisions for two-thirds of the funds it controlled. Moreover, as a lower limit about one fifth of the total investment pool or fourteen percent of cumulative 1965-99 GNP was used as working capital, which would indicate that a more efficient use of the funds, i.e. less foregone consumption, could have still been possible without affecting the investment success. The working capital appears to have been accumulated solely by the public sphere, which has surrendered some of it to compensate the financial limitations of the private sector. The exercise finds that private investment was predominantly directed towards the service sector and public investment largely towards overseas. Based on their investment decisions Singaporeans did not see an exploitable comparative advantage in manufacturing. Even foreign investors, who dominated the comparatively little manufacturing investments made, primarily committed their funds to the tertiary sector. The analysis also shows that Singapore was not a flying goose in the strict sense. Singapore's development did not follow a flying geese pattern in which the country copied another country's earlier development success story and invested in a successive list of increasingly advanced industries. Instead Singaporeans decided to invest in the tertiary sector from the start. If at all, it was the foreigners who were the flying geese, using Singapore for their own industrial sequencing.

The Chapter will first review the relevant literature strings dealing with the degree of government control, the standard development story of labour-intensive manufacturing, the Flying Geese Hypothesis and the question of over-saving. The second part will describe in some detail the sources, data constraints and procedures used to compile the data set. Finally, the third section will present the findings followed by a short conclusion.

III.1. Literature Review

The existing literature on this subject area is very limited. Similar attempts have not been made before. The only known example of something even remotely similar is Nehru and Dhareshwar (1993), who create time-series on capital stocks and Gross Domestic Fixed Investment for a number of countries, one of which is Singapore. Their GDFI series is very similar to the official GFCF series. However, they do not investigate investment patterns, nor do they try to include non-fixed investments, e.g. overseas assets and other financial investments, beyond those resulting in fixed capital stock. Some studies have focused on a certain aspect of Singapore's investment pattern, e.g. Low (1998), who describes Singapore's outward (private) direct investment for 1981-91.

On the other hand, the discussion of high or excessive government control is comparatively frequent, but has so far been hardly backed up with quantitative evidence. The literature review will therefore take its point of departure from the discussion of the degree of government control in Singapore, continue with a summary of the literature describing Singapore's development as one largely based on labour intensive manufacturing, which leads to the review of the Flying Geese Hypothesis of industrial sequencing. The section will close with a discussion of the literature on over-saving in Singapore.[402]

III.1.1. The Degree of Government Control

The question of the degree of government control in Singapore and East Asia in general has seen a distinct evolution over time. Krueger (1978) is a prominent

402 The related issue of reasons for the country's high capital inflows has been investigated at quite some length in the literature and will thus not be covered here. Edwards (2000 pp. 204-5) gives a concise summary of the literature explaining international FDI capital flows. For a description of early FDI activity into Singapore (especially from UK, Australia, Japan, Hong Kong, Taiwan, USA) see Hughes and You (1969). Huff (1995, pp. 1425-1429) also deals with FDI in Singapore and so does Ermisch and Huff (1999). Lim and Pang (1991) analyse FDI to Singapore and Malaysia.

example for the early misconception of low government involvement in East Asia. Anne Krueger (1978), starting from an emphasis on trade, argues that those countries where government intervention has been lower have exhibited higher growth rates, with influential examples being the four East Asian Tigers. This view has already been revised among others by Amsden (1989), Wade (1989), Rodrik (1994) and Lall (1996). Amsden (1989) pointed out that government intervention in Korea was much more extensive than has been portrayed in the literature up to that point. Wade (1989 and 1990) showed that the governments of Japan, South Korea and Taiwan all gave central attention to ways of augmenting and directing the composition of investment.[403] They led rather than followed the markets.[404] He also argued that one of the lessons to be learnt from these countries' economic histories was that sectoral industrial policies that lead the market can improve upon growth outcomes of self-adjusting markets.[405] From this point of view Wade (1989) compared the development policies employed by the nations of East Asia with those of Rosenstein-Rodan and Gerschenkron arguing for a big push in form of a sharp increase in capital formation under the prodding of government, allied at times with banks.[406] Similarly, Rodrik (1994) argued that the governments of South Korea and Taiwan played a crucial role in overcoming coordination failures in their respective economies. Lall (1996) argues that the initial misconception of a market driven interpretation of East Asian success was due to the timely coincidence with the rise of neo-liberalism in the USA and UK, which itself was due to the disillusionment with earlier development economics, which believed that markets in developing countries were 'missing' or 'inefficient'.[407]

Nevertheless, the World Bank's influential East Asian Miracle (1993) publication went to great pains to (largely) echo the low government involvement

403 Wade (1989, p.68)
404 Wade (1990, 303)
405 Wade (1989, p.69) Nevertheless, Wade also pointed out that the governments gave little attention to ways of increasing the efficiency of resource use.
406 Wade (1989, p. 71)
407 Lall (1996, p.112). Lall also offers a summary of the development of the discussion about the degree of government control in East Asia.

hypothesis. On the one hand, it departed from the earlier World Bank approach by admitting that some markets actually did not function efficiently, and that government intervention was needed to remedy market failure. It also admitted the existence and pervasiveness of selective interventions in East Asia. However, on the other hand, it was obliged to defend the fundamental postulates of the World Bank's policy advice, that governments should not be selective in influencing resource allocation, and in particular, not mount industrial policy.[408] Similarly the financial development literature used to refer to Singapore as an example of the advantages of liberal internal finance in promoting rapid economic growth.[409]

With particular respect to Singapore, Lim Chong-Yah (1991) had already concluded that the role of the government in Singapore's case had been central to Singapore's success based on his assessment of the role of public enterprises, fiscal policy, monetary policy, exchange rate policy and wage policy.[410] However, Lim (1991) discussed the role of the government in the economy rather than its control over the economy. Asher (1989), on the other hand, tried to determine the degree of government control but had to conclude that the traditional measures such as the share of government revenue in GDP or the share of government employees in the labour market do not adequately capture the degree of control in Singapore's case. Yet he is not able to calculate his own measure. Instead, he concludes that "the paucity of relevant and reliable empirical studies" necessitates a reliance on a qualitative rather than quantitative analysis.[411] Years later Asher (2001) again comes to a similarly sceptical conclusion:

> While Singapore's conventionally measured tax revenue to GDP ratio is rather low (fluctuating within a narrow range 15 to 18 percent during the

408 See for example Felix (1994) or Singh (1995) for good summaries and criticism of this and other aspects of the World Bank's East Asian Miracle publication.
409 See for example McKinnon (1993, pp.2 and pp.12-13)
410 Lim (1991, pp. 202-214)

> 1991-99 period), its total revenue to GDP ratio is not only high (reaching a peak of 37.2 percent of GDP in 1997), but has also shown considerable volatility. Even this does not fully capture the transfer of resources from the private sector to the public sector. This is because the budgetary figures, particularly for investment income and for capital receipts are incomplete and they do not include various off-budget accounts, preventing fiscal analysis on a consolidated basis. The balance sheet of the government is also presented in such a manner as to render rigorous analysis all but impossible.[412]

Notwithstanding these apparent data problems, Koh (1987) had already argued that the government had increasingly been playing "the role of an intermediary between savers and investors. This intermediary role of the government is unique among countries in the world."[413] According to Koh (1987), the public sector in Singapore commanded in the mid-1980s 70% of savings but only 30% of investment.[414] However, Koh (1987) does not give any details of his calculations or further support to this claim. Arguing along similar lines Ermisch and Huff (1999) state that although the government virtually determined Singapore's remarkable savings ratio, investment came mainly from private enterprise and in the form of direct foreign investment. Again, they make this claim without reference or any statistical support.[415]

Earlier Huff (1994) had already pointed out that in addition to government control of savings through the CPF, there was also a large indirect transfer of savings from the private sector to the government as a result of voluntary deposits with the Post Office Savings Bank since the POSBank was required to use most of the money deposited with it to buy government securities, or as

411 Asher (1989, p. 131)
412 Asher (2001, p. 4). His view on the usability of government budgetary statements is also shared in IMF (2000, p.3).
413 Koh (1987, p. 100)
414 Koh (1987, p. 82)
415 Ermish and Huff (1999, p.22); Huff (1995c) at least contrasts the respective shares of the public and private sector in Gross National Saving and GFCF, which were published by the government until 1985.

deposits with the Monetary Authority of Singapore. Yet, he does not go on to quantitatively assess this 'redistribution'.[416] In Ermish and Huff (1999) they argue, again without statistical support, that the mobilization of public savings relied chiefly on manipulation by the government, which used its control over public utilities and telecommunications (constituted as statutory boards and given monopoly status) to turn the internal terms of trade against workers.[417] Additionally, they argue that most of the private sector's contribution to Singapore's high savings rate was extracted through the government's Central Provident Fund.[418]

Alten (1995) tries to circumvent the (apparent) lack of empirical data by surveying the opinions of managing directors of multi-national companies in Singapore. Based on the answers obtained, he concluded that Singapore's "economic development is, above all, a political process, decided upon and guided by a strong government determined to overcome the country's backward economic status and to enter the first league of industrialised nations in the beginning of the next century."[419] Easton and Walker (1997) use economic freedom indicators to address the question of government control on prices for a cross-section of 57 countries in 1985 and conclude not too surprisingly that market socialism is a continuum, i.e. there are countries with strict pricing rules and with less strict pricing rules even though they have similar public ownership structures. Overall ownership and pricing policy are positively associated, i.e. public ownership will influence pricing in reality.[420] Chiu and Lui (1998) assess Singapore's policies and also come to the conclusion that Singapore's government was very active in shaping the country's industrialisation particularly through its pioneer industries policy, the taming of unions, provision of infrastructure and by inducing foreign investments through the

416 Huff (1994, p. 336)
417 Internal terms of trade are defined as workers' wages in comparison with the prices at which they had to buy from government monopolies.
418 Ermish and Huff (1999, p. 30)
419 Alten (1995, p. 230)

formation of alliances with foreign partners, thus reducing significantly the risk in such undertakings. However, they further emphasise the differences between Singapore and the other Tigers. Contrary to some of her neighbours, Singapore has kept the economy open to foreign trade and investment.

Another aspect of government control is the government's high degree of involvement in the private sector through its many Government-linked-Companies. The IMF (2000, p.9) quotes a recent study by La Porta, Lopez de Silanes and Shleifer (1998) looking at the ownership structure of the twenty largest publicly traded firms in each of the 27 richest economies in the world, which has found that Singapore had the second-highest proportion of state-controlled firms (45 percent, second only to Austria), and higher than Korea and Japan.[421] Control was defined as ownership of 20 percent of stocks or more. Another study by Claessens, Djankov and Lang (1999) using 2980 publicly traded corporations in nine East Asian countries reaches similar results. Within their sample, Singapore has the highest level of state control with 23.6% of the 221 corporations scrutinised with state ownership of over 10%, 23.5% with ownership above 20% and 11.25% ownership above 30%. However, estimating the role of the GLCs in Singapore's economy has remained a contested issue.[422] For many years the annual review of the Singapore economy by the American Department of Commerce stated that GLCs produce as much as 60 per cent of GDP, an estimate taken form a report from the Ministry of Finance of 1993. The Singapore government has not commented on this estimate until very recently when, in answer to a question in parliament, the Minister of Trade and Industry stated that in addition to the government's own share of 8.9 percent of GDP the GLCs in fact contributed only 13 percent of GDP and foreign controlled

420 Market socialism is defined as a system in which public ownership is pervasive but where, nevertheless, markets are permitted to clear. In theory, reliance on public or private ownership is determined separately from the issue of control of market outcomes. Easton and Walker (1997) offer no direct reference to Singapore.

421 IMF (2000, p.9)

422 This section on the role of the GLCs follows Peebles and Wilson (2002, pp.13-16) See also Peebles and Wilson (2002, pp. 44-49) for more details on the inter-relationships between the different GLCs and other government bodies.

companies 42 per cent.[423] Surprisingly, the Heritage Foundation, which still ranks Singapore as the second most free economy in the world, states that GLCs dominate Singapore's economy, constituting up to 70 percent of Singapore-owned companies and generating up to 60 percent of GDP. Moreover, it detected increasing evidence of Government intervention in Singapore's economy which led to it being downgraded on this criterion.[424] The issue is further complicated by the fact that some of the GLCs in defence-related areas or strategic sectors are exempted from having to file accounts with the Registrar of Companies, as Low (1998) points out.[425] Low estimates the number of GLCs in 1990 herself at 616.[426] Peebles and Wilson (2002) report that after the 1985 recession the Public Sector Divestment Committee recommended in 1987 the selling of shares in many GLCs. Nevertheless, the government has retained significant holdings in many listed companies such as Singapore Telecommunications (79.7 per cent), Semb Corporation Industries (58.8 per cent), Singapore Airlines (53.8 per cent) and Singapore National Printers Corporation (49.0 per cent) and others at present.[427] The GLCs owned by Temasek Holdings alone accounted for about 10 per cent of GDP and about 27 per cent of the stock market capitalization in 2000 despite years of privatization.[428] Upon review of the literature, Peebles and Wilson (2002) summarise that it has proved very difficult to compile a complete list of GLCs.[429] They also argue that many aspects of the government's influence over the economy's resources are not revealed in such numbers as the proportion of GLCs or the public sector in output. Ownership is not the main factor but rather how the government can mobilize resources and allocate them where it sees fit.[430] However, the desired information is not offered in their publication.

423 The Straits Times, 24 February 2001, p. H6; and Singapore Department of Statistics (2001)
424 The 2001 Index of Economic Freedom
425 Low (1998, p. 159)
426 Low (1998, p. 201)
427 IMF (2000, p. 11)
428 Peebles and Wilson (2002, p. 46)
429 Peebles and Wilson (2002, p. 44)
430 Peebles and Wilson (2002, p. 24)

Approaching the question of government control from a qualitative angle necessarily leads to the government's own view on this issue. Yet, the picture which emerges appears at first ambiguous. Goh, Keng-Swee, Singapore's deputy prime minister at the time and former Finance Minister, wrote in 1972: "The government has to be the planner and the mobilizer of the economic effort" but "the free enterprise system, correctly nurtured and adroitly handled, can serve as a powerful and versatile instrument of economic growth."[431] In 1976, Goh Keng-Swee writes: "The laissez faire policies of the colonial era have led Singapore to a dead end, with little economic growth, massive unemployment, wretched housing and inadequate education. We had to try a more activist and interventionist approach."[432] Lee Kuan Yew is quoted in the Straits Times, January 6, 1982, as saying: "Those developing countries that have tried centralized state planning and nationalized economic activity, and put bureaucrats in place of entrepreneurs, they have stagnated." The ambiguity seems to suggest that the government was not quite sure where to strike the balance between a free market economy and a more centrally planned economy. The commitment to let the market set the prices appears to have been rather strong. Yet, the leaders also seemed convinced that some degree of control over the factors of production was necessary, particularly the control over credit.[433] The government was also able to strongly influence the wage setting procedures through its National Wage Council, which Huff (1995c and 1995d) considers to be one of the central aspects of Singapore government control. Moreover, the government was convinced that the state together with foreign MNCs needed to compensate for a lack of entrepreneurs in Singapore.[434]

431 Huff (1994, p. 339), quoting Goh Keng-Swee in The Asian, 20 August 1972.

432 Goh (1976, p.84)

433 Lee (2000, p. 639) offers a very telling quote. Lee writes that when advising China on their development options in the 1980s Goh Keng-Swee "believed China's most important problem was the inability of the People's Bank of China (PBOC), their central bank, to control credit."

434 See for example Hughes (1969, p.29 and pp.32-33), Hermann (1970, p. 217), Yoshihara (1976, p. 21 and p. 162), and Lee (2000, p. 66)

In summary, a high degree of control by the government in Singapore has become the accepted view.[435] However, so far the lack of data has not allowed to put a figure on it. If the government's own position has been assessed it was mostly through general macro-economic indicators or the government's budget statements. The government's Financial Statements have not been used. Nor have the balance sheets of government banks been reassessed and consolidated into the government's own financial position. Potentially very informative sources have yet gone unused, particularly when considering the central role of capital accumulation and thus saving and investment for Singapore's economic development.

III.1.2. Labour Intensive Industrialisation

The share of manufacturing value added in GDP more than doubled in Singapore between 1960 and the early 1980s. The World Bank's Development Indicators show an increase from 16.2 percent in 1960 to a peak of 39.2 percent in 1984. The share of the labour force employed in manufacturing rose from 14.2 percent at the census year of 1957 to a peak of 30.4 percent in 1981.[436] Based on this 'transformation' Singapore's development story is often interpreted in the literature as springing from the exploitation of a comparative advantage in cheap labour through labour intensive manufacturing, which was followed by a move up the (manufacturing) value-chain. This understanding is founded in the

435 Huff (1995c, p.1) probably captures this view best when he writes: "The Singapore model featured a strongly interventionist government and planning, which went well beyond the World Bank's 'market-friendly' approach to include 'market replacement'. In Singapore, decisive departures from the price mechanism and a domestically managed regime allowed capitalism to work."

436 Labour force ratios taken from Dept. of Statistics (1982): Economic and Social Statistics; Table 3.5. p. 37. A very important statistic for the newly independent Singapore is the shift away from rubber processing to manufacturing. In 1959 *manufacturing output* was S$ 389.9 million, while the value of rubber processing stood at S$ 1186.8 million; by 1963 *manufacturing had overtaken* rubber processing with total output of 843.8 and 740.6 respectively and by 1966 manufacturing *had surpassed the rubber processing* output from 1959 with total manufacturing output of S$ 1325.8. The increase in manufacturing was able to compensate for the fall in the rubber processing industries. The EDB Annual Report 1969 (p.52) offers the following figures for total output:

S$ million	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Manufacturing	389.9	456.6	518.4	660.3	843.8	927.9	1086.4	1325.8	1687.2	2175.7	2635.8
Rubber proc.	1186.8	1195.9	891.7	1074.2	740.6	608.1	591.4	646.5	558.7	619.4	805.2

government's own view of Singapore's development and takes further support from the very well publicised incentives given to "pioneer industries" by the Singapore government.[437] Exemplary proponents of this (standard) view of the country's development are Yoshihara (1976), Peoples Action Party (1985), Meier (1986), Lim (1991), Chan (1993), Islam and Chodhury (1997) or Peebles and Wilson (2002). This notion is even more prevalent in the popular press, see for example The Economist (June 1st, 20002, p. 59).[438]

The Peoples Action Party summarised Singapore's development up to 1985 in four phases:[439]

1. 1956-65: growth of import-substitution industries
2. 1965-73: trend towards labour-intensive industries. Examples given are: shipbuilding and ship-repairing, assembly of refrigerators and integrated circuits, production of garments and wigs [440]
3. 1973-1978: shift towards more diversified and higher value-added industries. Examples given are: production of semi-synthetic penicillin, oil refinery, oilfield equipment, liquid crystal displays, colour tv-tubes
4. 1978-84: upgrading and restructuring into skill and technology intensive industries. Examples given are: electronic components and materials, computer hard-drives.

437 Furthermore, the belief that a country would need to industrialise in order to develop was the prevalent view when Singapore set out to join the 'industrialised' nations. See for example Goh (1971, p.8): The Asian economists who set up the development plans for the newly independent Asian states "believed that it was the progress of the manufacturing activities in the West and its near absence in the East that explained the disparity in wealth. The expansion of industry was expected to introduce new technology, new social attitudes, raise levels of existing skills, provide employment for the large numbers of unemployed or underemployed citizens. In short, industry would modernize and enrich."

438 Yoshihara, Kunio (1976, p.10), for example, states: "Singapore swiftly changed her strategy after her separation from Malaysia, and emphasized export oriented, labour intensive industrialization." Lim (1991, p. 197 and p. 202) writes: "From a basket case at the time of independence in 1965, Singapore has metamorphosed into a showcase economy. (...) Structurally, Singapore has been transformed from a largely entrepot trade economy into an industrialising one. (...) Manufactured exports also dominated the exports of Singapore, forming 71.8% of total exports in 1988, whereas in 1960, they formed only 21.1% of total exports. (...) Export-oriented industrialisation has remained the main strategy of development. It consists of a broad range of development activities, such as the establishment of physical infrastructure, construction of industrial parks, manpower training and development, creation of a legal and administrative framework for industrial promotion, and fiscal incentives for export-led industries. As unemployment was a serious problem, the initial emphasis was on labour-intensive industries. And as there was a dearth of local industrial entrepreneurship, the main reliance was on foreign investment and the creation of an investment climate conducive to such investments, both local and foreign, to take place. However, the orientation towards labour-intensive industrialisation has shifted towards higher skilled, higher value added activities since 1979." Chan (1993, p. 48) writes: "Stressing their comparative advantage in an abundant, cheap, and malleable work force, these economies [East Asia, including Singapore] found a favourable niche in the export of light-industrial, labour-intensive products, such as textiles, shoes, and toys, to the markets of the developed countries." Islam and Chodhury (1997, p. 199) write: "In the 1960s, the economic strategy focused on the expansion of low-skilled, labour intensive manufacturing activities. The focus shifted in the 1970s to the diversification of the manufacturing sector to higher skill levels and higher value added activities." For an article explicitly describing and analysing Singapore's pioneer industry policies see Ermish and Huff (1999).

439 PAP (1985, pp. 170-179); See for example also Goh (1995, pp. 34-38) about the pre-dominant role of manufacturing in Singapore's economic development between 1960-90. In a speech given in 1986 Goh (1995, p. 32) summarises: "Let me sum up our experience in economic growth between 1960-85. In the first 20 years, the manufacturing sector was the main engine of growth, providing rapid employment and income."

Some have built on this understanding of Singapore's development history and draw pessimistic conclusions from it for the country's economic future. Okposin (1997), for example, argues that after losing her comparative advantage in cheap labour combined with a high reliance on FDI Singapore will face difficult times in the future.[441] Michael Porter even suggested, among other things, that the focus of the Singapore economy must shift much more towards services in order to cope with the challenges of the future.[442] Young (1992) interprets the country's rapid industrialisation as one of the main reasons for its low return on capital due to the fast redundance of former capital investments.[443]

Overall the role of services in Singapore's development history has not often been appreciated. Peebles and Wilson (2002) even refer to it as "apart from certain quirks arising from its history as an entrpot trading centre and island city state bereft of natural resources, Singapore's structural change began predictably with labour-intensive industrialization in the late 1960s and the economy has moved steadily up the value-added ladder ever since."[444] They write this even though earlier in their book they point out one of the main advantages of the service sector for an economy bereft of natural resources, namely its low import leakage.[445]

On the other hand, Gereffi (1994) offers a more differentiated understanding of Singapore's economy and those of the other East Asian NICs. He argues that East Asian NICs have managed to build successful industries beyond their initial comparative advantage and original factor endowments which was limited raw materials, unskilled but disciplined labour, and small markets. The East Asian

440 This PAP publication, which celebrates 30 years of the party's existence, also mentions – not without a certain pride – that the exports of refrigerator compressors to the US and France attracted protectionist responses in the early 1980s.
441 Okposin (1999, p. 96)
442 Business Times, 6 August 2001
443 Young (1992, p.15 and pp.26-27)
444 Peebles and Wilson (2002, p. 135)
445 Peebles and Wilson (2002, p. 74)

NICs thus were motivated by the principle of dynamic competitive advantage rather than by their static comparative advantage in cheap, disciplined labour.[446] Huff (1994 and 1995c) is one of the few examples which assigns the development of the service sector a more central role. He argues that the development of financial and business services followed a more precise planning strategy than manufacturing. He shows how this strategy was set out in the 1972 budget speech, strengthened in the 1981 economic development plan for the eighties and further elaborated in 1986 in The Singapore Economy: New Directions.[447] He points out that during the 1980s "every budget statement contained new measures aimed at financial innovation. A complementary thrust of government policy which aimed at attracting international financial institutions to Singapore was demonstrably successful. From 1981 to 1990, while there remained 13 Singapore local banks offering a full range of banking services, the number of foreign banks rose from 86 to 128, and merchant banks from 39 to 68. By 1990 there were 199 ACUs, since virtually all banks and merchant banks dealt in Asian dollars."[448]

III.1.3. Of Product Cycles and Flying Geese

Bruce Cumings (1984) argued in his often cited analogy with flying geese that countries in East Asia followed one another in a developmental trajectory in which the latecomers replicate the developmental experience of the countries ahead of them, starting with the Japanese.[449] The Flying Geese hypothesis calls for a pattern of industrial sequencing, which moves from the import of consumer goods, to the production of consumer goods, to the export of consumer goods to

446 Gereffi (1994, p. 36)
447 Huff (1994, p. 341) and Huff (1995c, pp. 16-18)
448 Huff (1994, p. 343)
449 This idea was first developed by Akamatsu (1961). For an example of a graph visualising the flying geese pattern see Ito (1992, p. 26). For a summary of the literature see Ohkawa and Kohama (1989). For a recent (largely) descriptive comparison of the development policies of Japan and the Asian NICs see Yamada and Kuchiki (1997).

the import of capital goods, the production of capital goods and the export of capital goods. In its final stage the production of earlier stage products is terminated. This view has found early support by Singapore's and in general East Asia's industrial policies but more recently has also attracted a fair share of criticism.

Early support stems from Singapore's import substitution policies followed until the demise of the hope for a common market with Malaysia and later by the government's well publicised incentives given to pioneer industries, initially largely in labour intensive manufacturing.[450] Even local politicians have early on described an Asian group of newly independent states in Asia which followed similar development policies, e.g. Goh (1971). In one of Goh's earlier speeches given in 1967 he even directly refers to Japan as a leading example for modernization without the loss of cultural identity against the other option of a communist development.[451] Meier (1986) also follows Cumings (1984) arguing that the East Asian NICs followed Japan and as the NICs move up the ladder of comparative advantage into capital-intensive and knowledge-intensive products, the second tier countries (Indonesia, Malaysia, Philippines and Thailand) follow behind with exports from light industries such as food processing, textiles, clothing and simpler electronics.[452] Soon and Tan (1993) also write that Singapore's policy makers did look to Japan - as well as Germany - for lessons for their development plan. They extend this view further and argue that even more importantly "although Singapore did not have a role model for its bureaucracy, the same qualities have been significant in the economic success of Japan, Republic of Korea and Taiwan, China."[453] Ito (1996) also finds that the patterns in output and export for Singapore, Korea, Taiwan, Malaysia and Thailand imply

450 See for example: Economic Development Board (1962), International Bank for Reconstruction and Development (1955), and Legislative Assembly, Singapore (1959), which offers the industrial development plan by Mr. F.J.Lyle *a Canadian industrial expert*, who delivered his suggestions by request of the Singapore government.

451 Goh (1972, p. 30): "Can Asia modernize without recourse to the methods used by the communists? The Japanese have succeeded in establishing a modern state in every sense of the word while preserving all that is precious in their cultural heritage and discarding what is not consonant with progress." See also Hughes (1969) for a summary of Singapore's early industrialisation policies.

452 Meier (1986, p. 14)

453 Soon and Tan (1993, p. 43)

that these East Asian economies, with the exception of Hong Kong, are indeed repeating Japan's pattern of economic development.[454] However, Ito (1996) also states that the flying geese hypothesis has not yet been rigorously tested beyond such observational evidence.[455]

On the other hand, Bernard and Ravenhill (1995) disagree with the simplified flying geese analogy and the notion that other East Asian countries tried to copy the Japanese development trajectory. Instead, they argue for the globalisation of production networks, increased governmental disputes over economic relationships and the rapid pace of technological change as explanatory factors for the economic integration in East Asia. While they do not deal with Singapore explicitly, they find that the pattern of industrialization in Korea and Taiwan has been dramatically different from that pursued by the original goose, Japan. They point out that "although Korea and Taiwan, and more recently Malaysia and Thailand, may be exporting products in the same industries in which Japan enjoyed success a few years ago, the context in which they are doing so is substantially different, in terms of both industrial organisation and geopolitics. (...) [The] dependence on Japanese technology, coupled with the dependence of Japanese corporations on other locations in the region for lower-cost labour for assembly operations, has produced a new regional division of labour that is based not on national economies but on regionalized networks of production."[456] They also do not think that ultimately the East Asian countries will be able to overcome this dependence due to substantial changes "in the global political economy and in production techniques in the last twenty years. Steeper learning curves, increased costs of research and development, and the necessity of locating within an established distribution network all exacerbate the problems faced by economies seeking to reduce their technological dependence."[457] While they disagree with the idea that East-Asian countries simply tried to copy the

454 Ito (1996, p. 250)
455 Ito (1996, p. 250)
456 Bernard and Ravenhill (1995, p. 206)
457 Bernard and Ravenhill (1995, p.207)

Japanese trajectory, as a whole they do not oppose the notion of a process of economic integration in East Asia. Instead, their main criticism is that the flying geese analogy does not fully capture the complexity of the regional political economy and that product cycle theory is not in line with the industrial development of many East Asian countries, particularly Taiwan and Korea.

III.1.4. Over-Saving in Singapore

The question of over-saving in Singapore's case has been discussed, more or less directly, since the second half of the 1980s, partly initiated by the country's recession in 1985/86 which only Singapore experienced and was preceded by sustained increases in the country's saving rates peaking at 46.6 percent in 1983. One of the earliest examples, a study group of the National University headed by Prof. Lim Chong-Yah, who was also the president of the tri-partite National Wage Council, did not necessarily address the question of over-saving directly, but still recommended changes to the CPF among them a reduction in mandatory contribution rates.[458] The study group argued that after provisions have been made for housing, for life annuity, and for Medisave, the 50% rate of contributions to the CPF in the early 1980s was quite in excess of the needs of an average worker in Singapore. Koh (1987) reads this as implying that Singapore had over-saved.[459] In fact, the government seems to have reached the same conclusion, because it did indeed lower the CPF contribution rates twice in 1986 and 1987.[460] Nevertheless, the government has always emphatically disputed the view that Singaporeans are saving too much.[461] Han (1996), in a book edited by

458 Lim et al. (1986). This view is reiterated in Lim (1988a, pp. 234-235)

459 Koh (1987, p. 86)

460 A similar political situation occurred again during the Asian Crisis, when Singapore had reached another peak in her saving with 52.4 percent of GDP in 1998. This time an occasional paper by Singapore's Department of Statistics (1999) on household expenditures points out that Singapore's households have reduced their expenditure more than disposable incomes have fallen in 1998 and that thus household savings increased while incomes were declining. Such a situation is hardly conducive to a recovery, although the study stays away from making any such value statements. But again the government reacts by lowering the CPF rates from forty to thirty percent in 1999.

461 See Huff (1995b, p. 749) and Deputy Prime Minister Lee in the Straits Times Weekly (August 29, 1992): *'Too much Savings? Not true – BG Lee'*. In this article Lee somewhat paradoxically argues that the country is not suffering from oversaving because the private sector has access to abundant

Lim Chong-Yah, argues that Lim's earlier position is no longer tenable and that statistical evidence had been "adduced to demonstrate that compulsory savings through the Central Provident Fund are not longer excessive."[462]

Although not directly addressing the question of oversaving, Young's (1992) study shows that Singapore, although investing and saving significantly more than Hong Kong, only achieved similar growth, which can be interpreted as a clear sign for over-saving.[463] Moreover, his study shows how the real return to capital has rapidly fallen in Singapore to levels well below Hong Kong's. His central finding that Singapore's before subsidy rate-of-return on capital was one of the lowest in the world is taken up by Huff (1995b). Huff argues that Young's results indicate that additions to output from further investment (the marginal efficiency of investment) may have been close to zero. If so, Singapore's share of investment in national income approached growth maximisation.[464] This, he continues, is a sign that the Singapore government was not maximising utility but growth. If it had maximised utility the government would have targeted a higher return. Therefore, Huff (1995b) argues that while in terms of utility there might have been over-saving owing to a potentially unrewarded sacrifice of current consumption, in terms of growth there probably wasn't. However, he does not further quantify his argument, i.e. the potential degree of over-saving in terms of utility or growth. Moreover, the comparison with Hong Kong at similar growth rates still poses the question why Singapore was not able to both maximise utility and growth, as her city-state neighbour apparently did. If we accept that Hong Kong should be Singapore's benchmark, we must conclude that

funds, but is not using it. He points to the fact that the interbank market is flush with funds, interest rates are at a historic low and the price/earnings ratios on the stock-exchange are high. "It is not projects which are are short of funds, *but banks which are short of good borrowers to lend to.*"

462 Han (1996, p. 24). However, Han does not offer *a reference to this presumably existent statistical evidence.* The only evidence Han refers to is Han's *own calculation that CPF-Savings* accounted for *a mere* 13 percent of Gross National Savings between 1975 and 1993. He also echoes the government's view that without CPF savings the majority of Singapore's population would have inadequate housing and medical services. Therefore, particualrly the low return on investment of housing stock needs to be taken in consideration when comparing ICORs across different countries.

463 This view has been recently restated by Gerald O'Driscoll, one of the authors of the Heritage Foundation's Index of Economic Freedom report for 2000. In the Straits Times (1 December 1999, p. 23; as quoted by Peebles and Wilson 2002, pp. 87-8) he argues: "Hongkong pursues a persistent laissez-fair policy. In Singapore there are government-directed investments, almost twice the rate invested in Hongkong. Yet, the real per capita GDP is higher in Hongkong than in Singapore. In other words, the Singapore government has wasted the savings of its citizens." The executive summary of the Economic Freedom 2000 report writes on p.8: "since Singaporean growth rates were no higher for all the compulsory investment required of its citizens, it is fair to say that the government effectively dissipated all the forced savings."

464 Huff (1995b, p. 750)

the country has clearly over-saved both in terms of utility and growth, unless we assume that Singapore's economy was not able out of some exogenous reason to increase its productivity further and thus raise its returns closer to world levels and consequently maximise its growth rates even more.[465] Gapinski (1999) reaches the same conclusion that given the much higher rate of labour and capital accumulation in Singapore, the country should have experienced faster growth of output and labour productivity than did Hong Kong.[466] Gapinski (1999) explains this growth shortfall by the high degree of government interventionism and reduced civil liberties in Singapore, which are manifested in the high saving rates. He refers to his earlier work (Gapinski, 1996), which has argued empirically that reduced civil liberties undermine economic growth. His calculations also show how the marginal product of capital in Singapore falls from 0.103 in 1961-65 to 0.028 in 1986-90. These dramatic declines notwithstanding, Singapore did however manage to post marginal products above the real rate of interest, which Gapinski (1999) interprets as a confirmation of the consonance of the country's capital acquisitions with capital optimization.

The World Bank's influential 'East Asian Miracle' publication, on the other hand, concluded that Singapore may have compelled its consumers to save too much. According to the World Bank, the country's overall low TFP performance lends support to the thesis that social returns of Singapore's saving were not very high, possibly even below the opportunity costs of foregone consumption.[467]

In the absence of direct evidence, which according to Koh (1987) is lacking due to the difficulties in calculating an optimal saving rate, he also interprets the rising Incremental Capital to Output Ratio (ICOR) in the 1980s as suggesting that there are increasing amounts of excess capacity. This in turn implies that "there is less

465 One such factor is pointed out by Peebles and Wilson (1996, p. 29). They argue that comparisons with Hong Kong must also allow for the fact that Singapore has the burden of maintaining a defence force while Hong Kong does not. It spends about 6% of GDP on national security expenditures – a comparatively high share due to the small size of the country. Lee (2000, p. 545) also refers to the basic difference that Singapore had to be a self-reliant nation: "We had to be a nation or we would cease to exist. We had to subsidize education, health, and housing even though I tried to avoid the debilitating effects of welfarism."

466 Gapinski (1999, pp. 154-159)

need for Singapore to invest as much as it has done over the last few years, and hence from the standpoint of the adequacy of savings, the need to save as much as it has done is less. Thus, there is a strong presumption that Singapore has over-saved." [468] Lim (1988a), without referring to excessive savings as directly, also points to a rising ICOR from 2.8 for the period 1965-73 to 4.6 for 1974-83.[469] Similarly, Hooley (1995) approaches the question from an analysis of the ICOR as an arguably problematic but still best available measure for investment efficiency for a whole economy and finds that Singapore's investment efficiency between 1977-89 has indeed been below that of other East Asian economies but above that of South East Asian countries. Arndt (1991 and 1993) also finds Singapore's ICOR to be the highest, i.e. the least efficient, in his Asian sample, except for the Philippines. Even India's ICOR was lower in the 1980s. However, as Peebles and Wilson (2002) point out the 1980s are particularly bad for an analysis of investment efficiency for Singapore due to the fact that the country experienced two recession years and much investment was in housing. Peebles and Wilson (2002) show that Singapore's ICOR in the 1980s was indeed higher than in the two earlier and the following decade.[470] Peebles and Wilson (2002) also refer to a discussion centering around an unpublished paper by Toh and Ng (2000), which most likely formed the basis for deputy prime minister Lee Hsien Loong's claim that Singapore's ICOR of around 5 during the 1990s compares favourably to that of Hong Kong with 9 and even Japan with 18.[471] Han (1996) argues that Singapore's ICOR needs to be compared with Japan or Switzerland rather than its closer East Asian neighbours since these two countries share a very limited natural resource base with Singapore and finds that indeed Singapore does compare favourably to these countries between 1977-91.[472] Peebles and Wilson (2002) discuss Singapore's absolute capital-output ratio, finding similar results as for the ICOR calculation, namely a continuously rising ratio between 1978-85 and

467 World Bank (1994, p. 221)

468 Koh (1987, p. 86) However, it must be noted, that a rising ICOR could also mean that new technologies simply demand higher capital ratios. In other words, a rising ICOR is not necessarily a sign of excess capacity but possibly a sign of structural changes in the economy.

469 Lim (1988a, p. 232)

470 Peebles and Wilson (2002, p. 67)

471 Lee, Hsien Loong: Speech at the 2000 Singapore Business Awards; as cited by Peebles and Wilson (2002, p. 67)

constant values for 1985-96. In 1996 the capital-output ratio is the highest compared to those of Indonesia, Malaysia, Philippines and Thailand and about the same as that of the United States.[473] Miles and Scott (2002) compare the 1965-90 average investment ratios for 27 countries and relate them to the 'Golden Rule' finding that Singapore together with Japan have had high investment ratios but still within the 'target range' of 30-35 percent of GNP, which the Golden Rule would approximate as the optimal investment rate in an industrialised steady state economy.[474]

Guest and McDonald (2000) built a simulation model based on maximising a social utility function and various assumptions about productivity growth, demographic change and other aspects. For Singapore, their estimate of the optimal saving rate for 1996 was 30.9%, much lower than their estimate of the actual rate of 45.4%. Claessens et al.(1998) approach the question on the company level by calculating the return on assets defined as EBIT over Total Assets less annual inflation for 358 Singaporean companies. Singapore's average 4.4 percent real return for 1988-96 is one of the lowest among the country's Asian peers. Only Japan and Korea have worse returns. However, it is comparable to Germany's 4.7 percent or the United States' 5.3 percent, while Singapore's new investments ratio (new investments as percent of existing investment) with 10.4% was much higher than that of the United States (3.4) or Germany (2.5) and even Japan (8.0).[475] However, the sample of companies is not necessarily representative of the economy, covering mainly large firms and not taking into account the economy's structural composition. The sample might be biased, for example, towards utility companies with high assets and low ROA while the total economy might have a different structure.

472 Han (1996, pp. 27-28)

473 Peebles and Wilson (2002, p. 56)

474 Miles and Scott (2002, p. 104). This assumes a standard Cobb-Douglas production function with a marginal return to capital which is approximated by the factor share of capital in GDP, which in turn stands at 30-35% in most industrialised steady state economies.

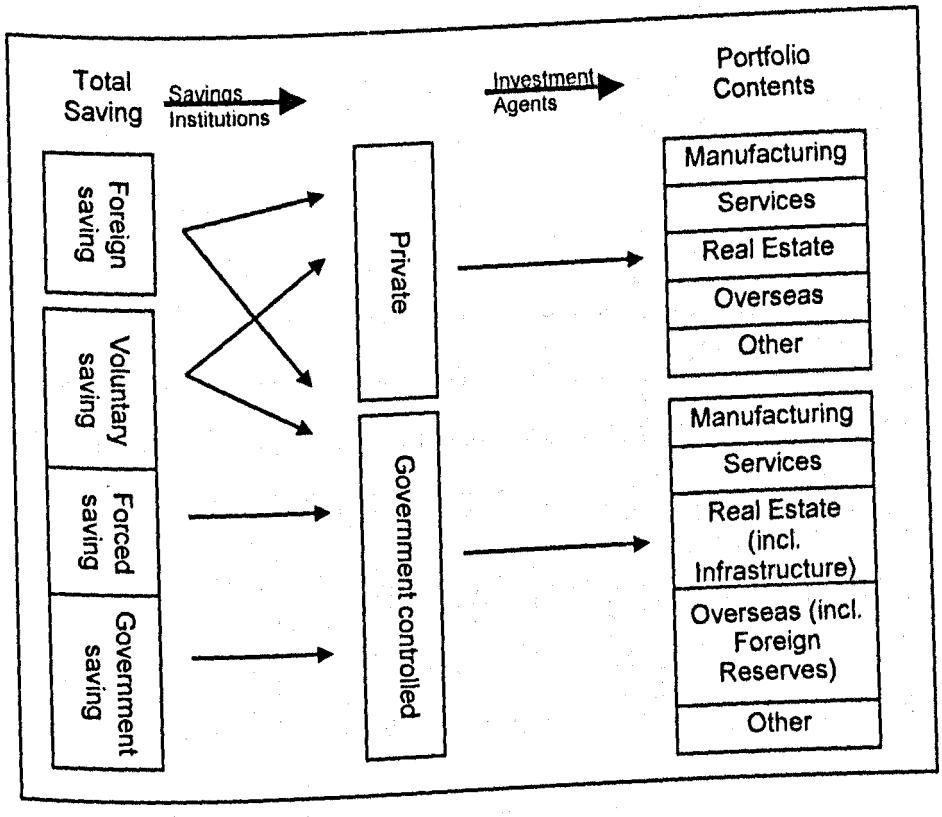
III.2. Procedures, Data Sources and Data Constraints

As discussed above investment behaviour has so far rarely and if at all only to a limited degree been investigated, largely due to the lack of a readily accessible data source. In an attempt to close this gap, a large variety of government and private sources have been combined into a new database, which allows a much more revealing investigation into Singapore's investment pattern than hitherto possible and leads to a number of new insights into Singapore's recent economic history.

The first step was to determine the country's total investment pool, inclusive of appropriated foreign savings, followed by the reclassification of Gross National Savings into public savings on the one hand, and voluntary and compulsory private savings on the other hand.[476] Subsequently, the amount of foreign and voluntary private savings which the government managed to control through its own financial institutions was re-classified in order to derive a more accurate estimate of the government's role in the allocation process. The exercise continued by classifying total investments made over time by the agency in charge of the ultimate investment decision and by the main asset categories into which the funds were invested. Graph III.2. summarises the procedure graphically.

475 The returns calculated for Germany and the USA relate to those companies listed on the DAX or NYSE respectively.
476 Disaggregating the official Gross National Savings series followed the same methodology as described in Chapter Two and is therefore not separately discussed here. This chapter will use the GNS series adjusted for housing withdrawals as set out in Chapter Two.

Graph III.2. The Accounting Exercise



III.2.1. Gross Foreign Savings

In order to derive the total investment pool available for the purposes of this investigation Total Gross Foreign Savings appropriated into the Singapore economy need to be added to GNS.

Gross foreign savings appropriated into Singapore's economy are defined as the sum of Direct Investment Inflows, Portfolio Investment Inflows, Other Investment Inflows (including trade credits) as well as Errors and Omissions.[477] The data is taken from the IMF's Balance of Payments publication, which has two

477 Errors and Omissions are customarily included in efforts to determine capital inflows, e.g. Edwards (2000) and Loayza et al. (1998a). Errors and Omissions are of a substantial nature in the case of Singapore's Balance of Payments. In total they account for S$11.6billion out of a total of S$351billion of appropriated foreign savings. It is not clear why Errors and Omissions are so high in Singapore's case. One possible explanation is the omission of trade with Indonesia in its national accounts, stemming from the years of the confrontation between the two countries during the formation of the Federation of Malaya. For an early reference to this peculiarity see Yang (1970, p.9).

main data constraints. Firstly, some subsections are netted before 1987, since separation between changes in assets and liabilities was not strictly adhered to, e.g. other long-term capital of deposit money banks. Before 1977 direct and portfolio investments are only reported as net-inflows. Errors and Omissions are by definition netted figures. This results in a tendency in the data-set to underestimate the additions to the total investment pool stemming from foreign sources. Secondly, the data offered in the annual IMF publications appears to have undergone regular and retro-active alterations. Assuming that the alterations are correcting mistakes from the past and not adding any of their own, the most recent figures for each year were used to compile the series, i.e. the observation for year X was taken from the publication in year X+t when year X lay too far in the past to be reported any longer in year X+t+1. Notwithstanding these constraints, the data available through the IMF is much more detailed than any official Singaporean publication, which makes using it inevitable.

A potential difficulty occurs because data from national income accounting is combined with information taken from the Balance of Payments. The basic national income identity, which is used to determine GNS, already incorporates Net-Exports and Net-Income-From-Abroad, which are both accounted for in the Current Account of the BoP with their counter-entry in the Capital Account and thus might appear to be a source for double-counting. However, the opposite is the case. Without the inclusion of the Capital Account the total available investment pool would be substantially understated. If a country experiences a trade deficit, for example, the resulting net-imports reduce gross national saving but on a financial perspective are only made possible through foreign savings appropriated into the economy. Therefore, the total available investment pool would actually be understated if only Gross-National-Savings would be considered.[478] If the country experiences an export surplus, as Singapore has

478 In mathematical form the calculation is represented as follows:

since the mid-1980s, the economy is investing overseas by giving trade credits to foreign buyers. The income effect of the net-exports increases gross national savings and is accounted for via the national accounts. The decision to allow the buyers to finance these purchases through trade credits or the sale of other investment vehicles is an allocation decision which should not affect the total investment pool. Therefore, only credit entries in the capital account of the BoP are used to determine total appropriated foreign savings and thus double-counting is prevented.[479]

III.2.2. Determining the Degree of Government Control

In order to derive the degree of government control that portion of voluntary savings, which was held through the government's financial institutions, needs to be re-classified. This in turn requires the construction of a data-series for all non-government liabilities on the balance sheets of the DBS, POSBank, MAS and BCCS.[480] The sources and formulas used in detail are:

DBS: Total Liabilities less Government Loans both taken from DBS annual reports.[481]

Total Investment Pool = GNS + Credit Entries in Capital Account

where

GNS = Y – C – G – Net-Imports

Credit Entries in Capital Account = Direct and Portfolio Investment Inflows + Trade Credits Received + Other Investment Inflows + Errors and Omissions

Rearranging the formulae gives us:

Total Investment Pool = Y – C – G + Direct and Portfolio Investment + Other Investment + Errors&Omissions + (Trade Credits Received – Net-Imports)

Therefore, only the balance of trade credits and net-imports affects the total investment pool. In other words only net-imports which have not been financed by trade credits would lower the investment pool and only trade credits which were not used to finance net-imports would increase the pool.

479 Overseas trade credits are part of Singapore's investment abroad and will be covered as such when the investments are traced.

480 DBS: Development Bank of Singapore; POSBank: Post-Office-Savings Bank; MAS: Monetary Authority of Singapore, Singapore's Central Bank; BCCS: Board of Currency Control Singapore

481 Total liabilities side of DBS balance sheet = all deposits, share capital, retained profits, other funds payable, but not contingencies/guarantees and other off-balance sheet liabilities. Loans from the Singapore government to DBS are deducted prior to 1994. From 1994 on, however, the annual reports do not list Singapore government loans separately anymore. Yet, the total amount has fallen to S$20million in 1993 and is therefore negligible. The loan schedule in the government's financial statements does not show any loans outstanding to the DBS after the financial year 1992/3. Government share capital was not deducted from DBS' total liabilities, since share-issues after the banks' creation could not be separated into government and non-government placements. However, since total share-capital in 1998 was S$1.65billion which is less than 2% of total liabilities this omission should not alter the results substantially. Furthermore, the majority of the government's share capital is held by government investment vehicles, such as Temasek and MND Holdings, which – due to the lack of data availability - must be considered part of the private sector along with all other government-linked companies.

POSBank: Total amounts due to depositors as reported in the MAS annual report.[482]

MAS: total balances of Commercial Banks and Finance Companies with the MAS taken from the MAS annual reports.[483] For the years 1965-69 before the MAS' creation this refers to balances with the Accountant General and Bank Negara Malaysia as reported in Singapore's Statistical Yearbooks.

BCCS: non-currency liabilities taken from BCCS annual reports.[484]

In addition to the share of voluntary private savings captured by the government's financial institutions the share of foreign savings which was commanded by the government must also be re-classified. The information is taken from the IMF's Balance of Payments publications. However, it is questionable to which degree public and private spheres have truly been kept separate in the country's balance of payments statistics.

A further complication derives from the fact that after 1968 the government and the MAS operate on a financial year running until March 31st. The financial years were re-apportioned over the respective calendar years, for example ¾ of the increase between financial years 1997/8 and 1998/9 are allocated to calendar year 1998 and ¼ to calendar year 1999, with calendar year 1998 receiving ¼ of the increase between financial years 1996/7 and 1997/8.

482 The government uses the MAS as its bank and thus it is very unlikely that any of these deposits are government funds.

483 This definition excludes any deposits from financial institutions other than commercial banks and finance companies, such as insurance companies or merchant banks, which makes this figure a conservative estimate. However, the definition would include the DBS's deposits with the MAS, which have already been accounted for as part of the DBS non-government liabilities. Unfortunately, neither the MAS nor the DBS specify the amount of DBS reserves deposited with the MAS. Therefore, an imputation becomes necessary. Assuming that the DBS holds a similar ratio of its non-bank customer deposits with the MAS as the average commercial bank, we can impute a figure for the DBS' deposits with the MAS. The reserve ratio for each year of all commercial banks defined as deposits with MAS over total deposits by non-bank customers taken from the MAS' annual reports is applied to the DBS' non-bank customer deposits taken from the bank's annual reports. The POSBank is not considered a commercial bank until it is acquired by the DBS in 1998. Therefore, no imputation of its likely deposits with the MAS is necessary to avoid a potential problem of double-counting.

484 Since these non-currency liabilities are predominantly funds that are to be transferred to the Consolidated Fund, i.e. to the government, this treatment assumes that the government has not yet accounted for these funds as part of Total Government Revenue, otherwise this would lead to some degree of doublecounting, e.g. in 1999 the BCCS showed 132 Mil. to be transferred to Consolidated Account – in our treatment these funds are additional to the governments financial surplus (Tot Rev. – Consumption) of 35.8 Billion in 1999.

III.2.3. Tracing Public Investments

While the establishment of the savings pool and the degree of government control looks at the liabilities side of the saving agencies' balance sheets, tracing the corresponding investments requires an analysis of the development of their respective assets. The task is complicated by the fact that these agencies exchange funds among themselves, which if counted each time the same funds appear on one of the agencies' asset side will lead to a substantial degree of double-counting. For example the CPF carries government bonds on its asset side and the government itself shows the respective funds received from the CPF as an asset. Therefore, only assets which carry a final investment decision must be included in the analysis. The sources used for this exercise were the central government's financial statements and the annual reports for the individual institutions. Table III.2.3. summarises the respective asset items included and excluded.

Even though the asset side of the balance sheets has been disentangled as well as the information provided permits, some degree of double-counting is still possible, since the individual institutions use different formats to categorise their assets and since the schedules to their respective accounts vary substantially in terms of the detail offered - not only between them but also over time.

Two further investment vehicles need to be considered in order to fully capture the government's investment pattern, namely the government's capital expenditures and the country's foreign reserves. The former is necessary because unlike a private enterprise the government does not capitalize its capital expenditures onto its balance sheet in the form of fixed assets. The latter becomes necessary, because the officially reported foreign reserves do not match the external assets held by the MAS and the BCCS, which indicates that there are further vehicles involved in the foreign reserve position of the country.

Table III.2.3.: Asset Categorisation for Public Investments[485]

	Included Assets, i.e. with final investment decision	Excluded Assets, i.e. without final investment decision
Central Government	• Loans Receivable • Advances Receivable • Quoted Investments • Unquoted Investments • Public funds administered by organs of state • Other Assets	• Cash • Government Stocks • Deposits with investment agents
DBS	• Loans Receivable • Domestic Equity Investments • Real Estate • Overseas Government Securities • Other Assets	• Loans to and Equity in other financial institutions • Singapore government securities and T-Bills • Cash and balances with banks and agents • Amounts due from other banks
POSBank	• Loans Receivable • Real Estate • Listed and Unlisted Shares • Bonds and Debentures • Overseas Government Securities • Other Assets	• Singapore government securities • Time deposits and short-term investments • Deposits with MAS • Treasury Deposits / T-Bills • Accrued Interest • Cash and Deposits
CPF	• Fixed Assets • Staff Loans • Portfolio Investments • Debtors & Deposits • Overseas Government Securities	• Singapore government securities • Bank deposits • Cash and bank balances • Accrued Interest
MAS	• Foreign Reserves • Fixed Assets • Staff Loans • Overseas Investments • Other Assets	• Singapore government securities • Cash and Cash Equivalents
BCCS	• External Assets • Real Estate • Other Assets	• Cash in hand and with agents

The Singapore government does not publish capital expenditures in its own publications, where it refers to development expenditures, which can include current expenditures for salaries, training and the like. Therefore, Capital Expenditure were taken from the IMF's Government Financial Statistics, which however only refer back to 1972/3 and also do not offer a breakdown of the capital expenditures apart from the years 1977/8-86/7. For the years before 1972

485 Investments by the EDB are not separately listed, because they are included in the government's loan portfolio as loans to the EDB until the DBS takes over the industrial finance function from the EDB in 1969. From that point on they are included in the DBS' loan portfolio.

the IMF's International Financial Statistics were used instead. Yet, this source does not directly publish capital expenditure, which meant that they had to be derived by subtracting government consumption from total expenditure. Unfortunately, the derived figures are substantially larger than those published in the IMF's Government Financial Statistics for the years where both are available. In order to be rather on the conservative side and to have the longest continuous series the IMF's Government Statistics were used after 1971. This might underestimate government capital expenditures.[486]

The official foreign reserves were taken from Singapore's Statistical Yearbooks for the years 1965-99 and for 1963-64 from Singapore Department of Statistics (1982). The difference between official reserves and the sum of BCCS' external assets and MAS' foreign reserves was added to government overseas investments.

As a general clarification, it is important to point out that the public investment measure does not fully capture the whole public sector since Government-Linked Companies (except for the DBS) are not reclassified due to their multitude. Furthermore, potentially retained earnings of statutory boards (except for POSBank, CPF, MAS and BCCS) are also left in the private sphere. In essence, therefore, the definition of public sector in this exercise is rather narrow, comprising the central government, its financial institutions and that part of the statutory boards' investments, which was financed through government loans or took the form of profit transfers to the central government.

486 One potential explanation of this discrepancy between the IMF's IFS and GFS publications could be a differing treatment of debt service. However, as it turns out both publications consider debt service a separate item, i.e. the GFS does not consider debt-service (neither interest nor repayments) as part of capital expenditures. Instead it is part of current expenditure. The IFS does not include debt-repayments as part of either government consumption or government expenditure.

III.2.4. Tracing Private Investments

Private agents making investment decisions comprise commercial banks (excl. the DBS), finance companies, merchant banks, insurance companies, discount houses, foreigners and Singaporean residents investing in Singaporean equity or debt instruments as well as Singaporeans investing abroad. For the private financial institutions the same problem regarding double-counting applies as described above for investments by the public sector. Therefore, for the purposes of this exercise their assets exclude cash, investments in government securities and t-bills, deposits with the MAS, and amounts due from other Singaporean financial institutions. DBS assets were subtracted from commercial bank assets because they are already accounted for in the public sphere.

The information for the private financial institutions is taken from the MAS' annual reports, which summarise their balance sheet positions. However, the data series do not extend further back than 1969 or 1970. For merchant banks or discount houses they do not start until 1974 and 1972 respectively. Domestic equity investment by foreigners and Singaporean residents is taken from the surveys, 'Foreign Equity Investment in Singapore', conducted by the Department of Statistics. Their data is drawn from the accounts of all companies incorporated or registered in Singapore except for partnerships and sole proprietorships. The publication started in 1992 with data going back to 1978 for foreigners' equity positions and back to 1980 for Singaporeans'. Additionally, the EDB annual reports offer foreigners' investments in manufacturing going as far back as 1963 and investment by Singaporean residents in manufacturing for the years 1963 to 1968, which at least allows for interpolation of the years 1969-79 until the publication by the Department of Statistics becomes available. No information is available for domestic investment in corporate debt instruments by foreigners or Singaporean residents, which however seems unlikely to having been substantial. A potential source of doublecounting can stem from the fact that the

commercial banks have loans to non-bank financial institutions on their balance sheets. This can include financial holding companies and investment corporations but also finance companies and merchant banks, which are accounted for separately. If these loans were indeed granted to finance companies and merchant banks and these institutions in turn used the funds to finance their loan portfolio then the funds will have been double-counted.

A survey of overseas investments by firms registered in Singapore is published by the Department of Singapore, 'Singapore's Investment Abroad', with data going back as far as 1976. This survey does not cover official foreign reserves or any investments by the central government, which for the purposes of this exercise is beneficial since that information is already accounted for in the public investment analysis. However, it does include financial institutions' investments abroad from 1994 onwards, which have already been accounted for using the MAS annual reports. Since the publication does not list investments by source, i.e. where the funds for the investments came from, but only offers information about the type of overseas investment held, e.g. equity, portfolio etc., the information included in the MAS annual report about financial institutions' overseas investments was deducted from 1994 onwards in order to avoid double-counting.[487] There is no information about individual Singaporean residents' personal investments overseas.

All equity measures are at cost. Domestic equity includes retained earnings. Investments abroad in foreign equity, however, do not include retained earnings, although this information is available, because retained earnings are by definition not repatriated. Consequently they are not part of the country's national income and thus not part of the domestic investment pool.

487 The subtraction of financial institutions' overseas assets as published in the MAS report leads to a dip in the series in 1994 below 1993 levels, which means that the publication by the Department of Statistics either already included some of those investments before 1994 or does not fully account for them in 1994.

While the potential pitfall of double-counting between the different sources has been minimised, the lack of observations for the early parts of the period is less easily dealt with. In general, there are four ways to deal with this problem. The first option is to disregard the early parts of the period and not start the exercise until the late 1970s. The second is to assume that the starting balances in 1965 were equal to the first available observation, while the third option would assume that they were zero. The fourth would apply some form of reverse engineering in order to estimate observations backwards from the given data. This would involve fitting a trend to the available observations and extending that trend backwards. Different trending mechanisms were applied to the data after their transformation into constant 1990 S$, using the GDP-deflator as reported by the Department of Statistics. Linear trends often resulted in unlikely negative starting balances and quadratic trends in early observations far above the later observations. Exponential trending, on the other hand, yielded consistently good fits to the existing data and reasonable estimates above zero but below the later observations. Given the country's overall development, an exponential trend does not seem out of the question. Therefore, early observations for those data-series were estimated using exponential trends.[488]

III.2.5. Overall Evaluation of Quality of Data

The creation of this dataset had to contend with two, in their combination seemingly paradoxical main problems. On the one hand, there is the potential problem of having too much data, i.e. double-counting, when at the same time there is also the problem of having too little data, i.e. missing observations. The danger of double-counting has been removed as far as possible through a diligent read of the notes and schedules of the data-sources. As it turns out the

488 See appendix for the exact formulas and description of fit. Commercial bank loans (excl. DBS) to Transport and Communication and Foreign Equity in Agriculture, Mining and Quarrying could not be trended backwards, since they included negative observations for the early years. In that case

total cumulative investment pool for 1965-99 amounts to S$1,217,986 million while the total traced investments account for S$1,121,455 million or slightly over 92 percent of the investment pool (both constant 1990 S$).[489] Given the fact that the investment pool probably is somewhat understated due to the netting of some Balance-of-Payments positions, this outcome seems to indicate that double-counting has been successfully removed from the dataset, unless substantial gaps in the investment pattern remain unaccounted for. However, none of the gaps described above seems substantial enough to increase the traced investments significantly above the total investment pool. Even the reverse engineering of the starting balances for the missing private investment data series only amounts to S$ 11,385 (constant 1990 S$). In other words, if this imputation was not used and instead the worst case scenario of a zero value for the starting balances of these series was used, traced investments would still be below the cumulative investment pool. Other gaps, such as investments in sole proprietorships and partnerships or private investments in debt vehicles are also not likely to raise the traced investments significantly above the total investment pool. Therefore, the potential problem of too much data seems rather successfully dealt with.

The problem of missing early observations, however, is a more resilient one, which will never fully disappear unless potentially existent but not yet publicly available data is made accessible.[490] Until then, it becomes paramount to analyse to what degree conclusions derived from this dataset are potentially affected by the methods used to compensate for the missing observations. In the aggregate, using the estimations derived from exponential trending can, on the one hand, lead to understating investments by S$11,385 if indeed the zero assumption turns out to be true. On the other hand, it can result in a maximum overestimation of investments by S$26,930 if the first available observations are closer to the 'true'

a zero starting balance was assumed.

489 Total traced investments for the period 1965-99 refer to the increase in total stock of investments between 31/12/64 and 31/12/99.

490 Requests to the EDB for access to their data sources have been declined.

starting balances.[491] In total, this estimation procedure adds a maximum error window of S$ 38,315 or 3.4% around the traced investments. Therefore, conclusions based on the aggregate figures should not be too sensitive to this assumption. However, the more disaggregated the level of observation becomes the more will the degree of sensitivity to the trending assumptions increase. Therefore, in the extreme case of looking at an individual data series which has been trended back in time to derive its early observations, conclusions based on these early years must be considered as speculative.

491 The sum of the first observations equals S$38,315. Since S$11,385 are accounted for in the dataset using exponential trending, the difference of S$26,930 is the maximum likely overstatement deriving from this method.

III.3. The Allocation Process - An Accounting Exercise

III.3.1. The Total Investment Pool

In total the Singapore economy had 1.22 trillion constant 1990 Singapore dollars available for investment purposes, of which more than a third came from abroad increasing the total amount available for investment by over fifty percent above gross national savings. In turn this means that Singapore was able to make investments during 1965-99 equivalent to 70 percent of the sum of the country's Real GNP, while the gross national saving rate averaged 46.13 percent during these years.

Table III.3.1.a.: Total Real Investment Pool and Government Control

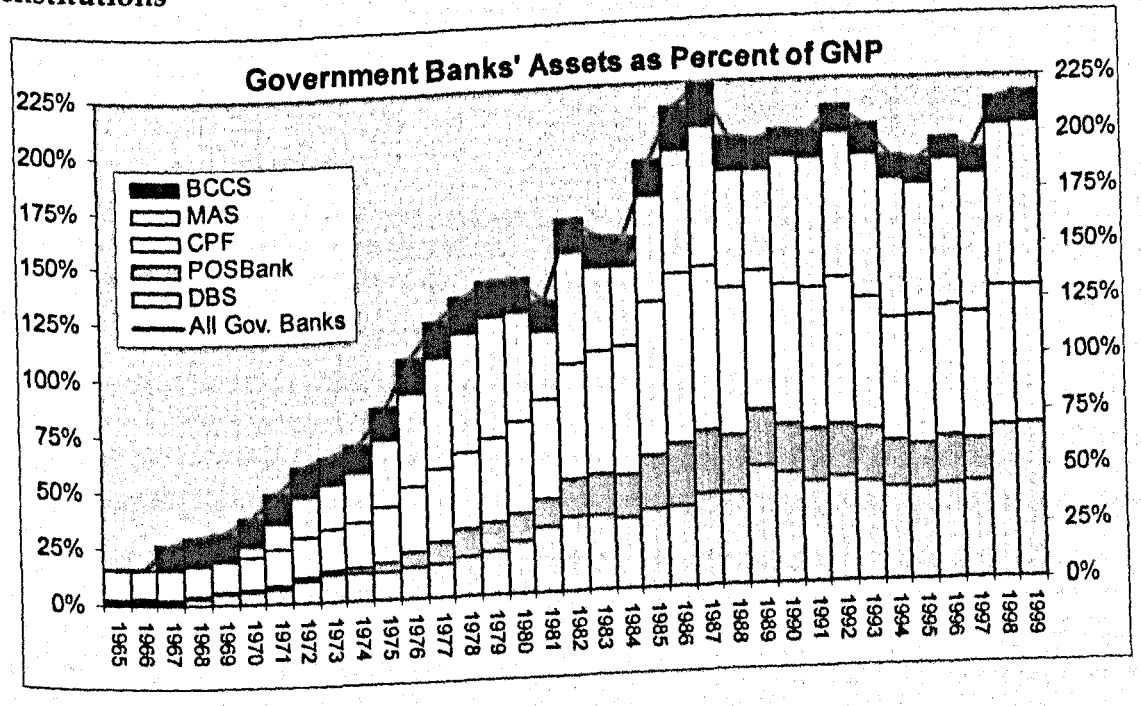
Constant 1990 S$ - million	**1965-99**
Government Saving	360,113
Forced Private Saving	181,729
Voluntary Private Saving	284,990
Total Gross National Saving [492]	826,831
Percent government controlled	65.5%
Reclassify POS + DBS + MAS + BCCS non-gov. liabilities	118,942
Percent government controlled	79.9%
Add Gross Foreign Saving Inflows	391,155
of which official funds	600
TOTAL GROSS INVESTMENT FUND	**1,217,986**
Of which government controlled	661,384
Percent government controlled	54.3%

Even more striking than this substantial amount of foreign savings is the extraordinarily high degree of government control. Beyond the government's own savings and its control over the compulsory pension scheme, it must be particularly noted that through its financial institutions the government was able

492 Adjusted for investment in residential housing channelled through the CPF.

to attract the equivalent of over forty percent of private voluntary savings into its realm of influence.[493] Overall, slightly over 54 percent of the total investment pool was controlled by the government which is equivalent to eighty percent of total gross national saving. This estimate of government control does not reclassify non-financial government-linked corporations, nor does it take into account other means of control such as the central banks' policies affecting credit creation or the influence over foreign savings exercised by Singapore's institutions dealing with Foreign Direct Investment. Therefore, it is safe to argue that even though this degree of government control appears already very substantial it is still a conservative lower limit estimate. Overall, the government is likely to have controlled or directed close to the equivalent of the nation's total gross national savings between 1965 and 1999.

Graph III.3.1.: The Government's Expansion of Control through its Financial Institutions



493 The main government controlled financial institutions are the Monetary Authority of Singapore (MAS), the Post-Office Savings Bank (POS) , the Development Bank of Singapore (DBS) and the Board of Currency Control of Singapore (BCCS).

Graph III.3.1. shows the development of the government's financial institutions consolidated balance sheets. At independence the government financial institutions controlled funds equivalent to a mere 15.5 percent of GNP. By the mid-1980s their balance sheets had increased to a value at or above 200 percent of GNP.

For a period of time the Singapore government published its own estimates of public sector saving. Huff (1995a) amended the official series by adding CPF savings for 1974-84. Table III.3.1.b. offers a comparison of the officially reported public sector saving and the CPF saving as a percent of GNS, both according to Huff (1995a) and the new estimates derived here. [494]

Table III.3.1.b.: Comparison of Government Control [495]

	Amended Official Series (Huff, 1995)			New Estimates			
% of GNS	Public Sector	CPF Saving	Total I (1) + (2)	Gov. Saving	CPF Saving	Total I (Gov + CPF)	Total II (+ Fin Inst.)
1974	22.8	20.0	42.8	42.0	22.2	64.2	70.6
1975	34.2	20.6	54.6	47.3	23.2	70.5	88.4
1976	32.1	18.1	50.2	39.3	22.8	62.1	92.3
1977	39.8	17.5	57.3	36.3	23.3	59.6	76.4
1978	37.6	17.3	54.9	33.7	23.6	57.3	78.7
1979	38.4	21.0	59.4	34.6	25.5	60.1	80.3
1980	41.1	24.6	65.7	42.0	29.1	71.1	73.3
1981	40.6	24.8	65.4	43.6	29.7	73.3	97.9
1982	46.1	27.2	73.3	46.3	31.7	78.0	110.7
1983	53.0	23.6	76.6	42.8	28.6	71.5	88.3
1984	60.7	17.0	77.7	33.5	27.8	61.3	71.8

Compared with the results from the current exercise even the amended official figures substantially underestimate the actual degree of control by the

494 Huff (1995a), pp. 1428-27, which offers the same data as Huff (1994) pp.332-333. Public Sector savings are defined as the current surplus in the consolidated accounts of the public sector, which consists of government plus seven major statutory boards, namely the Housing and Development Board, Jurong Town Corporation, Public Utilities Board, Port of Singapore Authority, Telecommunication Authority of Singapore, Urban Redevelopment Authority and Sentosa Development Corporation. Central Provident Fund savings are defined as the net addition that year to the accumulated fund due to members. Because of members' withdrawals of funds, this figure was normally less than members' contributions. A preliminary figure for 1985 is also given but not reported here. After 1985 the government discontinued the reporting of public sector saving.

495 After the addition of savings appropriated by the government's financial institutions its control over the savings pool is in some years larger then total GNS of that year, which means that the government must have attracted foreign savings into its sphere of influence. Huff's percentages are expressed as percent of official GNS, while this study uses as the denominator GNS adjusted for residential housing investments channelled through the CPF.

government. Only in the two final years are the estimates of the amended series by Huff (1995a) above the figures (excluding government financial institutions) derived in this exercise. Once the government's financial institutions are added, the gap between the two series becomes even more striking. The differences stem from a different definition of public sector savings and CPF savings. In our case government savings does not include the statutory boards due to limited data availability but adds in its final step savings appropriated by the government's financial institutions. Additionally, the current surplus used by Huff as the basis for government savings, does not always equal in Singapore's case the difference between total government revenue and total government consumption, the definition employed by this study. In respect to CPF savings, our series only deducts withdrawals for consumptive purposes in order to derive the net saving additions appropriated by the CPF. Other withdrawals, for example, for investments in government sponsored equity schemes or housing are considered to be merely a move between types of investment portfolios.[496]

Apart from a revision of earlier estimates of government control, the creation of a total investment pool also points out that an analysis based merely on Gross-Fixed-Capital-Formation (GFCF) substantially underestimates total investments made. Cumulative GFCF for 1965-99 accounts for 609.1 billion constant 1990 S$, which is the equivalent of 80.3 percent of total GNS or fifty percent of the total Gross Investment Pool. Therefore, merely considering officially reported GFCF will limit the analysis to only about half of the total funds available for investments. As the analysis by asset category below will show almost half of this gap can be accounted for by overseas investments, both by the public and the private spheres.[497]

496 For a *critical assessment of different definitions of CPF savings* see section II.4.3.

497 For an interpretation of the remaining gap and what it can possibly tell us about the question of oversaving and crowding out in Singapore see section III.3.4. and III.3.5.

III.3.2. Investment by Investment Agents

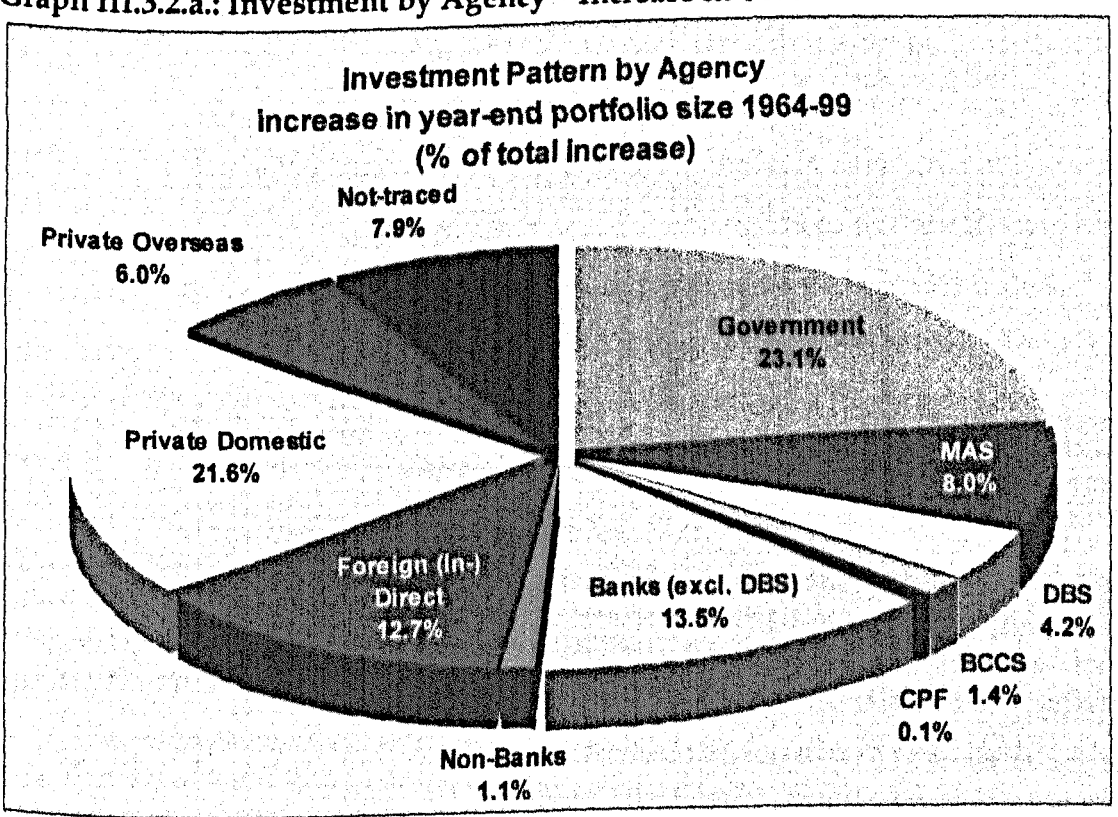
While the total investment pool is based on annual flows of savings, the analysis of the investment patterns uses year-end stock balances for the respective agents. Comparing the starting balance of December 31st 1964 with the ending balance of December 31st 1999 yields the comparable figure to the cumulative saving flows for 1965-99. However, this comparison might not capture important developments taking place between these two points in time. Therefore, a measure summarising the development over the whole time period is needed. In order to derive such an overall measure each portfolio position was tracked for each year and converted into constant 1990 S$. The sum of all year-end balances is then able to describe the cumulative importance of each respective item and agent. In other words, each portfolio position is given a 'point' for each constant 1990 S$ invested in it at each year-end. The more 'points' the portfolio position collected between 1965-99, the higher was the exposure of the total portfolio to this type of investment.

Table III.3.2. summarises Singapore's investment pattern by investment agent, using both the increase in the year-end portfolios and the overall measure. As it turns out, there are no major differences of the respective agencies' shares of total investments made between the two measures. The increase in the year-end portfolios as opposed to the overall measure seems to slightly overstate the government's and understate the banks' role in making the ultimate investment decision. In turn this means that the government has actually become somewhat more important towards the end of the period as the main investment agent.

Table III.3.2.: Investment Pattern by Investment Agents[498]

(constant 1990 S$)	Incr. Year-End Portfolio		Overall Measure	
Government	283,916	23.3%	2,480,477	21.2%
MAS	97,619	8.0%	918,969	7.9%
DBS	52,087	4.3%	332,509	2.8%
POSBank	(57)	0.0%	102,428	0.9%
BCCS	16,988	1.4%	216,159	1.8%
CPF	1,453	0.1%	9,429	0.1%
Additional Foreign Reserves	(4,266)	-0.4%	118,941	1.0%
Banks (excl. DBS)	165,643	13.6%	1,983,311	17.0%
Non-Bank Fin. Inst.	13,751	1.1%	263,720	2.3%
Foreign (In-) Direct	155,319	12.8%	1,337,904	11.4%
Private Domestic	265,548	21.8%	2,529,029	21.6%
Private Overseas	73,456	6.0%	609,169	5.2%
Not-traced	96,532	7.9%	786,493	6.7%
TOTAL	1,217,986	100%	11,107,675	100%

Graph III.3.2.a.: Investment by Agency - Increase in Year-End Portfolio[499]



498 The Not-Traced item is the difference between the Total Investment Pool and the sum of all traced items. The POSBank has a negative figure for the comparison of the starting and ending portfolios, because with the acquisition by the DBS in 1998 all assets have moved to the DBS. Additional Foreign Reserves, i.e. the balance between official reserves and those held at the MAS and BCCS, are also negative because in 1965 all foreign reserves are additional to MAS and BCCS since these institutions do not yet exist, while by 1999 unlike most of the rest of the period officially reported reserves are lower than what MAS and BCCS hold together. The BCCS is the Currency Board of Singapore in charge of issuing Singapore's national currency.

499 The graph only displays non-negative shares, as a result percentages can differ slightly from table III.2.

Nevertheless, the comparatively low government involvement, given its high control over savings, is very striking. In total the government and its financial institutions accounted for 36.7 percent of the total investments made, based on the increase of its year-end portfolios.[500] At the same time, however, it controlled 54.3 percent of the total available investment pool as shown in Table III.3.1.a. Consequently, it must have given up control over 17.6 percent of the investment pool and re-injected this portion into the private sphere, which as a result accounts for 55.3 percent of total investments made.

Over the whole period 1965-99 the Singapore government and its financial institutions controlled savings of 661 billion constant 1990 S$, but only made final investment decisions amounting to 452 billion. How can this gap of 209 billion be explained? The government shows on its balance sheet in 1999 investments in its own government stocks, presumably bonds, with the value of 88 billion constant 1990 S$, which at the time of issue must have increased the government's revenue and thus its savings. However, because the bonds have since then been bought back from the private sphere, the government has in essence abandoned control over the funds initially raised through the issue of these securities and thus re-injected those monies back into the non-governmental sector. Similarly, an additional 2 billion constant 1990 S$ was deposited with investment agents.[501] Together these items can explain forty-three percent of the gap between controlled savings and placed investments. The rest together with the question why the government felt the need to cease control over these funds remains a puzzle. This seems to suggest that due to too tight a grip on the nations' savings the government redirected more funds into its realm of influence than it could handle. After all the government went to quite some lengths in establishing and expanding its own financial institutions which were able to re-direct almost 120 billion constant 1990 S$ from voluntary private saving into the realm of

500 Based on the overall measure, the government's *share in investments made* was 35.7 percent.

501 Additionally, the government is holding *48.5 billion constant* 1990 S$ in cash at the end of 1999. To remain conservative it was assumed that these funds are deposited with government investment agents, such as the MAS or DBS. If that was not the case, the savings reflected in these funds would have effectively been neutralised.

government control, while at the same time the government felt the need to surrender control over 209 billion constant 1990 S$.

Looking at the foreign direct and indirect investments throws up another intriguing aspect. According to the country's Balance of Payments Singapore was able to appropriate 391.2 billion 1990 constant S$ in gross foreign savings. Yet, equity holdings by foreigners in Singaporean firms amounted only to 156.7 billion in 1999 or 155.3 billion above their estimated 1965 starting balance. Therefore, about 235 billion are either unaccounted for in the official publications or have been diverted to other investment agents, via such vehicles as sale of land leases, taxation, salaries and other running expenses. As the summary by investment category below shows, Singapore was able to increase her overseas assets by about 265 billion (constant 1990 S$) during the same time.[502] In other words, the Singapore economy was able to increase her own foreign holdings by a little more than the equivalent of what the country was able to divert from foreign inward investments.[503]

III.3.3. Investment by Asset Category

Table III.3.3. summarises the investment pattern by target asset category, both in terms of the increase of the year-end portfolios between 1964 and 1999 and the overall measure. Again, no substantial difference between the two types of measurement emerges.

502 Low et al. (1998) point out that a substantial portion of Singapore's overseas assets are owned by companies in Singapore, which themselves are controlled by foreign interests. For example, in 1990 50 percent of the stock of Singapore's direct investments abroad originated from foreign controlled firms.

503 This gives rise to another interesting question: why was Singapore not able or willing to invest even *more overseas instead of having* substantial domestic funds linger more or less unused as working capital? Two potential answers emerge: an even higher rate of foreign investment might have undermined the policy of a controlled appreciation of the Singapore dollar, which in turn would have resulted in higher inflation and thus less of a success-story based on macro-economic stability. Alternatively, the players in the economy might not have noticed the degree of under-utilised funds in the system.

Table III.3.3.: Investment Pattern by Asset Category [504]

(constant 1990 S$)	Incr. Year-End Portfolio		Overall Measure	
Public Real Estate	89,217	7.3%	757,647	6.5%
Public Manufacturing	7,408	0.6%	68,143	0.6%
Public Services	19,813	1.6%	267,451	2.3%
Public Other	220,269	18.1%	1,862,053	15.9%
Public Overseas	111,032	9.1%	1,245,018	10.7%
Private Real Estate	100,529	8.3%	960,482	8.2%
Private Manufacturing	75,677	6.2%	927,904	7.9%
Private Services	322,225	26.5%	3,093,157	26.5%
Private Overseas	154,150	12.7%	1,365,891	11.7%
Private Other	21,135	1.7%	172,422	1.5%
Not-traced	96,532	7.9%	968,371	8.3%
TOTAL	1,149,879	100.0%	11,107,675	100.0%

Given the country's standard development story as a labour-intensive manufacturing export base, it might be somewhat surprising to find that manufacturing has attracted only 6.8 percent of the total investments made, far behind real-estate (15.6%), overseas investments (21.8%) and the service sector (28.1%).[505] Moreover, of the small proportion in manufacturing two-thirds came from foreign sources. This is of particular interest in respect to the discussion about the country's productivity performance, because recent studies have found considerable productivity growth in the manufacturing sector, while the overall conclusion of the TFP literature points to very limited productivity gains in the economy as a whole. Rao and Thangavelu (1998) found that FDI intensive industries as a whole experienced a signficiant improvement in TFP growth from -2.6% in 1974-84 to 10.9% in 1987-95. Thangavelu and Rao (1999) show very strong productivity growth in the almost exclusively foreign electronics sector.[506]

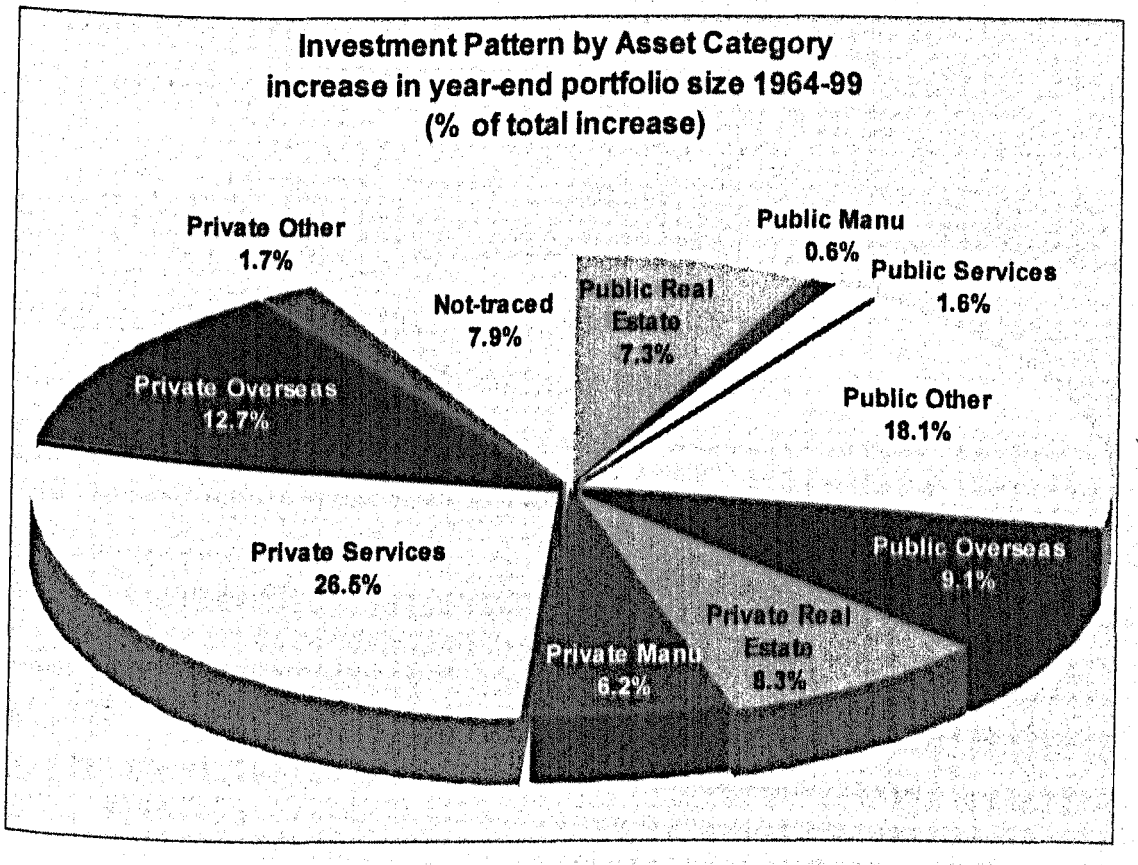
504 Foreign direct and indirect investment is considered part of the private sector for the purposes of this summary. Real Estate comprises investment in Housing, Real Estate Development as well as the Construction Industry at large.

505 Based on the overall measure the shares are: 8.5% manufacturing, 14.7% real estate, 22.4% overseas and 28.6% services. It must be noted, however, that this ranking of the recipient sectors is somewhat sensitive to that portion of the investment pool, which could not be traced or allocated. The non-traced share and the sum of Other category investments which could not be allocated due to lacking descriptions add up to 27.7%. Yet nevertheless, only if 73% of the non-traced and not-allocatable funds had gone to the manufacturing sector and none to services, would manufacturing have received the equivalent share of investments as the service sector. This seems very improbable particularly considering the fact that the main unallocatable investment portion are unspecified government investments and that the main GLCs are all in the service sector. Therefore, it seems much more likely that a sector specific treatment of the non-traced and non-allocatable investments would rather widen than close the distance between the investment shares received by the service and manufacturing sectors.

506 Thangavelu and Rao (1999) find TFP growth in the electronics sector of 8.5% between 1987-95 rising from 5.1% for 1974-84, which is significantly more than Young's (1994) hypothesis of close to zero growth for the whole economy. Young (1994) finds negative TFP growth for the manufcturing sector as a whole. Leung (1997) finds substantially lower, but still positive TFP growth in the manufacturing industries for the period 1983-93. Yet, the study is criticised by Thangavelu and Rao for not treating the 1985/6 recession years seperately.

If productivity gains have been realised it appears they have been achieved in foreign dominated parts of the economy. However, it must be noted that even foreign investment preferred the service sector, with over 60 percent of foreign direct and indirect investment flowing into the tertiary sector accounting for 27.6 percent of total investments made in services. Therefore, while both domestic and foreign investors seem to have agreed on Singapore's investment opportunities in the service sector and on their respective abilities to exploit them, they appear to have disagreed on their comparative lack of opportunities in the manufacturing sector.[507]

Graph III.3.3.a.: Investment by Asset Category



507 Yoshihara (1976,p. 16) explains this different view about the respective comparative advantages as a response to Singapore's negative assessment of her own competitiveness in manufacturing on a world market: "the export oriented industry had to compete in the international market against well-established Western and Japanese firms which enjoy more advanced technology, better marketing and management know-how, and better access to capital. How could these disadvantages be overcome? Singapore's answer was to invite foreign investment."

That this decision to invest predominantly and from the start in the service sector might have been a superior development strategy for a government in charge of a country bereft of natural resources is supported by the generally low import leakage of the service sector.[508] The MAS Quarterly Bulletin March 2001 offers a calculation which calculates the import component of each dollar of final expenditure in services to be only 0.29 cents as compared to over 90 percent imports for Petroleum refinery for example or 0.62 cents for manufacturing. While this aspect might not be of importance to the private investor, whose economic objective is to merely maximise return-on-investment, from the government's point of view guiding investment towards services makes fundamental sense because most of the income stays within the country, not like manufacturing where the predominant share of revenue needs to be spent on imported inputs. Given Singapore's resource endowment a concentration in services is therefore logical, especially if one also takes into consideration that services usually carry a high labour content, the one resource Singapore has been blessed with.

Additionally, at least the Singapore government was convinced that Singapore with its trading background was suffering from a lack of entrepreneurs suitable for exploiting manufacturing opportunities. Therefore, very early on it set out to built Singapore into a service hub, particularly a financial centre. Lee Kuan-Yew writes in his autobiography:

> We did not have a group of ready-made entrepreneurs such as Hong Kong gained in the Chinese industrialists and bankers who came fleeing from Shanghai, Canton, and other cities when the communists took over. Had we waited for our traders to learn to be industrialists we would have starved. It is absurd for critics to suggest in the 1990s that had we grown our own entrepreneurs, we would have been less at the mercy of the rootless MNCs. Even with the experienced talent Hong Kong received in Chinese refugees, its manufacturing technology level is not in the same class as that of the MNCs in Singapore.[509]

508 See also Peebles and Wilson (2002, p. 74)

509 Lee (2000, p. 66) See also Lee (2000, pp. 543-544). The view of a lack of entrepreneurs has also been prevalent in the secondary literature. See for example Soon (1993, p.5), Rodan (1989, p. xv), Yoshihara (1976, p. 162 and p. 21), and Hermann (1970, p. 217) and Hughes (1969, p. 29 and p.33). Lee Kuan-Yew's autobiography also describes how the decision to turn Singapore into a financial centre goes back to 1968, when it was

While Singaporeans apparently did not consider opportunities in manufacturing as promising as foreigners and while the exploitation of opportunities in the service sector rested substantially on the private sphere, Singaporeans have instead had a continuous desire for overseas investments, indulged almost equally by the public and the private spheres.[510]

In 1999 the Singapore government held (current) S$128.5 billion in official foreign reserves, which equalled 90 percent of that year's GDP or 70 percent of total money supply (M3). On first sight this might appear excessive. However, it should not be forgotten that at the same time the government has a substantial liability through the CPF, which in 1999 amounted to S$ 88.4 billion. The question on whether these overseas investments are indeed foreign reserves or rather pension funds rests fundamentally on the assessment of the government's (not-allocatable) other domestic investments. At the end of 1999 the central government listed quoted and unquoted investments of over (current) S$160 billion. Yet, since no detail is provided on where and how these funds have been invested such an assessment is highly speculative, because it can only point to the government's shareholdings in a few large, well-known GLCs such as Singapore Airlines, Neptune Orient Lines, Singapore Telecom, Development Bank of Singapore etc. Therefore, the large public overseas investments are not only strikingly high but also strikingly difficult to assess. The most telling hint that these foreign reserves are actually pension funds comes from the fact that the Government Investment Corporation (GIC) is reported to have over 100 billion of these funds under its management. The GIC's portfolio includes such assets as real estate and direct investments in overseas companies. These investments are far from liquid and therefore will not be able to fulfil the

recommended that Singapore fill the time gap in the international financial world, which existed between the close of trading in San Francisco and the opening of the banks in Zurich. Lee (2000, p.72) describes the telephone conversation between Dr. Winsemius, Singapore's Dutch economic advisor, and Mr Van Oenen, the vice president of the Bank of America branch in Singapore, which gave rise to this idea. Van Oenen is quoted as saying: "If we put Singapore in between, before San Francisco closes, Singapore would have taken over. And when Singapore closes, it would have handed over to Zurich. Then, for the first time since creation, we will have a 24-hour round-the-world service in money and banking."

510 The continued and substantial overseas investment flows by the public sphere contradicts some of the literature which points to the private sector as the driving force behind outward investment. See for example Yeung (1999, p.252)

standard role of foreign reserves, i.e. to alleviate a potential current account or currency crisis.[511]

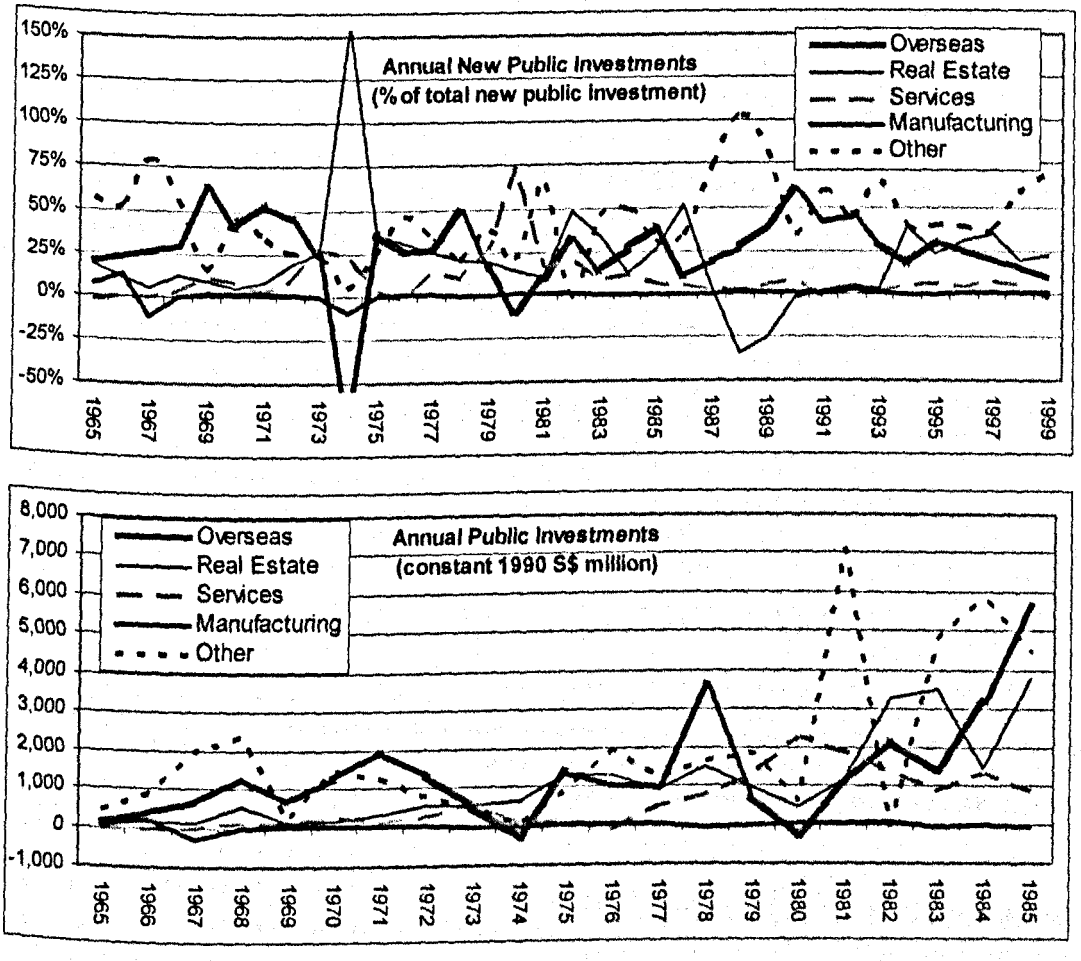
The monetary history of Latin American countries, can potentially suggest another reason for these substantial overseas investments, particularly by the public sphere. Edwards (2000) points out that almost every one of the Latin nations has tried to sterilize large capital inflows in an effort to maintain greater control over monetary policy - however rather unsuccessfully. He argues that the lack of success has been due to the fact that interest earnings on international reserves are rather low, while the central bank has to pay a relatively high interest rate to persuade the public to buy its own securities. Transplanting this argument to Singapore's history offers very intriguing insight. Contrary to the Latin American countries, Singapore was able to use the Central Provident Fund to mop up the additional purchasing power stemming from FDI (and other sources) at virtually no (real) interest cost to the government. At the same time, the government was able to profitably invest these funds overseas through its financial institutions, particularly the Government Investment Corporation. Therefore, sterilisation worked in Singapore due to the country's institutional framework and more active investment fund behaviour - but also at the cost of Singapore residents' real pension balances with the CPF. In other words, Singaporeans paid for low inflation with a negligible (real) return on their CPF balances. Whether this procedure resulted in a net social gain, however, cannot be assessed due to the fact that the GIC is not required to publish its annual reports.[512]

511 The government is also substantially exposed to public sector housing. In 1999 its balance sheet showed 61.8 billion constant 1990 S$ of loans outstanding from the HDB. However, since Singaporeans predominantly own their houses and apartments bought at some point from the HDB these loans do not have an asset value on a national level. In other words, if these assets were indeed used to pay back the CPF liabilities, then the pensioner would in essence receive a pension from the government which he would have to hand over to the HDB in service charges etc. in order for the HDB to be able to repay these loans to the government in the first place.

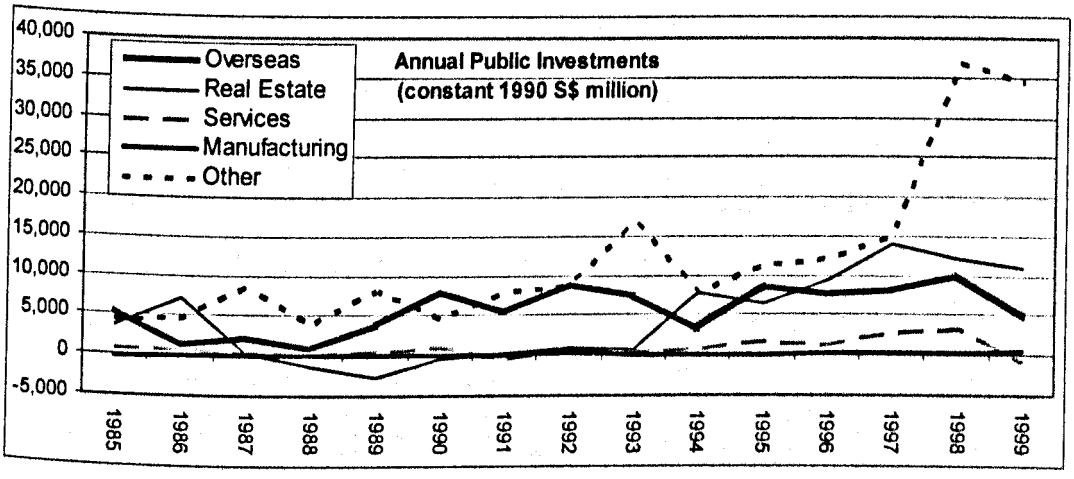
512 The income tax system also offers an institutional bias towards overseas investment, since overseas income is free of Singapore tax if not remitted back to Singapore. Even if such income is remitted, so long as Singapore has a double taxation relief agreement with the source country, no tax liability would be incurred.

In order to follow the annual investment flows and thus the development of the investment pattern over time, the (1990 constant S$) year-end stocks of each portfolio item were converted into first differences. Graphs III.3.3.b-d show the percentage distributions, i.e. percent of total public investment flows, and the absolute figures.

Graphs III.3.3.b-d: Annual Public Investment Flows [513]



513 The not-traceable portion consists predominantly of not further specified quoted and unquoted investments. For the sake of the graph they were, however, calculated as the difference between total annual public investment flows and *the sum of the flows going into overseas, real estate, services* and manufacturing. Due to the lack of a 1964 year-end observation for foreign reserves, the 1965 figure for overseas investments assumes that there has been no change.

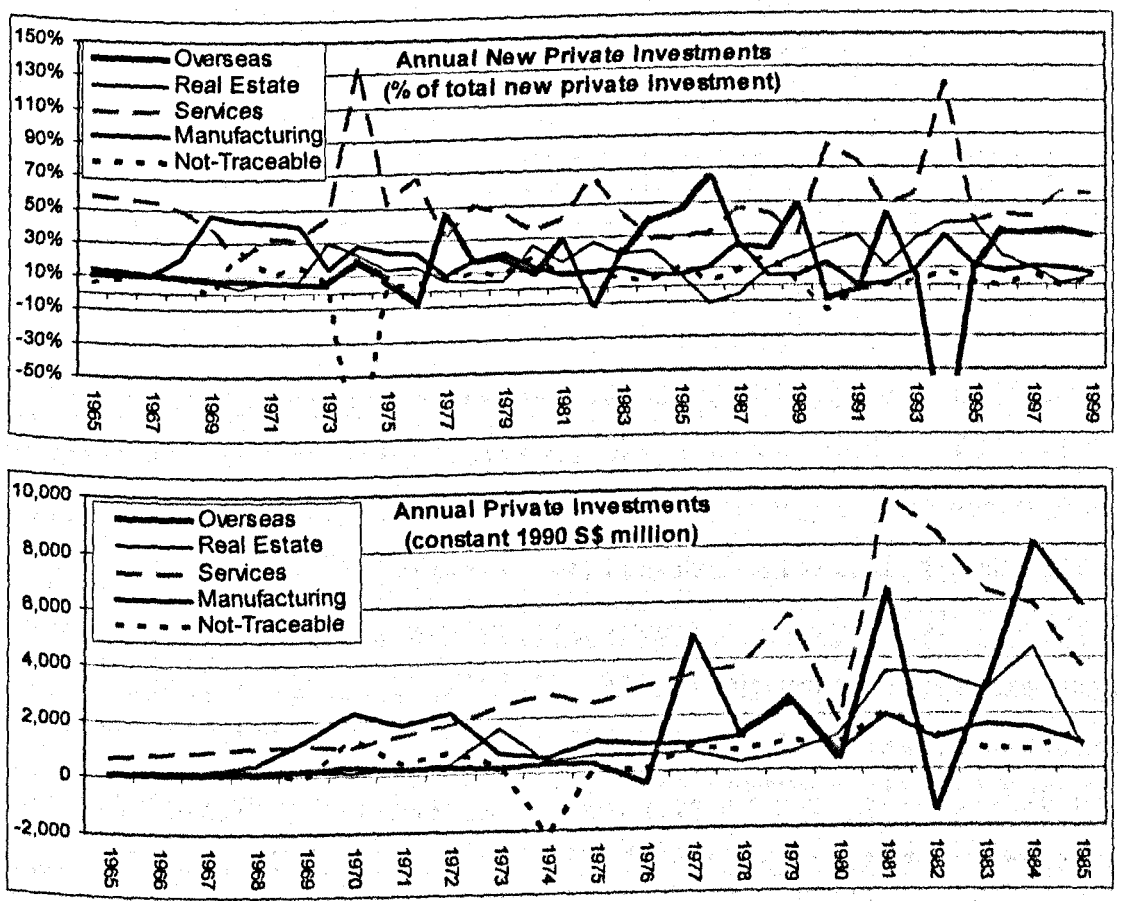


The small role of manufacturing investments for the whole period is reinforced. New investments in the service sector, however, seem to have been concentrated in the mid-1970s to mid-1980s. New overseas investments have always figured high on the government's investment agenda, apart from 1974 which shows a substantial divestment in that portion of foreign reserves not held by the MAS and BCCS most likely in response to the world-wide oil-crisis induced recession. Real estate investments figure prominently as well, with a rising importance from the late 1960s onwards. For a period until 1987 the share of new investments in real estate can even rival the share of new investments in overseas assets. Between 1986 and 1993, however, the government seems to have tried to reduce its portfolio's exposure to real estate. This coincides with an increasingly liberal policy of allowing Singaporeans to use their CPF funds to acquire their HDB apartments. Yet, from the mid-1990s on the government again increases the share of new real estate investments. The proportion of not-allocatable, new quoted and unquoted investments rises as well from the mid-1980s, which also coincided with a proliferation of the government's investment funds.

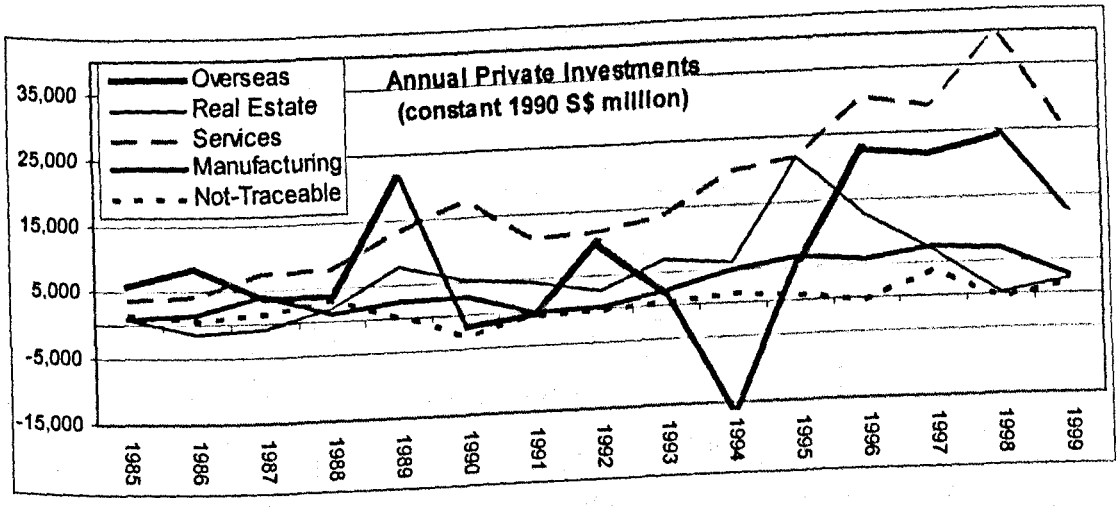
In the private sphere services have dominated for the whole period. Only for a very short time around 1970 does the manufacturing sector appear to have been the dominant target for new private investments. However, this result is

somewhat sensitive to data-limitations in this particular sector and time-period. Nevertheless, the predominant role of services is supported by the fact that in 1969 almost 50 percent of the non-government, non-cash assets of Singapore's commercial banks' were committed to the service sector and only about 20% to manufacturing. This finding casts some doubt on the standard description of Singapore's early development, which points to labour-intensive manufacturing as the driving force. Additionally, based on the analysis of the investment patterns a strict reading of the flying geese hypothesis must be rejected, since it would argue for a much later development of the tertiary sector. Instead Singapore 'chose' to develop its service sector from the outset and continuously invest overseas.

Graphs III.3.3.e-g: Annual Private Investment Flows [514]



514 The not-traceable portion is calculated as the difference between total annual private investment flows and the sum of the flows going into overseas, real estate, services and manufacturing. Due to the lack of early observations – particularly for non-manufacturing – investments during the



III.3.4. Oversaving?

Ever since the mid-1980s there has been speculation about whether and if so by how much Singapore might have over-saved. What can the new dataset possibly add to that discussion? Taking the starting position from the literature, we explore the development of Singapore's Incremental Capital to Output Ratio (ICOR) over time. Additionally, we extend the ICOR concept by a Total Incremental Capital to Output Ratio (TICOR), which uses the increase in the total available investment pool instead of only considering fixed-capital investments.[515] Since GFCF only accounts for about half of the total available investment fund, this adjustment seems sensible if one wants to evaluate the question of whether the country has forgone unnecessary amounts of consumption. The difference between TICOR and ICOR can only be due to three factors: overseas investments, working capital and corporate investments in non-fixed assets, which have been capitalised, i.e. are shown as assets on the company's balance sheet and are thus not accounted for as an expense. Additionally, we assess the capital efficiency applying the Golden Rule to the

early years of the period are sensitive to imputational assumptions. The divestment of overseas assets in 1994 might be due to data inconsistencies, since the series detailing Singapore's investment abroad changes in 1994.

515 The (T)ICOR indices are calculated using GNP instead of the more customary GDP in order to ascertain consistency with the other parts of the chapter and explicitly allow for the effect of income on overseas investments.

development of Singapore's capital stock and finally approach the question through a simple but revealing accounting exercise.[516]

Table III.3.4.a. shows sub-period averages for the ICOR and TICOR concepts. The watershed of the 1985/86 recession becomes immediately visible, confirming Peebles and Wilson's (2002) argument that ICOR assessments of the 1980s might be unduely biased.[517] As a matter of fact, treating the two recession years seperately and splitting the sample period around them reveals that the ICOR for 1987-99 is actually lower than that for 1965-84, which points to rising (fixed) capital efficiency in the second period. On the other hand, the TICOR continues to rise, indicating falling efficiency. The disparate behaviour of the two series can only be explained by higher returns to fixed capital than non-fixed capital investments in the post 1986 period.

Table III.3.4.a.: Singapore's ICOR and TICOR [518]

	ICOR	TICOR
1965-73	2.72	4.49
1973-78	5.13	7.66
1978-84	5.27	7.92
1985-86	90.45	164.72
1987-99	4.37	9.76
1965-84	4.55	6.92
1987-99	4.37	9.76
1965-99	4.69	9.38

Going beyond sub-period averages, annual (T)ICOR calculations have the disadvantage of being rather volatile. However, since we are predominantly interested in Singapore's development since the country's independence, using 1964 as the base year for an alternative (T)ICOR calculation, i.e. cumulative GFCF

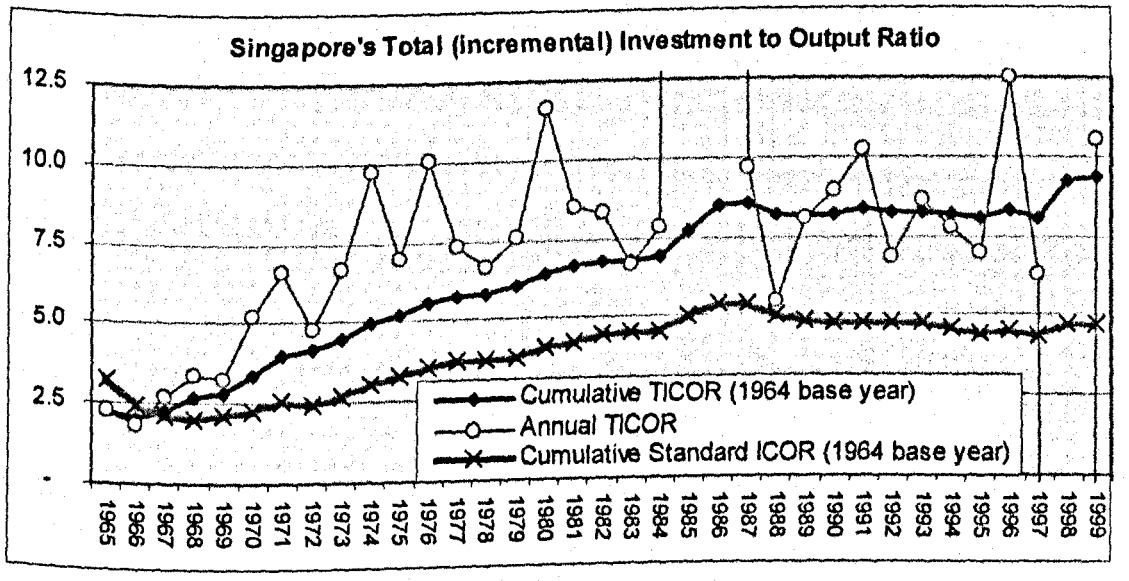
516 For an assessment using financial counterfactuals see Section III.5. 'Excurse: Financial Assessment of Singapore's Oversaving' at the end of this chapter.

517 Peebles and Wilson (2002, p. 67)

518 The periodisation is based on the government's own view of Singapore's development stages. It is taken from PAP (1985, pp. 170-179) as described in section III.1.2. and extended by treating the Singapore recession of 1985/6 seperately and the remainder of the period 1987-99 as one sub-period.

since 1965 over the change in real GNP since 1964, seems both historically sensible and analytically more revealing. As graph III.3.4.a. shows, the increasing distance between TICOR and ICOR is again striking. The inclusion of non-fixed asset investments can make a substantial difference to the evaluation of Singapore's investment success.

Graph III.3.4.a.: Singapore's Investment and Saving Ratios



Comparing, as is generally done, one country's ICOR with another's is not particularly helpful if one wants to evaluate the investment success. Since investing in another country's GNP and participating in that country's GNP is not an investment option. Instead one economy can only invest in another country's companies. Therefore, the appropriate benchmark with which to compare Singapore's TICOR would be the price-earning ratios of other countries' stock markets. The price-earnings ratio compares the earnings of a company with its stock market valuation. In essence, this allows for the same interpretation as the TICOR, namely that at a price-earnings ratio of x the company would need to achieve at least the same earnings for a period of x years to justify its price, i.e. the investment necessary to acquire the share. In 1999 Singapore had

accumulated investments of S$ 1,218 billion, gross-fixed-capital assets of S$ 609 billion and had achieved an increase in annual GNP of 130 billion (all in constant 1990 S$). This equals a TICOR with base year 1964 of 9.38 and an ICOR with the same base year of 4.69. With a TICOR of a little over nine Singapore would need to stop investing for a period of a little over nine years while keeping its real GNP level in order to recoup her investments. From this perspective, a TICOR of a little over nine in the late 1990s does not look too bad, since most international stock markets had average Price-Earning Ratios significantly above 9 at that time.[519] In other words, if Singapore had wanted to acquire similar earning streams than what it enjoyed by 1999, it would have had to pay a much higher price at the end of 1999 than what it actually did by investing in her own economy over the course of the preceding thirty-five years. If Singapore was to indeed withdraw the whole investment pool at the end of 1999 and invest it in the Financial Times 30 stock market index it would only gain the rights to a little over a third of the earnings it realised by investing in her own economy. From that point of view, the investment was highly successful.[520]

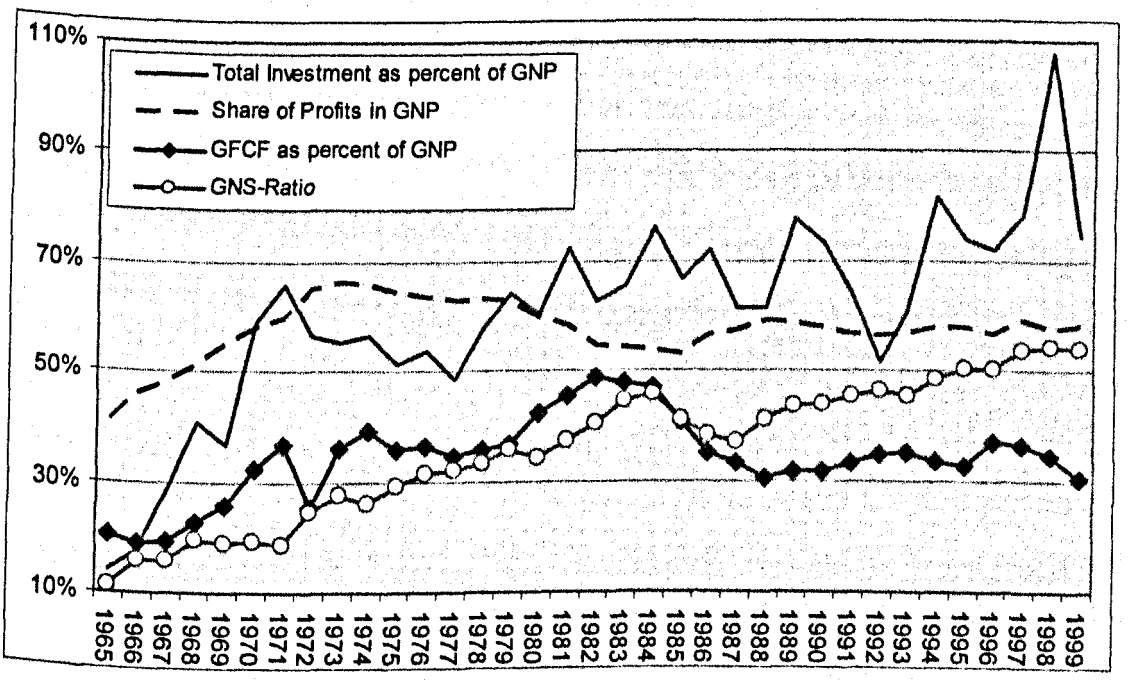
Beyond pointing to the relative falling efficiency of non-fixed assets and interpretations of possible comparisons with other countries, whose economies operate at different ICOR levels or whose stock markets offer different investment opportunities, it is difficult to draw definite conclusions from the mere observation of (T)ICOR indices. The question of over-saving can not be adequately resolved this way. However, macro-economic theory can further our investigation. The Golden Rule Rate of Investment states that the capital stock should be increased so long as steady state consumption also rises or in other words the optimal level of investment in the steady state is achieved when the marginal product of capital equals the depreciation rate. Under the general

519 For example, the price-earnings ratio of the shares combined into the Financial Times 30 index stood at 22.40 on December 30th, 1999, with a high of 25.41 and a low of 15.80 over the course of the whole year.

520 The Exkurse in Section III.5. calculates a similar counterfactual by assuming that Singapore had invested all of her savings in the NYSE composite index, yet not as one lump-sum investment in 1999 as the comparison of p/e-ratio and TICOR assumes but annually over the course of the whole development period. It comes to the conclusion, that although the counterfactual is unrealistic, if it had nevertheless been possible, investing in the NYSE composite index would have yielded a comparable increase in income by 1999 than the one actually achieved by Singapore's own economy.

assumption of diminishing returns, any additional investment beyond this level would result in a fall in total consumption, since the incremental cost of depreciation to the economy would be higher than the additional output achieved. [521]

Graph III.3.4.b.: The Golden Rule [522]



The marginal product of capital is generally estimated as the factor share of capital in GDP, which empirically lies around 30 to 35 percent. Therefore, in the

521 The Golden Rule condition that the optimal level of saving is reached when the marginal product of capital (MPK) is equal to the depreciation rate (δ) can be quite simply derived at mathematically taking its starting position from the basic consumption identity in the steady state, where investment is equal to depreciation: $C = f(K) - \delta K$, where C stands for the total consumption of the economy. K is the total capital stock and f(K) the economy's total output. To find the K, which maximises C in the steady state, we need to differentiate to find $dC/dK = f'(K) - \delta$ and set this derivative to zero. Since f'(K) is nothing else than the marginal product of capital, we obtain the Golden Rule condition of $MPK = \delta$ for the optimal level of investment. If the model is extended to include population growth (n), the Golden Rule condition is achieved if $MPK = \delta + n$. If the model is further extended to allow for technological progress (g) the Golden Rule condition is given as $MPK = \delta + n + g$. Or in other words at the Golden Rule level of capital, the net marginal product of capital ($MPK - \delta$) equals the rate of growth of total output ($n + g$). An alternative interpretation of the Golden Rule therefore says that as long as the net marginal product of capital is larger then the growth rate, the economy would benefit from additional capital investments. For an explanation of the Golden Rule see most macroeconomics textbooks, for example Miles and Scott (2002, pp. 102-104) or Mankiw (2000, pp. 89-97). For an early discussion see Phelps (1961).

522 Sources: GFCF taken from 1960-95 from Department of Statistics: Singapore System of National Accounts 1995; Singapore, 1996; pp. 86-103; 1996-99 taken from Dept. of Statistics: Statistical Yearbook (various issues); Share of Profits: see NWage Series in Chapter One, which is based on various sources for total renumeration. The Profit Share appears relatively high, compared to the regularly assumed one-third of GDP. However, even the Singapore Department of Statistics (1997) puts it at an average of 0.551 for 1973-96 and Young (1995, p.658) , calculating his estimates using interpolation from Input-Output tables, finds Singapore to have the highest capital factor share within his sample of Taiwan, South Korea and Hong Kong. He works from an average of 0.491 for 1966-1990. The average of our series is 0.5772. Asher (1999, p.1) argues that the Singapore government followed a policy to keep the wage share in national income as low as possible and correspondingly keep the share of capital as high as possible. With respect to the following analysis, if anything this high profit share gives our subsequent analysis a conservative character, since the gap between profit-share and investment-share is lower than if we had employed other, lower estimates.

steady state where depreciation equals investment, the 'optimal' investment is generally approximated as lying between 30 and 35 percent. While the country is moving towards a new, higher steady state from a comparatively low level of capital in the economy the investment rate can be higher until the depreciation rate matches the marginal product of capital. Based on this criterion and given the development of Singapore's Gross-Fixed-Capital-Formation as shown in graph III.3.4.b. no clear over-investment becomes visible, since the GFCF-rate stays largely within the target range.

An alternative reading of the Golden Rule has been proposed by Abel et al. (1989). If an economy is capital efficient, they argue, the operating profits of the corporate sector should be large enough to cover investments. If they are, the corporate sector has been a net-source of funds for consumption. But if investments exceed profits, then the capital stock has been financed at the expense of consumption. Comparing Singapore's gross-national-savings and the profit share as shown in graph III.3.4.a. give no indication of oversaving until possibly the very end of the period. However, once we consider total investments made, i.e. inclusive of the substantial savings appropriated from abroad, the assessment changes dramatically. Considering total investments made, the economy has been lacking capital efficiency from the early 1980s onwards, which can be interpreted as support for the oversaving hypothesis.

Table III.3.4.b. compares the averages for sub-periods. With the investment share averaging at 60.7 percent and the achieved average profit share at 57.7 percent, Singapore appears to have over-invested three percent of cumulative GNP between 1965-99. Moreover, splitting the sample period around the 1985/86 recession shows that over-investment has been concentrated in the post 1986 period when the investment share stood at more than 14 percent of GNP above the profit share.

Table III.3.4.a.: Total Investment vs. Profit Share (both as percent of real GNP)

	Total Investment	Profit Share
1965-73	41.7%	54.6%
1973-78	53.9%	64.5%
1978-84	65.7%	58.3%
1985-86	69.5%	54.8%
1987-99	72.3%	58.0%
1965-84	52.3%	57.9%
1987-99	72.3%	58.0%
1965-99	60.7%	57.7%

One could argue, that based on these results Singaporeans could have potentially lowered their savings rate and thus have enjoyed higher consumption levels without affecting the economy's wellbeing. However, because foreign and domestic investment can not be considered disjointly due to their multiple interactions and feedback mechanisms, the question whether the potential over-investment can be translated one-to-one into domestic over-saving depends on one's view of how much domestically financed investment was necessary in order to make Singapore such a successful recipient of foreign investment. The central question therefore turns out to be whether and to what degree lower domestic savings would have also lowered foreign investment in Singapore. While this cannot be established with an exact elasticity, looking at Singapore's own substantial overseas investments allows us to make a lower bound estimate. Even if we assume that all of the government's overseas investments were necessary in order to generate through its foreign reserves the required macro-economic stability requested by foreign investors, private overseas investments by Singaporeans will have hardly attracted foreign funds to Singapore. It is safe, therefore, to assume that private overseas investments, which totalled (constant 1990) S$ 154,500 millions or 11.28 percent of cumulative real 1965-99 GNP, could have been lowered by three percent of GNP without significantly affecting the country's ability to attract foreign investments. Thus, it can be argued that as a conservative estimate Singapore over-saved the equivalent of (at least) 3 percent of cumulative 1965-99 GNP and this largely in the period after 1980.

Moving beyond macro-economic theory, the simplest but potentially most revealing way of addressing the question of oversaving is to look at how much of the saving did go unused. Table III.3.4.b. offers the respective calculation, in which cumulative GFCF for 1965-99 together with all overseas investment is deducted from the total investment pool, which was available for these years. The balance can only be working capital or corporate investments in non-fixed assets, which have been capitalized onto the companies' balance sheets.[523]

Table III.3.4.b.: Working Capital in Singapore

1990 constant S$ million	
Cumulative Investments 1965-99	1,217,986.29
Less Cumulative GFCF	- 609,117.33
Less Cumulative Overseas Investments	- 269,437.74
Equals Working Capital	339,431.22

The calculation shows that as an upper limit a little over 27.5 percent of the total investment pool were merely used as working capital, i.e. did not find a final investment target. If we were to assume that the 7.9 percent share of the investment pool, which can not be traced, was fully invested overseas, we obtain a lower limit bound of a little under 20 percent.[524] This means that in a conservative estimate almost every fifth dollar, which Singapore had available for investment purposes, did not find a final investment. Twenty percent of the total investment pool equals about fourteen percent of the cumulative real GNP for 1965-99. Saving fourteen percent of GNP only for it to be used to help 'oil the system' appears somewhat high, although again no benchmark exists of how much working capital an economy requires. Moreover, Singaporeans and particularly their government but also the country's foreign direct investors valued stability very highly.

523 Unfortunately, there is no information available about the amount of potential non-fixed capital investments capitalized onto corporate balance sheets. However, since this can only be capitalised patents, royalties or goodwill it is not likely to having been a substantial amount in terms of their share in GNP.

524 The portion of the investment pool which can be traced but not allocated, such as the unexplained quoted and unquoted investments by the government or parts of its capital expenditures, are not likely to having been overseas investments, because foreign investments are shown as a separate item on the government's financial statements and capital expenditures do by definition not allow for overseas investments.

Nevertheless, this large proportion of savings which was not put to a direct investment combined with the finding of over-investment based on the Golden Rule indicates that even though Singapore's investment performance must be considered a success, it could have potentially been achieved with lower (domestic) savings. Therefore, Singaporeans could have (in retrospect) enjoyed a higher level of consumption by at least three percent of cumulative GNP without affecting the country's growth performance. Particularly in the second half of the period gross national savings were unnecessarily high by more than ten percent of GNP. The thus generated investment funds went largely unused.

III.3.5. Crowding Out?

A related issue is the question of whether the high government involvement has crowded-out private enterprise. The IMF (2000), for example, argues that the overwhelming power of government owned companies in Singapore is "likely to have crowded out local private enterprise 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."[525] On the other hand, Huff (1994 and 1995c) argues that public investment most likely crowded-in private investment. He points out that crowding-in would help explain the paradox of high public sector savings and yet reliance on private sector capital formation: "public sector savings which finances infrastructure brought even higher private sector investment. A possible drawback, however, was that private industry crowded in was largely foreign."[526] At face value, our analysis so far could be understood as showing an even more direct form of crowding in. The

525 IMF (2000, pp. 10-11)

526 Huff (1994, pp. 338-339). In Huff (1995, p. 1431), however, he argues that an "Adaptation, frequently suggested in the mid-1960s, of a Hong Kong development model reliant on small Chinese manufacturing enterprise and so local entrepreneurs appears never to have been seriously considered by

government gave up control over savings and thus allowed the private sector to make the investment decision. Contrary to Huff (1994 and 1995c), however, it was not private industry investments, which were crowded in, but largely service sector investments. The surrender of control by the government combined with the fact of considerable unused funds in the economy, therefore, would cast some doubt over the argument that the government's strong involvement in the economy has crowded out private domestic investments - at least from a financial point of view.

However, a closer look reveals a significantly different picture. Until 1995 Singapore published GFCF separated by public and private sector. Combining this information with our new database and applying the same calculations as in table III.3.4.b. shows that indeed the Singapore government kept the private sector at a tight financial leash.

Table III.3.5.: Crowding Out

1990 constant S$ million	
Government controlled investment pool 1965-95	442,433.99
Less Real Public GFCF 1965-95	112,679.16
Less Real Public Overseas 1965-95	79,623.88
Collected Working Capital 1965-95	250,130.94
Private controlled real investment pool 1965-95	353,913.80
Less Real Private GFCF 1965-95	324,507.65
Less Real Private Overseas 1965-95	71,830.40
Collected Working Capital 1965-95	(42,424.25)

As table III.3.5. shows the government appears to have been responsible for the collection of the considerable amounts of working capital described above, while on the other hand the private sphere seems to have experienced a financial crunch. The repurchase of government bonds shows nicely how this crunch has been remedied by the government by giving up control over parts of the savings

the PAP. (...) It's decision to rely for economic development on MNEs and state-owned enterprises allowed Singapore's local business elite largely to be excluded form the decision-making process."

appropriated into its realm of influence. At the end of the 1995/96 financial year the government's financial statements show (constant 1990 S$) 42,571 million in government bonds and deposits with investment agents, which equals almost exactly the underfunding of the private sector. Additionally, the government's other investments of almost (constant 1990 S$) 100 billion in quoted and unquoted investments will have further eased the private sector's financial tension. Yet, it must be assumed that these investments contrary to the repurchase of government bonds also came with a substantial degree of control by the government over the investment target's decision process and it is therefore doubtful whether they can be considered as evidence against crowding-out.[527]

While we can not show whether this tight leash has actually led to unfulfilled investment and the neglect of other entrepreneurial opportunities in the private sector, the disparate financial endowment seems to nevertheless rather support the crowding-out than the crowding-in hypothesis. If crowding-in has taken place it was under strong and financially direct influence of the government.

527 In addition, the government's financial statements also show a cash position of (constant 1990 S$) 38,793 million and outstanding loans to the HDB of (constant 1990 S$) 27,590 million, which are anybody's guess on whether they should actually be considered as capital expenditure and thus GFCF, see the discussion in sections III.3.2. and IV.3.

III.4. Conclusion

Essentially, this chapter intended to determine how the substantial amounts of savings were transformed into investment. In combination with the by now well-established growth literature and the saving investigations of Chapters One and Two, this link will be able to close the circle of Singapore's development: saving based on favourable circumstances, which were very well exploited, leading to investment, which in turn lead to growth and thus enabled more saving.

The investigation indicates more clearly than previously the Singapore government's control over investment decisions. On a conservative estimate the government managed to appropriate the equivalent of eighty percent of the country's (real) gross national savings between 1965-99 into its realm of influence. The Government also acted as a very active Investment Fund Manager, who however delegated one third of his control over the appropriated funds to the private sector. In this respect Singapore has been a clear case of government control along the lines of Amsden and Wade: a pro-active state, which interferes in an hands-on, practical and substantial way in the economy, much more so than North's notion of a strong but limited government whose main role is to create efficient organizational structures, and even stronger than Eichengreen's, whose state only gets involved in re-distributory negotiations through its guarantee of a social contract.

In terms of industrial policy, the exercise finds that private investment was predominantly directed towards the service sector and public investment largely towards overseas. Based on their investment decisions Singaporeans did not see an exploitable comparative advantage in manufacturing. Even foreign investors, who dominated the comparatively little manufacturing investments made, primarily committed their funds to the tertiary sector. The analysis also shows that Singapore was not a flying goose in the strict sense. Singapore's

development did not follow a flying geese pattern in which the country copied another country's earlier development success story and invested in a successive list of increasingly advanced industries. Instead Singaporeans decided to invest in the tertiary sector from the start. If at all, it was the foreigners who were the flying geese, using Singapore for their own industrial sequencing.

Additionally, it becomes apparent that Gross Fixed Capital Formation captures only about half of total investments made, which casts some doubt over other analyses merely based on GFCF. The exercise is able to show that as a lower limit about one fifth of the total investment pool or fourteen percent of cumulative 1965-99 GNP was used as working capital, which would indicate that a more efficient use of the funds, i.e. less foregone consumption, could have still been possible without affecting the investment success. Singaporeans could have (in retrospect) enjoyed a higher level of consumption by at least three percent of cumulative GNP without affecting the country's growth performance. Particularly in the second half of the period gross national savings were unnecessarily high by more than ten percent of GNP. Although not strictly comparable due to very different methodologies employed, it is striking how close this finding is to the policy impact on Singapore's savings established in Chapter One, which ranged from five to ten percent. The collected working capital appears to have been accumulated solely by the public sphere, which has surrendered some of it to compensate the financial limitations of the private sector.

Combining these findings with the results from Chapter One, it can be argued that while Singapore's savings in the second half of the period might not have been surprising, i.e. could have been expected of a country given Singapore's circumstances, they were nevertheless unnecessarily high. In retrospect, Singapore consumers could have enjoyed a higher standard of living, without affecting the country's economic development. Expanding the metaphor from

Chapters One and Two, the exercise shows that the trainer has committed the child to a highly controlled and unnecessarily ambitious training and competition schedule. In retrospect, we can say that the child could have had a little bit more fun, particularly during its adolescence, without endangering its success.

III.5. Excurse: Financial Assessment of Singapore's Oversaving

Even though financial theory has made major advances since the 1950s, it remains notoriously difficult to evaluate the efficiency of investments. While calculating the respective return might be comparatively easy, assessing that return and thus finding ex-ante performance benchmarks of similar risk-levels remains difficult. Therefore, we try to assess the country's investment performance through two counterfactual analyses. The counterfactuals try to estimate for two alternative investment strategies that return, which would have been necessary in order for these alternative scenarios to have yielded the same increase in income as Singapore's actual investment behaviour. This makes Singapore's actual investment success assessable.

If Singapore had used her savings in a purely financial manner and thus invested each year's addition to the investment pool as well as all cumulative investment revenue since 1965 in interest bearing debentures an annual real return of 6.21 percent would have yielded additional (real) income in 1999 equal to the increase in GNP actually achieved since 1964.[528] Therefore, the (real) internal rate of return of Singapore's investment over the thirty-five years since the country's independence was a little over six percent per year. Table III.5. shows the spreadsheet procedure which was used to iteratively determine this internal rate of return.

Table III.5.: Singapore's Internal Rate of Return

Constant 1990 S$ million	1965	1966	1967	...	1999
Starting Balance	0	1,125.33	2,760.78	...	2,091,440.86
Real Interest Earned	0	69.91	171.50	...	129,920.31
New Saving that year	1,125.33	1,565.55	2,861.96	...	102,377.53
Ending Balance	1,125.33	2,760.78	5,794.25	...	2,323,738.70
Increase in GNP since 1964					129,923.96

528 This calculation assumes that the saving is invested at year end. On the assumption of investment in mid-year, the real internal rate of return falls to 6%.

Considering this calculation a 'counterfactual' analysis in economic terms, however, brings out its main caveat. Although it is financially instructive, it is nevertheless historically impossible and thus not really useful for a benchmark analysis on which to base one's evaluation of the country's investment success. Investing the country's whole savings purely in financial instruments is neither politically nor economically viable. The saving performance, particularly of the early years, would not have been possible if the increase in GNP had been restricted to the interest earned from earlier financial investments. For example by 1970 Singapore's real GNP had already increased by (constant 1990) S$6.8 billion from its starting base in 1964. The country also managed to add (constant 1990) S$ 8.5 billion to its investment pool in that year. This would have been impossible if the increase in incomes would have been restricted to the interest earned on the financial investments of the last five years, which equals only (constant 1990) S$ 1 billion. As a matter of fact, the assumption of the same saving behaviour as if the country had invested in its own infrastructure etc. would require Singaporeans in 1970 to have invested the equivalent to one hundred percent of their income.[529] In other words, Singaporeans would have never been able to save us much as they have without the increase in income stemming from the growth generated by domestic investment. Given the investment performance which Singapore was able to realise the country did indeed achieve a real internal rate of return of a little over six percent. But Singapore would never have been able to follow such an investment performance had her income only increased by the equivalent of six percent on past investments.

A similar outcome is obtained if one assumes that Singapore had invested the additions to her total investment pool since 1965 annualy in an equity portfolio tracking the performance of the NYSE composite index. Assuming -

529 GNP in 1964 = 7.5 billion. The additional income due to past investments in financial instruments at real rate of return of 6.21% would have yielded additional income of 1 billion in 1970, making that year's GNP 8.5 billion, which is exactly the amount which Singapore was in reality able to invest in 1970. All constant 1990 S$.

counterfactualy - that the country would have still been able to realise the same gross national savings, attracted the same amounts of FDI and had the foresight to sell its portfolio at the end of 1999, the country's total investment pool would have increased to over (constant 1990) S$ 3.577 trillion, only based on the capital gains in the NYSE composite index.[530] If reinvested in 1999 in interest bearing bonds with a real interest rate of 3.62 percent, this would yield (constant 1990) S$ 130 billion income to Singaporeans, which equals the increase in (real) GNP since 1965. Given the fact that a real interest yield of 3.62 percent at the end of 1999 is not unreasonable, this counterfactual would argue that had it been possible for Singapore to simply invest the total investment pool in US stocks, the country would have potentially achieved a similar increase in GNP as was achieved by the country's actual domestic investment.

530 The historical NYSE composite index data was taken from the NYSE internet page (last updated 12.06.2003) at: http://www.nyse.com/marketinfo/p1020656068262.html?displayPage=%2Fmarketinfo%2Fmarketinfor.html. The lack of inclusion of dividend payments in the available data series can be rationalised in our case by assuming that these dividend payments would have been used to cover the expenses of the fund, which have also not been included in the counterfactual analysis.

Chapter Four

Concluding Remarks

IV. Concluding Remarks

Singapore's history holds many clues to understanding fast, capital-driven economic development. The thesis has examined some of the central, yet so far unresolved issues. The methodologies employed were largely quantitatively driven, the approach therefore predominantly investigative and not so much argumentative. The resulting findings are presented in a concise format in the Executive Summary at the beginning of the thesis. But how do these quantitative findings alter our qualitative perception of Singapore's economic history beyond each individual figure's respective impact? The following concluding remarks intend to briefly highlight two such aspects crucial to understanding Singapore's recent economic history and then extend the findings of the thesis to point to some likely challenges in Singapore's future.

IV.1. Favourable Starting Position

Both saving chapters point to a number of circumstances in favour of Singapore's saving transition and thus in favour of her capital-driven rapid development, such as the opportunity presented by the country's demographic transition and its geographic location allowing for a strong external position.

Beyond those circumstances which can be quantitatively assessed there are quite naturally a number of others which can not. Lucky timing is one of them. The country's comparatively late independence allowed Singapore to learn from the

mistakes of early developers.[531] The economic situation right after independence was furthermore helped by extraneous factors like the Vietnam war and the resumption of trade with the 'new order' in Indonesia. Rodrik (1996) also points to a relatively well educated work force, which in turn he argues made it easier to establish a competent bureaucracy as well as enhancing the productivity of interventions aimed at boosting private investment.[532] A comparatively equal income and wealth distribution is also regularly mentioned as a reason for a well functioning public administration.[533] The political economy argument in essence maintains that societies with lower inequality will resort to less redistribution and grow faster, since redistribution acts as a tax on accumulation.[534] Due to her free-trade history, Singapore did not have a problem accepting foreign economic influence, as Huff (1995) points out.[535] Moreover, it should not be forgotten that Singapore was at her independence one of the richest Asian nations, which again is due to the country's excellent geographic location, and had already shown a decent growth performance from the mid 1950s onwards.[536]

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[531] See for example Goh (1971, p.9) as he describes the lessons learnt from other countries, which focused on import substitution policies, or Goh (1972, p. 43) in a 1967 radio interview or Goh (1972, p. 79) in a paper presented at a conference in February 1965. Lee (1998, p. 538-9) describes his impressions from his 1964 trip through Africa and subsequent missions in 1970 and 1979 as an unforgettable lesson in decolonisation, the crucial role of social cohesion and a capable, effective government to take power from the colonial authority. He summarises his experiences: "When misguided policies based on half-digested theories of socialism and redistribution of wealth were compounded by less than competent government, societies formerly held together by colonial power splintered, with appalling consequences."

[532] Rodrik (1996, p. 20-21)

[533] Huff (1995, pp. 1422-23) points out for example that Singapore had for Asian standards a substantial middle class and less of an immigration problem. See also Rodrik (1996), Alesina and Rodrik (1994), Persson and Tabellini (1994), George Clarke (1993) and Nancy Birdsall, David Ross and Richard Sabot (1994) or specifically on wealth distribution Bardhan (2001)

[534] Rodrik (1999) additionally argues that the economic costs of external shocks are magnified by the distributional conflicts that are triggered and that this diminishes the productivity with which a society's resources are utilized.

[535] Huff (1995, p. 1434): "In Singapore ... development through multinationals as a substitute for local entrepreneurship required of the Republic no more than what historically it had always done – to respond to changes in the international economy and the resulting requirements of foreigners."

[536] Huff (1995, p. 1422-23); Goh (1972, p. 37), for example, writes in a 1966 speech to the Malayan Society: "In Malaya and Singapore, the primary accumulation of capital on which subsequent growth was mounted took place during the colonial era about the turn of the century.

Our findings reinforce the argument about the importance of a favourable starting position for Singapore's subsequent development. Rather than against all odds, as the PAP's legacy tries to describe Singapore's development success, the nation's true success story lies in how well the favourable odds have been exploited.[537] This is far from a lesser achievement, but a different and more realistic one. Moreover, it is significant for those nations trying to learn from and possibly copy Singapore's development policies. Before doing so, they need to assess their own starting position, how it compares to Singapore's in the 1960s and how they can possibly compensate for differences. The analyses of this thesis should help in that undertaking.

IV.2. The Role of an Altruistic Generation and a Sense of Crisis

Putting a definitive paid to the notion of Singapore's success being due to the free movement of market forces, the thesis has been able to establish (lower limit) estimates on the degree of control exercised by the government over the nation's savings and the resulting degree of unnecessarily foregone consumption. The thesis therefore lends support to those interpreting the growth accounting literature on Singapore as an indication that the country's success was due to sacrifices.[538] The thesis has shown which instruments the government used and which opportunities it was able to benefit from. However, while it has been relatively easy to establish which institutional tools the Singapore government employed to gain its high degree of control, it is more difficult to reason how it

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This process produced conditions as abominable as those in Western Europe, the Soviet Union and Japan during the first stages of their industrial revolution."

[537] Or as Huff (1994, p. 369) puts it: "Singapore became rich because it was already relatively rich, and because it had good policies."

[538] Most forcefully Krugman (1994, p.78): "If there is a secret to Asian growth, it is simply deferred gratification, the willingness to sacrifice current satisfaction for future gain."

persuaded at least one generation of Singaporeans to allow such a high degree of control and forego substantial amounts of consumption for the sake of future generations.[539] The thesis, especially the bridge built by its investment analysis to the existing growth accounting literature, shows that this role of an 'altruistic generation' must be considered the decisive factor in Singapore's economic history.

One possible explanation is offered by Michael Barr (2000), who points out that since the expulsion from the Federation of Malaya Singapore was governed under a constant fear of crisis. Barr (2000) referring to Arnold Toynbee's 'Challenge and Response' thesis, argues that Lee Kuan-Yew and the PAP have used the opportunity presented by the expulsion to face Singaporeans with the challenge to survive and to convince them to make immediate sacrifices. This has led to Singapore being governed under a constant sense of crisis, internal and external enemies and the re-occurring need to respond to some new crisis which needs all to stand up for Singapore and support the PAP.[540] This strategy has been employed to the present day. Peebles and Wilson (2002) argue that even in contemporary Singapore "the government seems keen to keep its people in fear

[539] That the PAP government knowingly aimed for a strategy of sacrifices combined with a highly controlling government becomes evident in the following quote from Goh (1972, pp.34-5) taken from a speech given in 1966 to the Malayan Society: "In the history of advanced industrial nations of today, except the fortunate few well-endowed with natural resources such as the United States and New Zealand, the first stage of economic development had been a harsh and cruel phase. It meant the destruction of traditional institutions and the imposition of terrible sacrifices on the vast majority of the population. In most instances the first stage of economic growth represented a traumatic experience. It was possible to drag the country through it only within a strong political framework. Such was the experience of Britain and Western Europe during the Industrial Revolution, and Japan too during the Meiji Restoration. (...) it is worthy of note that Western Europe, the Soviet Union and Japan, during the time they achieved their economic breakthrough, did not have universal franchise. (...) Hence it was possible to exact from the general population sacrifices which no popularly elected government today would dare even to contemplate. (...) I believe that unless democratic backward countries can create new institutions and promote new values which can galvanize, inspire, cajole, induce and, in the last resort, compel men into action, they will not be able to lift themselves out of the present state of stagnation and poverty."

[540] Barr (2000, pp.80-81). He also argues that Lee Kuan-Yew also applied this strategy in order to minimize his personal embarrassment as he had been the one who had manipulated Singapore into Malaysia in the first place.

of imminent collapse and the return to the low quality of life and standard of living of the colonial era."[541]

Indeed, it is striking how the picture propagated by the PAP government both at the time and to the present day in retrospect contrasts sharply with the one drawn above of a favourable starting position for Singapore. The PAP has always tried to convey a sense of crisis to the Singapore electorate.[542] Yet far from being a contradiction, this 'tool' was used deliberately and very effectively to help overcome the certainly existent challenges and to make the reforms and hard work more palatable which were necessary to allow the country to benefit from the yet-to-be exploited favourable initial situation.[543] In other words, in the early 1960s Singapore had the advantage of actually having a favourable starting position which was however hidden under a very troublesome political environment. The PAP government's main achievement was to combine both these apparently contradictory aspects into one successful development strategy, convincing the contemporaneous generation to accept sacrifices on behalf of later

[541] Peebles and Wilson (2002, p. 7)

[542] The problematic interpretation of Singapore' situation particularly around and after the separation from the Federation of Malaya and the withdrawal of the British military forces was also shared by a number of outside commentators, for example: Bonavia (1967), Bellows (1968), Emery (1968) or Buchanan (1972). It is also noteworthy that on the other hand the Singapore government tried to convey just about the opposite interpretation of the country's situation to the world outside. Yoshihara, Kunio (1976, p.18) quotes E.J. Mayer, the first Director of the Economic Development Board in January 1962: "It is completely wrong to think of Singapore as an underdeveloped country. Yet this belief is very prevalent both in Singapore and abroad. It has probably arisen from the fact that the surrounding countries are comparatively under-developed – but what may apply to nearby states certainly does not apply to Singapore. In almost every respect this is a highly developed country."

[543] It is also noteworthy that this tool of a sense of crisis has probably only worked due to the fact that Singapore had indeed something to lose due to its comparatively high standard of living in Asia. Furthermore, the PAP government made sure that at least parts of the gains from the growth success were immediately shared with the population, see for example Campos and Root (1996) or Jaspersen (1997). Moreover, the PAP used the HDB housing programme very effectively to support its legitimisation. These aspects function as the facilitating link between crisis and the need to make sacrifices on the one hand and a favourable situation on the other.

generations using the troubled political environment to create a sense of crisis as justification for the sacrifices.[544]

IV.3. Selected Challenges in Singapore's Future

Singapore was very successful at exploiting a government controlled, capital led development strategy, in which one generation has given up a substantial degree of their entitlements in form of foregone consumption and surrendered control. As pointed out by the growth accounting literature, once this strategy has run its course Singapore needs to focus on raising the economy's productivity instead of merely increasing its capital inputs. Given the results of the thesis on government control, this however would require a complete policy turn around and a substantial re-design of the economy's ownership structures. Whether the Singapore political elite will be able to steer a course which in essence requires it to return the control it accumulated over decades back to free market forces is questionable. The progress along this path has so far been very hesitant. If the PAP government is not able to relax its doubly firm grip over both the economy itself and the political system controlling it, it is not likely that a Schumpeter process of creative destruction will be able to take hold. Such a process almost by definition is not likely to be successfully instilled via doctrine no matter how efficient the public administration.

Beyond the mere theoretical argument for change, the thesis points to two further sources of pressure: the second stage of the demographic transition, in which the formerly beneficially increased labour force ratio turns into a quickly

[544] This strategy is much in the Chinese tradition, where the word for Crisis combines two symbols: the first, wei, meaning 'danger' and the second, ji, opportunity.

aging population, and potential problems with the government's balance-sheet position.

The demographic transition which the saving analysis has shown was one of the central aspects in Singapore's capital accumulation, will over the course of the next decades turn into somewhat of a burden for Singapore's economy and social system. Asher (1994) already pointed out that by the year 2030, one in every four persons is expected to be above 60, as compared to every eleven persons in 1990.[545] This second stage of the demographic transition has sparked a rather controversial discussion about the adequacy of CPF savings, which after all are designed to be the financial support in old age even though substantial amounts were diverted for the purchase of housing.[546] The most studies point to a considerable under-endowment for the needs of an older generation in the mature industrialised economy, which Singapore has become. Combined with the wish of the 'altruistic' generation to fully benefit at least in their old age from the improvements in living standards achieved during their active working lives this situation puts substantial pressure on the existing solution to the welfare question in Singapore.[547] Moreover, the positive effect of CPF savings on the overall saving performance of the country will evaporate as withdrawals start to equal or possibly even exceed contributions, making further capital accumulation strategies next to impossible.

Due to the very strong connections between the government's financial situation and the economy, and particularly the CPF, the government's balance sheet gives

[545] Asher (1994, p.34).

[546] See for example Asher (1994, pp. 78-80), Wong and Park (1997), Heller and Symansky (1998), Asher (1999, pp. 3692-3693), Shantakumar (2002) or Peebles and Wilson (2002, pp. 91-93) for a recent summary.

[547] Shantakumar (2002, p.25), for example, recommends a minimum pension guarantee to people in the lower-income brackets. Interestingly, Asher (1994, p.71) refers to a quote by Goh Keng-Swee stating that all modern societies regardless of their economic or social systems move towards the welfare state in their advanced stage of development.

further rise to reservations about Singapore's economic future. While a complete assessment is not possible due to lacking details especially about substantial parts of the government's assets, one particular peril can be quite clearly established. In April 2000 the government carried loans granted to the HDB of S$ 72 billion. With the exception of 1988 and 1989 the loans outstanding to the HDB have been continuously rising since 1960 with no sign of a substantial repayment. In the 1990s alone the outstanding loan arrangements increased from S$ 16.5 billion in April 1990 to over S$ 72 billion in April 2000. The quality of these loans is rather questionable. How will the HDB ever be able to repay those loans? After all already well over 90% of the population own their houses. Over the next fifty to sixty years, i.e. until the HDB regains the legal title to the leaseholds, these loans in essence can only be repaid through service charges, which is not very likely.[548] If the government had to write-off these loans its financial position would be seriously harmed. This becomes evident if one considers the fact that the total loans outstanding equal in value about fifty six percent of the country's total officially reported foreign reserves, which as argued in the thesis must be considered to be largely pension fund assets. The financial and social snowball effect would be considerable. This in turn makes the Singapore government liable to a major moral hazard problem, similar to any bank which is dependent on one single debtor. It will need to continue to support the HDB's losses because it can neither politically nor financially afford to cut back its commitment to the debtor. The strong increase in outstanding loans in the 1990s might be an indication that this mechanism has already been at work. Technically, the government should consider payments to the HDB as capital expenditures instead of capitalising them as assets in the government's

[548] The city of Glasgow gives a good point of reference for a city with similar problems, although at a much smaller scale. In 2002 the city had to write-off all of the debt outstanding to the local housing authority (financed with a grant from the British Treasury) and sell the remaining flats to a tenant organisation for £25 million, which however required a further cash-injection of £700m from the Scottish parliament. (The Economist, March 30th, 2002, p. 28)

loan portfolio. In the 1990s alone such a treatment would have reduced the government's reported surplus by about half.

The combination of the three challenges to Singapore's future briefly discussed here form a very potent cocktail, even without the consideration of other domestic or international challenges to Singapore's economic foundation. This cocktail is likely to create quite some headaches for the country and requires a substantial redesign of the nation's further economic policies.

V. Bibliography

V. Bibliography

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VI. Appendix

VI. Appendix

VI.1. Data and Detailed Regression Results for Chapter One

Included in the attached CD-Rom are the following SPSS files. The numbers in the file name correspond with the respective section in the thesis:

- Dataset_Chapter1.sav (SPSS-format)
- Results I-4-1.spo (SPSS-format)
- Results I-4-2.spo (SPSS-format)
- Results I-4-3.spo (SPSS-format)
- Results I-4-4.spo (SPSS-format)
- Results I-4-5-1.spo (SPSS-format)
- Results I-4-5-2.spo (SPSS-format)
- Results I-4-5-3.spo (SPSS-format)
- Results I-4-5-4.spo (SPSS-format)
- Results I-4-5-5.spo (SPSS-format)
- Results I-4-6.spo (SPSS-format)

VI.2. Data and Detailed Regression Results for Chapter Two

Included in the attached CD-Rom are the following SPSS, Microsoft Word and Microsoft Excel files. The numbers in the file name correspond with the respective section in the thesis:

- Dataset Chapter Two.xls (Excel-format)
- Results II-5-3.doc (Word-format)
- Results II-5-4.spo (SPSS-format)
- Results II-5-5.spo (SPSS-format)
- Results II-5-6.spo (SPSS-format)
- Results II-5-7.spo (SPSS-format)
- Results II-5-8.spo (SPSS-format)
- Results II-5-7.spo (SPSS-format)

The dataset is also attached in print.

Dataset Chapter Two

	Dependent Variables					
	GNSrat	GNSrat2	PuNSrat	PNSrat	FNSrat	VPNSrat
Visual	I(1)	I(1)	I(1) ?	I(1) ?	I (1)	I(1)?
ADF (3)	-2.73 T	-2.35 T	-5.22* T	-3.93* T	-1.73	-5.34* T
Order of I	I (1)	I(1)	I (0)	I(0)	I (1)	I(0)
ADF (4)	-2.35 T	-2.04 T	-5.14* T	-3.99* T	-1.86	-5.39* T
Order of I	I (0)	I(1)	I (0)	I (0)	I (1)	I (0)
1960	-2,39	-2,39				
1961	-2,30	-2,30				
1962	5,78	5,78			1,36	
1963	3,73	3,73	7,25	-3,52	1,49	-5,01
1964	8,90	8,90	6,24	2,66	1,72	0,94
1965	11,17	11,17	7,54	3,63	1,72	1,91
1966	15,75	15,75	7,92	7,83	1,66	6,17
1967	15,89	15,89	8,49	7,40	1,59	5,81
1968	19,66	19,80	9,27	10,53	1,56	8,97
1969	19,06	19,48	7,64	11,84	2,24	9,61
1970	19,27	19,67	10,84	8,82	2,87	5,95
1971	18,84	19,18	9,65	9,53	3,42	6,11
1972	24,47	24,78	10,79	13,99	4,32	9,67
1973	27,61	28,12	10,37	17,75	5,04	12,71
1974	26,27	27,02	11,36	15,66	6,00	9,66
1975	29,38	30,37	14,35	16,02	7,05	8,97
1976	31,43	33,32	13,10	20,22	7,59	12,63
1977	32,04	34,46	12,53	21,94	8,02	13,91
1978	33,33	36,08	12,15	23,92	8,52	15,40
1979	35,71	37,85	13,09	24,76	9,65	15,11
1980	34,44	36,61	15,39	21,21	10,64	10,57
1981	37,40	39,86	17,39	22,47	11,82	10,65
1982	40,77	43,29	20,04	23,25	13,72	9,53
1983	44,80	47,89	20,52	27,37	13,70	13,67
1984	45,82	52,46	17,59	34,87	14,57	20,30
1985	41,23	48,12	13,22	34,90	17,39	17,51
1986	38,68	45,32	30,10	15,22	13,43	1,80
1987	37,09	43,24	15,71	27,53	10,86	16,67
1988	41,01	46,40	17,05	29,35	9,67	19,68
1989	43,63	47,68	16,58	31,10	10,32	20,78
1990	43,88	47,18	17,93	29,26	10,74	18,51
1991	45,38	49,36	19,34	30,03	11,74	18,29
1992	46,40	50,79	21,50	29,28	11,65	17,63
1993	45,26	49,01	22,35	26,66	10,99	15,67
1994	48,26	51,47	22,07	29,40	10,00	19,40
1995	51,08	54,86	24,58	30,28	11,41	18,87
1996	50,38	54,26	27,19	27,07	11,56	15,52
1997	54,25	58,11	29,28	28,83	11,08	17,76
1998	53,98	59,34	31,37	27,97	11,61	16,35
1999	54,06	60,27	23,37	36,90	9,00	27,90
2000	51,51	56,61	20,89	35,72	8,42	27,31

	Independent Variables: Income								
	RYPC	NWage	RWage	YPC	DispY	DispYCPF	Growth	NWGro	AvrGro
Visual	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)?	I(0)
ADF (3)	-0.13 T	1.50 T	1.54 T	-0.93 T	0.13 T	1.07 T	-5.73 *	-3.36 *	-6.91 *
Order of I	I (1)	I (1)	I (1)	I (1)	I (1)	I (1)	I (0)	I (0)	I (0)
ADF (4)	-1.40 T	1.30 T	1.37 T	-0.94 T	2.15 T	2.49 T	-4.90 *	-3.35 *	-6.87 *
Order of I	I+	I (0)	I (0)	I (0)	I +	I (0)	I (0)	I (0)	I (0)
1960	3.642,7	280,3	767,8	1.329,6	3.449,2				
1961	3.830,6	279,7	768,5	1.394,3	3.626,0	3.579,8	5,16	-0,18	
1962	3.989,9	288,3	785,7	1.464,3	3.771,5	3.724,3	4,16	3,07	
1963	4.314,0	281,0	761,6	1.591,9	4.099,5	4.051,5	8,12	-2,54	200,2
1964	4.056,2	286,5	764,0	1.521,1	3.819,1	3.768,6	-5,98	1,95	(508,6)
1965	4.223,6	294,6	769,1	1.617,6	3.973,4	3.922,2	4,13	2,82	82,1
1966	4.556,8	294,7	757,6	1.772,6	4.293,4	4.242,2	7,89	0,05	244,9
1967	4.999,8	301,6	775,4	1.944,9	4.715,2	4.664,1	9,72	2,35	351,3
1968	5.595,8	307,6	786,8	2.188,0	5.258,5	5.203,1	11,92	1,99	233,7
1969	6.216,9	311,0	773,6	2.499,2	5.833,3	5.728,6	11,10	1,09	70,2
1970	6.907,8	314,2	768,1	2.825,3	6.461,2	6.303,8	11,11	1,02	12,4
1971	7.535,6	328,5	765,7	3.232,8	7.057,3	6.847,3	9,09	4,55	(158,2)
1972	8.383,7	327,6	723,2	3.797,8	7.781,4	7.475,7	11,25	-0,26	61,9
1973	8.970,6	359,2	704,4	4.575,0	8.306,2	7.920,1	7,00	9,66	(292,1)
1974	9.366,3	422,9	720,5	5.498,0	8.523,3	8.045,7	4,41	17,73	(421,9)
1975	9.960,1	481,4	799,7	5.996,0	8.970,1	8.379,5	6,34	13,83	(113,9)
1976	10.380,9	504,0	823,5	6.353,1	9.267,1	8.621,9	4,22	4,68	(168,5)
1977	10.959,9	538,6	866,0	6.817,1	9.774,1	9.086,4	5,58	6,88	60,8
1978	11.864,8	569,0	893,2	7.557,9	10.681,2	9.892,3	8,26	5,63	315,1
1979	12.802,0	618,8	923,6	8.577,3	11.539,9	10.561,5	7,90	8,76	223,1
1980	13.335,6	699,4	936,3	9.961,7	11.915,6	10.784,3	4,17	13,03	(393,8)
1981	13.885,7	797,8	1.001,0	11.066,9	12.169,6	10.854,5	4,12	14,06	(353,3)
1982	14.370,7	859,0	1.033,7	11.942,0	12.433,6	10.846,8	3,49	7,68	(264,5)
1983	15.729,2	947,0	1.097,3	13.574,3	13.691,4	12.001,0	9,45	10,24	793,9
1984	17.092,2	1.048,0	1.206,0	14.853,1	14.975,6	13.028,7	8,67	10,67	467,9
1985	17.093,0	1.131,0	1.318,2	14.665,8	15.254,7	13.018,8	0,00	7,92	(1.230,5)
1986	17.229,6	1.140,0	1.347,5	14.576,3	15.941,8	14.300,2	0,80	0,80	(895,9)
1987	18.125,0	1.176,0	1.373,8	15.515,0	16.836,4	15.338,0	5,20	3,16	351,5
1988	19.904,4	1.273,0	1.400,4	18.093,1	18.488,7	16.930,6	9,82	8,25	1.416,8
1989	21.386,6	1.398,0	1.466,9	20.381,5	19.754,7	17.933,0	7,45	9,82	433,0
1990	22.410,9	1.528,0	1.528,0	22.410,9	20.603,7	18.663,1	4,79	9,30	(576,9)
1991	23.231,3	1.669,0	1.614,1	24.021,2	21.183,0	19.061,8	3,66	9,23	(827,1)
1992	24.364,6	1.804,0	1.723,0	25.509,7	22.116,1	19.829,6	4,88	8,09	(97,7)
1993	25.566,6	1.918,0	1.738,9	28.199,9	23.258,9	20.812,1	4,93	6,32	119,5
1994	27.690,5	2.086,0	1.812,3	31.871,8	25.201,7	22.771,2	8,31	8,76	975,9
1995	30.061,2	2.219,0	1.938,0	34.420,0	27.590,6	24.685,8	8,56	6,38	698,2
1996	30.640,6	2.347,0	2.026,8	35.481,8	28.159,8	25.195,2	1,93	5,77	(1.605,3)
1997	33.842,1	2.480,0	2.125,1	39.493,7	31.147,1	28.006,4	10,45	5,67	1.281,8
1998	32.549,7	2.740,0	2.395,1	37.236,9	29.952,7	26.896,7	-3,82	10,48	(3.654,2)
1999	34.775,3	2.813,0	2.518,4	38.844,0	32.365,0	29.938,0	6,84	2,66	1.297,1
2000	37.126,1	3.063,0	2.693,9	42.212,3	34.212,2	31.608,4	6,76	8,89	789,6

Dataset Chapter Two

	Demography			Quality of Financial Institutions					CPF	
	LabRat	Dep	Life	CABal	DoCrRat	PriDoRat	PriCrRat	R	CPFrat	CPFeff
Visual	I(1)	I(2)?	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)
ADF (3)	-2.01 T	-1.59 T	-2.30 T	-2.5 T	-1.54 T	-1.78 T	-1.48 T	-3.48 *	- 0.88 T	-0.09 T
Order of I	I (1)	I (1)	I (1)	I (1)	I (1)	I (1)	I (1)	I (0)	I (1)	I (1)
ADF (4)	-2.15 T	-1.50 T	-2.47 T	-2.77 T	-1.50 T	-1.67 T	-1.65 T	-3.40 *	-0.92 T	-0.45 T
Order of I	I (1)	I (1)	I (1)	I (1)	I (1)	I (1)	I (0)	I (0)	I (1)	I (0)
1960		82,73		11,18					10,00	
1961		83,54		11,74					10,00	
1962		84,36	64,5	7,76					10,00	
1963		85,17	64,9	11,62	7,03	470,65	33,11		10,00	
1964	27,86	85,99	65,3	5,93	11,28	328,48	37,06		10,00	2,4
1965	26,98	86,82	65,7	4,92	16,18	225,10	36,43	2,81	10,00	2,6
1966	27,09	83,84	66,1	-0,10	17,85	205,56	36,69		10,00	2,8
1967	27,91	80,95	66,5	5,44	16,33	215,92	35,25		10,00	2,8
1968	28,83	78,14	66,9	9,27	18,95	199,64	37,82	5,46	11,00	3,2
1969	29,87	75,43	67,3	11,47	18,96	219,42	41,61	3,10	13,00	4,7
1970	31,38	72,79	67,7	29,87	19,84	229,06	45,45	4,19	16,00	6,4
1971	32,70	69,73	68,1	32,29	15,96	285,32	45,53	1,06	20,00	8,2
1972	33,68	66,78	68,5	17,03	20,03	254,86	51,04	0,15	24,00	11,6
1973	35,61	63,93	69,0	12,71	25,70	238,25	61,22	-4,74	26,00	14,1
1974	36,97	61,18	69,4	20,31	21,36	261,21	55,80	-5,30	30,00	16,4
1975	36,84	58,52	69,9	10,21	22,47	252,26	56,68	3,15	30,00	18,4
1976	37,96	56,00	70,3	9,62	28,87	204,54	59,05	3,59	30,00	19,1
1977	38,87	53,57	70,8	4,54	29,26	205,11	60,01	3,83	31,00	19,1
1978	40,60	51,21	71,0	5,78	30,74	201,90	62,06	3,51	33,00	20,7
1979	42,72	48,92	71,3	7,83	34,00	196,45	66,79	2,35	37,00	23,2
1980	43,66	46,70	71,5	14,04	44,31	167,32	74,13	-0,85	38,50	23,9
1981	43,94	45,72	71,7	11,15	72,05	113,24	81,58	2,11	42,50	25,8
1982	43,09	44,76	71,8	8,64	63,88	134,86	86,15	2,70	45,00	27,3
1983	46,67	43,82	72,2	3,39	79,10	113,17	89,52	2,79	46,00	27,1
1984	46,45	42,88	72,5	1,86	81,39	107,81	87,74	6,06	48,00	28,9
1985	45,12	41,96	72,9	-0,32	75,10	118,80	89,22	6,22	50,00	31,8
1986	44,43	40,94	73,2	-2,05	76,48	113,20	86,57	4,77	40,83	27,5
1987	45,66	39,94	73,6	0,53	77,88	109,46	85,25	2,35	35,00	24,4
1988	46,79	38,94	73,8	-7,57	67,92	116,65	79,23	-2,04	35,50	23,8
1989	47,56	37,97	74,1	-9,68	61,57	132,58	81,63	-0,28	37,00	24,9
1990	48,22	37,00	74,3	-8,29	60,50	135,07	81,72	0,52	38,75	25,1
1991	48,61	37,64	74,6	-11,19	62,47	133,32	83,28	0,74	39,75	24,9
1992	48,77	38,28	74,8	-11,69	60,19	138,76	83,51	1,69	40,00	25,2
1993	48,02	38,93	75,6	-7,28	59,45	142,65	84,81	-2,43	40,00	26,1
1994	48,21	39,59	76,3	-15,97	57,50	145,75	83,81	-0,12	40,00	24,7
1995	48,28	40,25	76,4	-17,40	60,68	149,23	90,56	4,56	40,00	26,7
1996	47,63	40,47	76,7	-13,61	66,32	147,37	97,73	2,82	40,00	26,1
1997	48,25	40,69	77,0	-17,96	68,91	138,90	95,72	3,60	40,00	26,0
1998	47,67	40,91	77,4	-22,58	83,59	126,85	106,03	4,57	40,00	26,0
1999	47,73	41,12	77,6	-18,25	78,54	124,62	97,88	4,94	30,00	20,1
2000	52,94	40,35	78,0	-16,18	74,69	125,62	93,82	0,62	31,50	18,0

Dataset Chapter Two

Sources / Notes:

ADF (3) ADF (4)	*gives the ADF test statistic for Augmented Dickey-Fuller regressions with an intercept and for the optimal number of lags out of a maximum of either three or four lags. The optimal number of lags was determined by maximizing the Akaike Information Criterion. * denotes that the null hypothesis of a unit root, ie of non-stationarity, can be rejected at a 95%critical value. In other words * denotes that the variable has been found to be stationary. T denotes that a Dickey-Fuller regression with a time trend term was used in the ADF-test. The software package used for calculation of the ADF-test was Microfit 4.1.*
Order of I	gives the order of integration of the variable, e.g. I(0) = stationary variable, I(1) = non-stationary variable integrated at order of 1; I(2) = non-stationary variable integrated at order of 2. The order of integration was established by running an ADF test on the first-differences of the variable. If the first differences are stationary but the levels of the variable are non-stationary, the variable is considered to be I(1) and therefore also called first-difference stationary. If, however, the first-differences are also non-stationary, the variable is integrated of a higher order, e.g. if the levels are non-stationary but the first differences of the first differences are stationary the variable is I(2).

GNSrat	Gross National Saving as percent of GNP (both current LCU). 1960-94 from Singapore Dept. of Statistics (1996) table A.8 pp. 65-67and 1995-2000 from Dept. of Statistics: Yearbook of Statistics 2001 (as available online at www.singstat.gov.sg; May 2002).
GNSrat2	GNS + withdrawals from CPF for the purpose of buying housing. The adjustment becomes necessary because according to national accounts convention private individual's investment in housing is considered consumption and thus not included in GNS. However, given Singapore's peculiarity in respect to the interaction between the CPF and HDB withdrawals form the CPF for the purpose of purchase of HDB housing, must be considered simply a movement between government controlled saving portfolios. These withdrawals are therefore included in CPFsaving and in order to keep the saving aggregates consistent also need to be added to GNS. Withdrawals listed under Other Withdrawals are largely funds which get reinvested into equity or other forms of investment funds. No correction is necessary for these withdrawals because national accounting convention would not consider them consumption.
PuNSRat	Public national saving defined as Total Gov. Revenue less Gov. Consumption as % of GNP. Total revenue taken from IFS (line 81: Total Government Revenue) (various years), consumption until 1995 from Singapore National Accounts (1995), thereafter from IFS (various years; line 91f: National Accounts - Gov. Con.). Can only be found stationary if we assume a trend.
PNSRat	Private Saving Rate = GNSrat2 less Public Saving as % of GNP; Can only be found stationary if we assume a trend.
FNSRat	Increase in CPF Members' Balances + withdrawals for Housing and Others = Contributions + Interest Earned - Withdrawals under Section 15 - Withdrawals for Medical; As percent of GNP; CPF members' balances 1980-2000 from CPF annual reports; 1967-1979 from MAS Annual Report; 1961-68 from Dept of Stats.: Yearbook of Statistiscs; all data series link, ie are consistent in those years that they overlap; CPF detailed withdrawals 1980-2000 taken from MAS annual reports; Section 15: 55 years of age, leaving Singapore and West Malaysia, physical incapacity, unsound mind, death and Malaysian citizien leaving Singapore. For the years before 1980 the only breakdown available is into housing and others. Others must be predominantely section 15 withdrawals. After 1980 Withdrawals recorded under Other Category are largely withdrawals for the purposes of reinvestment into equity or other forms of investment funds.
VPNSRat	Voluntary Private Saving as % of GNP calculated by deducting CPF saving from Private Saving. Definition of CPFsaving see FNSRat.

RYPC	Real Per-Capita GNP using mid-year population and GNP (at current market prices) from Dept. of Statistics Online Dataresource, last updated March 2002. Total population includes residents and non-residents, only foreigners staying for less than 1 year are excluded. The series was deflated using the GDPdeflator at constant 1990 market prices. The GDPDeflator for 1960-94 was taken from Singapore Dept. of Statistics (1996) table A.4 pp.53-55 and for 1995-2000 Dept. of Statistics: Yearbook of Statistics 2001 (as available online at www.singstat.gov.sg; May 2002). If the ADF test is conducted on four lags, the first difference is not found to be stationary unless we use the Schwarz-Baysian Criterion instead of the AIC. If the ADF test is conducted with three lags, we need to assume a trend of the first difference variable in order to be able to reject the Null-Hypothesis of non-stationarity.
NWage	average nominal monthly wages over all industries and professions. 1972-81 are calculated from weekly wages reported in Singapore Department of Statistics (1982), table 3.7, p.39; 1982-91 are taken from Ministry of Labour: Singapore Handbook of Labour Statistics 1992; table 2.2, p. 23; 1992-2000 are taken from Singapore Handbook of Manpower Statistics (various issues). Nwage for 1982 could have been $920 instead of $859 if weekly rate from Singapore Department of Statistics (1983) had been transformed into monthly wage. Since GNP and other income variables show a fall in their growth rates during 1982, the lower value is more likely to be correct and was thus used. However, if one assumed sticky wages one could argue for the higher value. Wages for 1960-1971 were estimated by using the regression equation obtained from regressing Nwages on total employees' assessed income for 1972-81 from Dept. of Stats. (1983): Economic and Social Statistics. This source offers assessed income from 1960 onwards and thus allows for a statistical derivation of nominal wages. The exact equation was: Nwages = 241.7605 + 0.00009840 AssInc, with a R-squared=0.98 and Durbin-Watson=1.8907. First differences can only be found stationary if we assume a trend.
RWage	average real monthly wages, using the GDPdeflator. Sources see NWage and RYPC; First differences can only be found stationary if we assume a trend.
YPC	Nominal per-capita income. For sources see RYPC; First differences can only be found stationary if we assume a trend.

Dataset Chapter Two

DispY	*Real per-capita disposable income = GNP less direct taxes. For sources of real GNP and population see RYPC. Direct taxes are defined as the sum of taxes on corporate and private income, on property, payroll taxes and estate duties. This definition is taken from Republic of Singapore: The Budget for the Financial Year (1987/88) p.19. It does not deduct other compulsory payments like fees or CPF contributions. Income tax for years 1969-75 was only available on financial year basis and therefore had to be aportioned to fit calendar year series. Data is taken from Department of Statistics: Statistical Yearbook (various issues). It must be noted however that there is also a skill development fund levy of 1.0% of payroll of those below a certain wage, though currently it is an off-budget item and can therefore not be included in direct tax estimate, see Asher, 2001, p.19. If the ADF test is conducted on four lags, the first difference is not found to be stationary unless we use the Schwarz-Baysian Criterion instead of the AIC. If the ADF test is conducted with three lags, we need to assume a trend of the first differences in order to be able to reject the Null-Hypothesis of non-stationarity.*
DispYCPF	Real per-capita disposable income after CPF contributions plus withdrawals under section 15 and for medical. For sources see DispY, VPNSRat and CPFeff. First difference can only be found stationary if we assume a trend.
Growth	Annual growth rate of RYPC.
NWGro	annual growth rate of NWage
AvrGro	difference between the current year's income (RYPC) and the income predicted by multiplying last year's real per-capita income by the average growth rate of the three preceeding years. If the observation is negative the modelled average consumer would have predicted a higher income.

LabRat	people employed as percent of total population, both including non-residents. Total employed workforce 1974-2000 taken from Dept. of Manpower: Yearbook of Manpower Statists (various issues); observations for 1964-69 from Dept of Information and Arts: Singapore Annual Report (1978 and 1964 issues); observations for 1969-73 from Department of Statistics: Annual Key Indicators. Individual time series do not always match. In these cases always information from the latest publication was used.
Dep	those aged under 15 and above 65 as a percent of those aged 15-64. 1960-99 taken from WB World Development Indicators CD-Rom (2001 edition). Year 2000 from Dept of Stats: Singapore Population 2000, based on Census 2000. Both sources refer to resident population only. A complete time-series for the age distribution of the total population is not available, since the Department of Statistics does not incorporate or publish the demographic breakdown of the non-resident population. First-differences can only be found stationary if we assume a trend.
Life	Life expenctancy at birth; until 1999 from Development Indicators CD-Rom (2001 edition), some years had to be interpolated. 2000 from Dept. of Statistics: Yearbook of Statistics

CABal	The negative of Singapore's Current Account Balance. CABal for 1960-79 is taken from Dept of Stats (1983): Economic and Social Statistics; Table 4.10, p. 68-9. 1980-2000 from Singapore Dept of Statistics Internet Site: historical Dataseries, last updated 1 March 2002 Contrary to our results Agrawal (2001) finds this variable non-stationary.
DoCrRat	Total Domestic Credit (end of period, current S$) as percent of GNP. Taken from IMF's: International Financial Statistics (various issues); line 32: Monetary Survey - Domestic Credit.
PriDoRat	Total Credit to Non-Government as percent of Total Domestic Credit, both end of period. Taken from IMF's International Financial Statistics (various issues); line 32d: Monetary Survey - Claims on Private Sector.
PriCrRat	Claims on Private Sector (end of period, current S$m) as a percent of GNP; from IFS, line 32d (Monetary Survey - Claims on Private Sector)
R	Real interest rate, computed using 12 months time deposits and the GDPdeflator. The 12 months time deposit interest rates (end of period) for 1968-81 is taken from Dept of Statistics: Economic and Social Statistics (1982), for 1982-91 from Statistical Yearbooks and thereafter from the 'data-room' at MAS website at mas.gov.sg. The single observation for 1965 is taken from Ministry of Trade and Industry: Economic Survey of Singapore. Data before 1965 or for 1966 and 1967 was not available. The Null-Hypothesis of non-stationarity could not have been rejected if the Schwarz-Baysian Criterion had been used instead of the AIC.

CPFrat	Employer's and Employee's maximum contribution rates to CPF from Asher (1999a) except for year 2000, which was obtained from CPF directly. Not everybody pays this maximum CPF-rate. Government employees and certain age groups can have different contribution rates. In some years changes to the contribution rates took effect at points during the calendar year. The changes were then apportioned respectively.
CPFeff	Total Annual Gross Contributions to the CPF as a percent of total estimated remuneration. Contributions taken from Singapore Ministry of Information and Arts: Annual Report (various issues) + *1960 and 1961 from NUS: Report of the CPF Study group. Total Renumeration paid to employees for 1980-97 from* Department of Statistics: The Income Approach to Gross Domestic Product, July 1998; Table A11-12, pp.53-4. Remuneration includes employers' contribution to Central Provident Fund and any other benefits the emplyee received. It excludes the self-employed. Remuneration are recorded before the deduction of employees' CPF contribution. For the other years estimated as total (employed) workforce * average nominal wages (For sources see Nwage).

VI.3. Investment Database for Chapter Three

The investment database compiled for Chapter Three is attached in print as well as included on the CD-Rom in Microsoft Excel format. It consists of four main sections:

- Investment Pool 1965-99
- Real Public Investments 1965-99
- Real Private Investments1965-99
- Imputed Starting Balances (only on CD-Rom)

Real Investment Pool 1965-99

	in S$million (constant 1990 S$)	Cumulative 1965-99	1964	1965	1966	1967	1968	1969	1970
GNS Flows	Gov. Saving	360.113	465,9	601,0	698,2	839,6	1.044,0	970,4	1.553,8
	Forced Private Saving	181.729	128,5	136,8	146,4	157,7	175,7	284,1	411,2
	Voluntary Private Saving	284.990	70,4	152,5	543,6	574,2	1.009,5	1.219,7	853,1
	Total GNS (adjusted for housing)	826.831	664,8	890,3	1.388,2	1.571,5	2.229,2	2.474,1	2.818,1
	of which gov saving	43,6%	70,1%	67,5%	50,3%	53,4%	46,8%	39,2%	55,1%
	of which directly gov. controlled	65,5%	89,4%	82,9%	60,8%	63,5%	54,7%	50,7%	69,7%
	Reclassify POS+DBS+MAS+BCCS non-gov liab.	118.942	(9,3)	177,1	42,8	23,8	362,5	257,7	359,7
	% of GNS directly and indirectly gov. controlled	79,9%	88,0%	102,8%	63,9%	65,0%	71,0%	61,1%	82,5%
For. Sav. Flows	Gross Foreign Saving Inflows	391.155		235,0	177,4	1.290,5	2.372,1	2.177,7	5.665,5
	of which Official Funds	600		71,9	(102,3)	23,6	383,6	68,5	194,6
TOTAL GROSS FLOWS	TOTAL GROSS INVESTMENT FUND	1.217.986		1.125,3	1.565,6	2.862,0	4.601,2	4.651,9	8.483,6
	of which gov. controlled	661.384		986,8	785,0	1.044,7	1.965,8	1.580,7	2.519,3
	in % of total inv. fund flows	54,3%		87,7%	50,1%	36,5%	42,7%	34,0%	29,7%
TOTAL GROSS STOCK	Cumulative Total Inv. Fund	11.688.537		1.125,3	2.690,9	5.552,8	10.154,1	14.805,9	23.289,5
	of which gov. controlled			986,8	1.771,9	2.816,5	4.782,3	6.363,0	8.882,3
	in % of total inv. fund flows			87,7%	65,8%	50,7%	47,1%	43,0%	38,1%
COMPARE WITH GFCF	Gross Fixed Capital Formation	609.117	1.458,9	1.631,9	1.684,6	1.897,2	2.549,4	3.297,8	4.617,4
	as % of Total Gross National Saving	73,7%	219,5%	183,3%	121,4%	120,7%	114,4%	133,3%	163,8%
	as % of Total Gross Investment Fund	50,0%		145,0%	107,6%	66,3%	55,4%	70,9%	54,4%

Real Investment Pool 1965-99

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
GNS Flows	1.536,6	1.946,6	2.039,8	2.372,4	3.234,2	3.118,5	3.192,4	3.392,9	3.994,6	4.955,3	6.115,9	7.622,9
	544,5	779,7	990,8	1.253,5	1.588,0	1.808,0	2.044,1	2.379,7	2.944,3	3.425,4	4.158,2	5.217,5
	972,3	1.744,8	2.500,4	2.018,1	2.021,6	3.006,9	3.546,1	4.300,9	4.610,9	3.403,7	3.745,4	3.623,5
	3.053,4	4.471,1	5.531,0	5.644,0	6.843,9	7.933,3	8.782,6	10.073,6	11.549,9	11.784,3	14.019,6	16.463,9
	50,3%	43,5%	36,9%	42,0%	47,3%	39,3%	36,3%	33,7%	34,6%	42,0%	43,6%	46,3%
	68,2%	61,0%	54,8%	64,2%	70,5%	62,1%	59,6%	57,3%	60,1%	71,1%	73,3%	78,0%
	614,6	815,3	1.589,9	356,7	1.226,9	2.393,4	1.475,6	2.154,3	2.334,1	254,6	3.453,7	5.386,5
	88,3%	79,2%	83,5%	70,6%	88,4%	92,3%	76,4%	78,7%	80,3%	73,3%	97,9%	110,7%
For. Sav. Flows	7.434,9	5.722,8	5.340,7	6.161,0	4.701,3	4.875,5	3.576,0	6.190,3	8.126,6	7.692,6	11.437,0	7.426,1
	171,0	101,0	45,7	0,0	33,5	23,3	480,8	17,9	(54,5)	(44,8)	(40,6)	(38,6)
TOTAL GROSS FLOWS	10.488,3	10.193,9	10.871,7	11.804,9	11.545,1	12.808,9	12.358,7	16.263,9	19.676,4	19.476,9	25.456,6	23.890,0
	2.866,8	3.642,6	4.666,2	3.982,6	6.082,6	7.343,2	7.192,9	7.944,9	9.218,5	8.590,5	13.687,2	18.188,3
	27,3%	35,7%	42,9%	33,7%	52,7%	57,3%	58,2%	48,8%	46,9%	44,1%	53,8%	76,1%
TOTAL GROSS STOCK	33.777,8	43.971,6	54.843,3	66.648,2	78.193,3	91.002,1	103.360,8	119.624,8	139.301,2	158.778,1	184.234,7	208.124,8
	11.749,1	15.391,7	20.057,9	24.040,5	30.123,1	37.466,3	44.659,2	52.604,1	61.822,6	70.413,0	84.100,2	102.288,5
	34,8%	35,0%	36,6%	36,1%	38,5%	41,2%	43,2%	44,0%	44,4%	44,3%	45,6%	49,1%
COMPARE WITH GFCF	5.844,8	4.619,4	7.071,2	8.198,6	8.027,7	8.640,2	8.774,4	9.992,3	11.223,3	13.658,6	16.041,0	18.659,1
	191,4%	103,3%	127,8%	145,3%	117,3%	108,9%	99,9%	99,2%	97,2%	115,9%	114,4%	113,3%
	55,7%	45,3%	65,0%	69,5%	69,5%	67,5%	71,0%	61,4%	57,0%	70,1%	63,0%	78,1%

Real Investment Pool 1965-99

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
GNS Flows	8.652,0	8.214,0	6.183,6	14.174,7	7.898,8	9.659,1	10.390,0	12.241,3	14.086,3	16.932,6	18.943,4
	5.779,3	6.805,5	8.134,0	6.323,8	5.462,7	5.476,1	6.470,7	7.337,2	8.553,2	9.174,3	9.317,8
	5.763,9	9.479,0	8.188,1	846,2	8.384,1	11.150,9	13.024,0	12.642,2	13.322,1	13.886,3	13.284,3
	20.195,2	24.498,5	22.505,6	21.344,8	21.745,7	26.286,1	29.884,8	32.220,7	35.961,5	39.993,1	41.545,5
	42,8%	33,5%	27,5%	66,4%	36,3%	36,7%	34,8%	38,0%	39,2%	42,3%	45,6%
	71,5%	61,3%	63,6%	96,0%	61,4%	57,6%	56,4%	60,8%	63,0%	65,3%	68,0%
	3.396,1	2.580,8	4.627,2	4.626,7	5.343,5	3.498,9	12.346,9	3.129,1	3.750,1	7.124,5	6.862,2
	88,3%	71,8%	84,2%	117,7%	86,0%	70,9%	97,7%	70,5%	73,4%	83,1%	84,5%
For. Sav. Flows	7.475,6	10.999,9	8.789,8	12.639,6	9.248,2	8.507,9	18.823,6	17.938,9	10.827,7	544,5	10.478,5
	(205,7)	(27,0)	(35,9)	(208,5)	(46,7)	(44,3)	(34,8)	(68,9)	(25,1)	(15,6)	(13,2)
TOTAL GROSS FLOWS	27.670,8	35.498,4	31.295,4	33.984,4	30.993,9	34.794,0	48.708,4	50.159,6	46.789,2	40.537,6	52.024,0
	17.621,7	17.573,3	18.908,9	24.916,7	18.658,3	18.589,8	29.172,8	22.638,7	26.364,5	33.215,8	35.110,3
	63,7%	49,5%	60,4%	73,3%	60,2%	53,4%	59,9%	45,1%	56,3%	81,9%	67,5%
TOTAL GROSS STOCK	235.795,6	271.294,0	302.589,4	336.573,8	367.567,7	402.361,7	451.070,1	501.229,6	548.018,8	588.556,5	640.580,4
	119.910,2	137.483,5	156.392,4	181.309,2	199.967,4	218.557,2	247.730,1	270.368,8	296.733,2	329.949,1	365.059,4
	50,9%	50,7%	51,7%	53,9%	54,4%	54,3%	54,9%	53,9%	54,1%	56,1%	57,0%
COMPARE WITH GFCF	20.236,6	22.004,8	19.143,1	16.704,5	16.828,7	17.235,0	19.838,2	21.577,8	24.265,6	27.548,4	29.880,2
	100,2%	89,6%	85,1%	78,3%	77,4%	65,6%	66,4%	67,0%	67,5%	68,9%	71,9%
	73,1%	62,0%	61,2%	49,2%	54,3%	49,5%	40,7%	43,0%	51,9%	68,0%	57,4%

Real Investment Pool 1965-99

	1994	1995	1996	1997	1998	1999
GNS Flows	20.907,8	25.340,4	29.668,2	36.219,1	39.806,3	31.566,0
	9.476,7	11.758,3	12.612,8	13.703,4	14.735,6	12.161,9
	18.378,2	19.454,7	16.930,8	21.964,5	20.751,4	37.691,9
	48.762,7	56.553,3	59.211,7	71.887,0	75.293,3	81.419,8
	42,9%	44,8%	50,1%	50,4%	52,9%	38,8%
	62,3%	65,6%	71,4%	69,4%	72,4%	53,7%
	2.933,8	6.966,6	7.269,3	11.136,9	4.265,6	5.805,0
	68,3%	77,9%	83,7%	84,9%	78,1%	60,8%
For. Sav. Flows	28.716,6	21.734,7	21.964,6	28.482,1	62.422,2	20.957,7
	(5,3)	(3,6)	0,0	0,0	0,0	0,0
TOTAL GROSS FLOWS	77.479,3	78.288,0	81.176,4	100.369,1	137.715,5	102.377,5
	33.313,0	44.061,6	49.550,2	61.059,4	58.807,5	49.533,0
	43,0%	56,3%	61,0%	60,8%	42,7%	48,4%
TOTAL GROSS STOCK	718.059,8	796.347,8	877.524,2	977.893,2	1.115.608,8	1.217.986,3
	398.372,4	442.434,0	491.984,2	553.043,6	611.851,1	661.384,1
	55,5%	55,6%	56,1%	56,6%	54,8%	54,3%
COMPARE WITH GFCF	31.643,7	33.851,3	41.309,2	44.799,4	44.404,9	41.417,1
	64,9%	59,9%	69,8%	62,3%	59,0%	50,9%
	40,8%	43,2%	50,9%	44,6%	32,2%	40,5%

Real Private Investments 1965-99

	Constant 1990 S$dollars (after GDPdeflator) in S$million (Stocks, end of period)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
BANKS	Loans Agriculture	61,4	57,0	98,3	76,1	115,0	70,7	72,0	110,7	16,9	76,5
	Loans Housing & Construction	147,8	1.328,0	1.450,9	1.630,7	1.696,0	1.874,3	2.009,6	1.965,6	2.268,6	3.353,1
	Loans Manufacturing	1.920,8	2.270,7	2.776,8	3.099,4	3.200,9	3.239,3	3.649,9	4.783,2	4.774,2	4.880,8
	Loans Transport & Communication	(174,2)	(180,3)	291,0	285,0	327,8	385,8	333,1	558,2	814,7	991,7
	Loans General Commerce	2.163,9	2.979,8	4.274,7	4.715,4	5.395,1	6.489,8	7.871,8	9.682,0	10.273,5	10.287,6
	Loans Non-Bank Financial Institutions	571,8	588,0	559,1	799,8	1.110,3	1.252,4	1.417,9	2.023,5	2.253,7	3.279,6
	Loans Other Services	927,2	1.170,6	781,9	865,9	996,7	999,2	1.126,1	1.344,5	1.901,6	2.783,9
	Loans Others	2.651,2	2.530,4	(27,6)	(11,2)	(20,6)	538,7	656,3	915,3	1.007,7	953,9
	Fixed and Other Assets	700,1	769,7	775,1	896,0	1.051,2	1.111,2	1.165,0	1.425,0	1.471,3	1.813,8
	Overseas	251,7	176,5	154,3	129,2	132,5	4.040,2	4.234,5	5.406,3	5.455,5	9.523,3
	Non-gov Securities	393,6	570,6	563,9	646,1	456,0	561,4	743,7	744,8	969,7	1.126,8
	TOTAL COMMERCIAL BANKS (Excl. DBS)	9.615,3	12.260,9	11.698,6	13.132,6	14.460,9	20.562,9	23.279,9	28.959,2	31.207,3	39.071,1
	of which primary sector	0,6%	0,5%	0,8%	0,6%	0,8%	0,3%	0,3%	0,4%	0,1%	0,2%
	of which Housing, Construction	1,5%	10,8%	12,4%	12,4%	11,7%	9,1%	8,6%	6,8%	7,3%	8,6%
	of which Manufacturing	20,0%	18,5%	23,7%	23,6%	22,1%	15,8%	15,7%	16,5%	15,3%	12,5%
	of which Services (incl. Transp. & Comm.)	36,3%	37,2%	50,5%	50,8%	54,1%	44,4%	46,2%	47,0%	48,8%	44,4%
	of which overseas	2,6%	1,4%	1,3%	1,0%	0,9%	19,6%	18,2%	18,7%	17,5%	24,4%
	of which not able to allocate	38,9%	31,6%	11,2%	11,7%	10,3%	10,8%	11,0%	10,7%	11,1%	10,0%
	Total Banks as % of Tot. Gross Inv. Fund	17,1%	24,3%	-4,8%	12,4%	10,4%	49,4%	16,7%	28,9%	11,5%	30,9%
Non-Banks	Finance Companies' Housing Loans	395,1	523,5	524,7	588,0	719,0	693,6	700,8	823,3	853,0	958,1
	Finance Companies' Hire-Purchase/Lease Fina	375,3	482,4	448,0	380,4	379,1	477,2	660,3	951,0	1.208,3	1.381,8
	Merchants' Banks' deposits with Non-Sing Banl	*12,6*	*19,1*	57,4	35,9	27,6	74,8	145,8	247,9	504,1	1.008,7
	Finance + Insurance Companies' Domestic Sec	229,1	287,1	229,0	296,2	380,9	437,0	514,4	523,7	535,5	582,3
	Fixed and Other Assets	382,8	465,3	910,2	930,9	1.058,7	1.117,2	1.287,9	1.520,0	1.879,0	2.878,8
	TOTAL NON-BANK FIN INST.	1.394,9	1.777,3	2.169,3	2.231,4	2.565,2	2.799,7	3.309,3	4.066,0	4.979,9	6.809,7
	of which Housing	28,3%	29,5%	24,2%	26,4%	28,0%	24,8%	21,2%	20,2%	17,1%	14,1%
	of which Private Consumption	26,9%	27,1%	20,7%	17,0%	14,8%	17,0%	20,0%	23,4%	24,3%	20,3%
	of which overseas	0,9%	1,1%	2,6%	1,6%	1,1%	2,7%	4,4%	6,1%	10,1%	14,8%
	of which not able to allocate	43,9%	42,3%	52,5%	55,0%	56,1%	55,5%	54,5%	50,3%	48,5%	50,8%
	Total Non-Banks as % of Tot. Gross Inv. Fund	2,7%	3,5%	3,3%	0,5%	2,6%	1,9%	3,1%	3,8%	4,7%	7,2%

Real Private Investments 1965-99

	Constant 1990 S$dollars (after GDPdeflator) in S$million (Stocks, end of period)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
BANKS	Loans Agriculture	24,2	74,5	94,9	81,0	81,2	99,1	77,1	74,9	85,6	93,7
	Loans Housing & Construction	4.143,2	5.648,1	7.335,4	8.077,8	8.356,3	8.108,2	8.083,5	10.379,5	10.876,3	12.830,6
	Loans Manufacturing	4.940,4	4.932,2	4.911,1	5.297,8	4.777,5	5.700,6	5.843,1	6.160,0	6.018,2	6.154,3
	Loans Transport & Communication	1.161,9	858,0	670,1	687,5	671,8	555,7	531,3	728,1	1.351,3	1.408,2
	Loans General Commerce	10.742,7	11.732,4	12.184,4	11.274,1	11.701,6	11.842,8	12.029,0	12.091,1	12.702,2	14.360,7
	Loans Non-Bank Financial Institutions	4.040,0	4.604,9	5.296,1	5.740,3	4.796,6	4.905,9	6.039,0	7.021,2	6.880,2	6.925,2
	Loans Other Services	3.106,4	3.903,0	4.356,4	4.995,2	5.189,0	5.422,3	4.727,3	6.037,8	6.220,7	6.338,2
	Loans Others	1.253,0	1.157,0	1.164,1	1.375,9	1.197,6	1.437,8	2.479,8	2.992,3	3.419,0	2.888,3
	Fixed and Other Assets	972,6	975,5	1.254,3	2.180,7	2.216,8	3.357,6	3.786,5	3.325,1	3.674,1	3.686,6
	Overseas	7.303,7	9.440,9	14.993,9	17.826,3	25.521,9	28.968,9	32.481,9	44.394,8	37.054,2	34.690,7
	Non-gov Securities	1.917,4	2.121,5	2.153,9	2.175,3	2.520,0	2.489,2	2.703,3	2.846,1	3.024,8	2.900,8
	TOTAL COMMERCIAL BANKS (Excl. DBS)	39.605,5	45.447,8	54.414,5	59.711,8	67.030,4	72.888,2	78.781,7	96.050,7	91.306,5	92.277,3
	of which primary sector	0,1%	0,2%	0,2%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%
	of which Housing, Construction	10,5%	12,4%	13,5%	13,5%	12,5%	11,1%	10,3%	10,8%	11,9%	13,9%
	of which Manufacturing	12,5%	10,9%	9,0%	8,9%	7,1%	7,8%	7,4%	6,4%	6,6%	6,7%
	of which Services (incl. Transp. & Comm.)	48,1%	46,4%	41,4%	38,0%	33,4%	31,2%	29,6%	26,9%	29,7%	31,5%
	of which overseas	18,4%	20,8%	27,6%	29,9%	38,1%	39,7%	41,2%	46,2%	40,6%	37,6%
	of which not able to allocate	10,5%	9,4%	8,4%	9,6%	8,9%	10,0%	11,4%	9,5%	11,1%	10,3%
	Total Banks as % of Tot. Gross Inv. Fund	2,2%	21,1%	25,3%	16,9%	21,5%	18,9%	16,9%	35,5%	-9,5%	2,1%
Non-Banks	Finance Companies' Housing Loans	1.058,6	1.350,9	1.552,2	1.616,0	1.708,2	1.804,4	1.657,5	1.766,4	1.606,2	1.473,8
	Finance Companies' Hire-Purchase/Lease Fina	1.322,5	1.314,3	1.211,0	878,7	642,6	804,4	1.301,3	2.001,7	2.257,7	2.456,6
	Merchants' Banks' deposits with Non-Sing Banl	1.034,7	1.018,4	1.856,5	1.915,7	2.634,2	4.363,4	4.743,1	4.576,2	4.219,1	3.376,0
	Finance + Insurance Companies' Domestic Sec	816,5	905,8	941,3	1.003,7	1.372,5	2.073,0	2.452,6	2.794,0	579,0	594,3
	Fixed and Other Assets	3.774,7	4.580,8	5.143,6	5.696,0	5.950,4	5.199,6	5.803,2	4.886,1	2.682,5	2.663,5
	TOTAL NON-BANK FIN INST.	8.007,0	9.170,1	10.704,7	11.110,1	12.307,7	14.245,0	15.957,8	16.024,4	11.344,5	10.564,2
	of which Housing	13,2%	14,7%	14,5%	14,5%	13,9%	12,7%	10,4%	11,0%	14,2%	14,0%
	of which Private Consumption	16,5%	14,3%	11,3%	7,9%	5,2%	5,6%	8,2%	12,5%	19,9%	23,3%
	of which overseas	12,9%	11,1%	17,3%	17,2%	21,4%	30,6%	29,7%	28,6%	37,2%	32,0%
	of which not able to allocate	57,3%	59,8%	56,8%	60,3%	59,5%	51,1%	51,7%	47,9%	28,7%	30,8%
	Total Non-Banks as % of Tot. Gross Inv. Fund	5,0%	4,2%	4,3%	1,3%	3,5%	6,3%	4,9%	0,1%	-9,3%	-1,7%

Real Private Investments 1965-99

	Constant 1990 S$dollars (after GDPdeflator) in S$million (Stocks, end of period)	1992	1993	1994	1995	1996	1997	1998	1999
BANKS	Loans Agriculture	82,6	95,6	104,1	135,3	111,3	154,9	194,3	168,5
	Loans Housing & Construction	14.024,3	17.985,8	18.762,9	22.333,4	26.139,2	29.411,7	29.525,1	28.523,4
	Loans Manufacturing	6.000,0	5.207,4	4.743,4	6.167,4	6.936,4	5.558,8	4.812,1	5.011,8
	Loans Transport & Communication	1.341,8	1.019,6	119,7	71,7	141,3	143,2	479,3	240,1
	Loans General Commerce	15.211,4	15.136,2	15.224,8	16.473,3	18.050,9	19.272,2	15.538,5	13.931,8
	Loans Non-Bank Financial Institutions	8.138,4	8.893,6	8.750,2	10.322,0	11.825,8	11.738,0	13.473,0	14.102,4
	Loans Other Services	5.561,0	5.511,0	9.543,9	11.590,0	13.827,9	15.221,7	14.505,0	13.948,1
	Loans Others	2.575,6	2.583,3	2.628,3	3.242,6	3.381,9	3.630,3	1.791,0	2.197,0
	Fixed and Other Assets	3.469,9	3.188,0	3.823,1	3.903,6	3.862,2	7.339,2	7.754,6	10.860,2
	Overseas	43.779,5	41.117,9	45.023,5	42.429,9	44.684,9	58.422,9	59.452,4	76.521,5
	Non-gov Securities	2.987,1	2.877,9	2.805,8	3.078,6	3.275,4	3.414,7	4.549,5	3.008,5
	TOTAL COMMERCIAL BANKS (Excl. DBS)	103.171,7	103.616,5	111.529,8	119.747,7	132.237,1	154.307,6	152.074,7	168.513,3
	of which primary sector	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%
	of which Housing, Construction	13,6%	17,4%	16,8%	18,7%	19,8%	19,1%	19,4%	16,9%
	of which Manufacturing	5,8%	5,0%	4,3%	5,2%	5,2%	3,6%	3,2%	3,0%
	of which Services (incl. Transp. & Comm.)	29,3%	29,5%	30,2%	32,1%	33,2%	30,1%	28,9%	25,1%
	of which overseas	42,4%	39,7%	40,4%	35,4%	33,8%	37,9%	39,1%	45,4%
	of which not able to allocate	8,8%	8,3%	8,3%	8,5%	8,0%	9,3%	9,3%	9,5%
	Total Banks as % of Tot. Gross Inv. Fund	26,9%	0,9%	10,2%	10,5%	15,4%	22,0%	-1,6%	16,1%
Non-Banks	Finance Companies' Housing Loans	1.407,4	1.656,3	2.010,6	2.240,2	2.698,9	3.072,8	3.319,9	3.081,1
	Finance Companies' Hire-Purchase/Lease Fina	3.018,9	3.925,4	4.919,5	4.757,2	4.181,9	4.099,2	3.765,4	3.886,2
	Merchants' Banks' deposits with Non-Sing Banl	3.132,3	3.589,3	3.296,2	3.805,2	3.835,4	4.407,0	4.330,8	4.183,1
	Finance + Insurance Companies' Domestic Sec	670,8	766,5	819,2	925,7	954,7	992,1	1.481,5	1.489,0
	Fixed and Other Assets	2.227,6	2.313,1	1.908,1	1.991,5	2.066,2	2.057,2	1.887,5	1.560,5
	TOTAL NON-BANK FIN INST.	10.457,0	12.250,7	12.953,5	13.719,9	13.737,1	14.628,2	14.785,1	14.199,8
	of which Housing	13,5%	13,5%	15,5%	16,3%	19,6%	21,0%	22,5%	21,7%
	of which Private Consumption	28,9%	32,0%	38,0%	34,7%	30,4%	28,0%	25,5%	27,4%
	of which overseas	30,0%	29,3%	25,4%	27,7%	27,9%	30,1%	29,3%	29,5%
	of which not able to allocate	27,7%	25,1%	21,1%	21,3%	22,0%	20,8%	22,8%	21,5%
	Total Non-Banks as % of Tot. Gross Inv. Fund	-0,3%	3,4%	0,9%	1,0%	0,0%	0,9%	0,1%	-0,6%

Real Private Investments 1965-99

	in S$million (Stocks, end of period)	Incr. 64-99	Overall	1964	1965	1966	1967	1968	1969	1970	1971
	An italics typeset means that the number has been interpolated.										
Foreign Equity	Agriculture, Mining, Quarrying	28,4	941								
	Construction & Real Estate & Real Estate Dev.	6.891,2	79.399	*76,6*	*88,5*	*102,3*	*118,3*	*136,8*	*158,1*	*182,7*	*211,2*
	Manufacturing	53.917,3	527.237	145,1	186,1	217,1	287,4	489,5	1.457,1	2.432,8	3.671,3
	Transport & Communication	5.430,9	40.376	*49,8*	*56,5*	*64,1*	*72,8*	*82,6*	*93,7*	*106,3*	*120,6*
	General Commerce	21.188,1	185.409	*628,8*	*690,0*	*757,2*	*830,9*	*911,8*	*1.000,6*	*1.098,0*	*1.204,9*
	Financial & Business Services	67.887,6	500.169	*420,6*	*486,9*	*563,7*	*652,7*	*755,6*	*874,9*	*1.012,9*	*1.172,7*
	Other Services	(24,1)	4.374	*67,4*	*69,3*	*71,3*	*73,3*	*75,4*	*77,5*	*79,7*	*82,0*
	TOTAL Foreign Equity	155.319,5	1.337.904,1	*1.388,3*	*1.577,4*	*1.775,8*	*2.035,4*	*2.451,7*	*3.661,8*	*4.912,3*	*6.462,7*
	of which primary sector	0,0%	0,1%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which Construction, Real Estate	4,4%	5,9%	5,5%	5,6%	5,8%	5,8%	5,6%	4,3%	3,7%	3,3%
	of which Manufacturing	34,7%	39,4%	10,4%	11,8%	12,2%	14,1%	20,0%	39,8%	49,5%	56,8%
	of which Services (incl. Transp. & Comm.)	60,8%	54,6%	84,0%	82,6%	82,0%	80,1%	74,5%	55,9%	46,8%	39,9%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	tal Foreign Equity as % of Tot. Gross Inv. Fund	12,8%			16,8%	12,7%	9,1%	9,0%	26,0%	14,7%	14,8%
Domestic Equity	Agriculture, Mining, Quarrying	(1.029,2)	13.679	*1.155,9*	*1.066,2*	983,6	*907,3*	*837,0*	*772,1*	*712,2*	*657,0*
	Real Estate & Real Estate Dev. & Public Utilitie	62.225,3	548.678	*659,6*	*752,5*	*858,5*	*979,5*	*1.117,5*	*1.274,9*	*1.454,5*	*1.659,4*
	Manufacturing	17.641,8	258.247	175,2	214,7	273,4	287,4	406,3	*1.117,9*	*1.809,2*	*2.402,1*
	Transport & Communication	32.821,7	250.404	*222,9*	*257,2*	*296,8*	*342,5*	*395,2*	*456,0*	526,2	*607,3*
	General Commerce	17.106,2	255.631	*1.744,9*	*1.862,5*	*1.988,0*	*2.121,9*	*2.264,9*	*2.417,5*	*2.580,3*	*2.754,2*
	Financial & Business Services	133.664,6	1.172.750	*1.915,2*	*2.163,3*	*2.443,5*	*2.760,0*	*3.117,5*	*3.521,3*	*3.977,4*	*4.492,6*
	Other Services	3.117,6	29.642	*10,8*	*12,8*	*15,3*	*18,2*	*21,8*	*26,0*	*31,0*	36,9
	TOTAL Equity by Singaporeans	265.548,1	2.529.029,0	*5.884,5*	*6.329,3*	*6.859,1*	*7.416,8*	*8.160,1*	*9.585,7*	*11.090,9*	*12.609,5*
	of which primary sector	-0,4%	0,5%	19,6%	16,8%	14,3%	12,2%	10,3%	8,1%	6,4%	5,2%
	of which Construction, Real Estate	23,4%	21,7%	11,2%	11,9%	12,5%	13,2%	13,7%	13,3%	13,1%	13,2%
	of which Manufacturing	6,6%	10,2%	3,0%	3,4%	4,0%	3,9%	5,0%	11,7%	16,3%	19,0%
	of which Services (incl. Transp. & Comm.)	70,3%	67,6%	66,2%	67,9%	69,2%	70,7%	71,1%	67,0%	64,2%	62,6%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	l Domestic Equity as % of Tot. Gross Inv. Fund	21,8%			39,5%	33,8%	19,5%	16,2%	30,6%	17,7%	14,5%
Abroad	Singapore's Investment Abroad	73.456,1	609.169	*1.113,0*	*1.248,6*	*1.400,6*	*1.571,1*	*1.762,4*	*1.977,0*	*2.217,8*	*2.487,8*
	Total Abroad as % of Tot. Gross Inv. Fund	6,0%			12,0%	9,7%	6,0%	4,2%	4,6%	2,8%	2,6%

Real Private Investments 1965-99

	in S$million (Stocks, end of period)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	An italics typeset means that the number has been interpolated.										
Foreign Equity	Agriculture, Mining, Quarrying							29,5	35,7	34,5	101,3
	Construction & Real Estate & Real Estate Dev.	*244,1*	*282,2*	*326,2*	*377,1*	*435,9*	*503,8*	188,5	171,6	1.194,4	1.595,0
	Manufacturing	5.039,7	5.213,7	5.202,7	5.614,6	6.109,5	6.664,0	7.161,4	8.479,3	9.274,3	10.160,4
	Transport & Communication	*136,8*	*155,2*	*176,0*	*199,7*	*226,6*	*257,1*	362,8	523,3	596,7	694,9
	General Commerce	*1.322,2*	*1.450,9*	*1.592,1*	*1.747,1*	*1.917,2*	*2.103,9*	2.025,9	2.326,4	2.919,7	3.384,6
	Financial & Business Services	*1.357,7*	*1.571,9*	*1.819,9*	*2.107,1*	*2.439,5*	*2.824,4*	3.242,1	3.539,3	3.328,5	4.915,8
	Other Services	*84,3*	*86,7*	*89,2*	*91,7*	*94,3*	*97,0*	64,8	59,4	58,6	78,4
	TOTAL Foreign Equity	*8.184,9*	*8.760,6*	*9.206,2*	*10.137,3*	*11.223,0*	*12.450,2*	13.075,0	15.134,9	17.406,7	20.930,2
	of which primary sector	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,2%	0,2%	0,2%	0,5%
	of which Construction, Real Estate	3,0%	3,2%	3,5%	3,7%	3,9%	4,0%	1,4%	1,1%	6,9%	7,6%
	of which Manufacturing	61,6%	59,5%	56,5%	55,4%	54,4%	53,5%	54,8%	56,0%	53,3%	48,5%
	of which Services (incl. Transp. & Comm.)	35,4%	37,3%	39,9%	40,9%	41,7%	42,4%	43,6%	42,6%	39,7%	43,4%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	tal Foreign Equity as % of Tot. Gross Inv. Fund	16,9%	5,3%	3,8%	8,1%	8,5%	9,9%	3,8%	10,5%	11,7%	13,8%
Domestic Equity	Agriculture, Mining, Quarrying	*606,1*	*559,1*	*515,7*	*475,8*	*438,9*	*404,8*	*373,5*	*344,5*	366,1	586,7
	Real Estate & Real Estate Dev. & Public Utilitie	*1.893,2*	*2.159,9*	*2.464,2*	*2.811,4*	*3.207,5*	*3.659,3*	*4.174,8*	*4.763,0*	4.675,0	6.595,4
	Manufacturing	*2.916,2*	*3.160,0*	*3.240,4*	*3.642,3*	*4.057,5*	*4.459,4*	*4.810,5*	*5.007,2*	4.880,1	5.838,8
	Transport & Communication	*700,8*	*808,6*	*933,1*	*1.076,8*	*1.242,6*	*1.433,9*	*1.654,7*	*1.909,4*	2.004,6	3.133,1
	General Commerce	*2.939,7*	*3.137,8*	*3.349,2*	*3.574,8*	*3.815,7*	*4.072,8*	*4.347,2*	*4.640,0*	4.859,2	6.008,9
	Financial & Business Services	*5.074,5*	*5.731,8*	*6.474,3*	*7.312,9*	*8.260,1*	*9.330,0*	*10.538,5*	*11.903,5*	11.120,7	14.291,6
	Other Services	*44,0*	*52,5*	*62,6*	*74,7*	*89,1*	*106,3*	*126,7*	*151,2*	217,7	268,4
	TOTAL Equity by Singaporeans	*14.174,6*	*15.609,8*	*17.039,6*	*18.968,7*	*21.111,4*	*23.466,6*	*26.025,9*	*28.718,9*	28.123,3	36.722,8
	of which primary sector	4,3%	3,6%	3,0%	2,5%	2,1%	1,7%	1,4%	1,2%	1,3%	1,6%
	of which Construction, Real Estate	13,4%	13,8%	14,5%	14,8%	15,2%	15,6%	16,0%	16,6%	16,6%	18,0%
	of which Manufacturing	20,6%	20,2%	19,0%	19,2%	19,2%	19,0%	18,5%	17,4%	17,4%	15,9%
	of which Services (incl. Transp. & Comm.)	61,8%	62,3%	63,5%	63,5%	63,5%	63,7%	64,0%	64,8%	64,7%	64,5%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	l Domestic Equity as % of Tot. Gross Inv. Fund	15,4%	13,2%	12,1%	16,7%	16,7%	19,1%	15,7%	13,7%	-3,1%	33,8%
Abroad	Singapore's Investment Abroad	*2.790,7*	*3.130,5*	*3.511,7*	*3.939,3*	3.595,4	4.351,4	5.334,1	6.525,8	6.679,1	8.435,4
	Total Abroad as % of Tot. Gross Inv. Fund	3,0%	3,1%	3,2%	3,7%	-2,7%	6,1%	6,0%	6,1%	0,8%	6,9%

Real Private Investments 1965-99

	in S$million (Stocks, end of period)	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*
	An italics typeset means that the number has been interpolated.										
Foreign Equity	Agriculture, Mining, Quarrying	79,8	91,1	69,2	42,2	(22,3)	(5,4)	(11,4)	6,4	79,8	42,8
	Construction & Real Estate & Real Estate Dev.	2.114,0	1.680,0	2.228,8	2.391,8	2.502,8	2.159,1	2.396,3	3.443,9	4.118,0	4.145,4
	Manufacturing	10.889,0	12.056,9	13.136,4	13.882,9	15.551,5	18.566,2	19.548,3	20.820,7	22.657,8	22.104,4
	Transport & Communication	717,7	560,4	428,3	125,5	238,5	603,3	951,5	1.599,4	1.886,6	1.866,8
	General Commerce	4.153,1	4.325,4	4.333,4	4.093,6	4.129,9	4.496,1	5.052,1	5.715,9	7.541,4	9.256,2
	Financial & Business Services	6.479,4	6.742,6	8.168,7	8.980,5	11.166,3	14.300,9	17.237,8	17.435,4	21.302,2	23.283,5
	Other Services	62,0	176,4	175,5	206,4	221,0	230,7	234,8	327,8	349,1	142,4
	TOTAL Foreign Equity	24.494,9	25.632,7	28.540,2	29.723,0	33.787,8	40.351,1	45.409,4	49.349,4	57.934,9	60.841,4
	of which primary sector	0,3%	0,4%	0,2%	0,1%	-0,1%	0,0%	0,0%	0,0%	0,1%	0,1%
	of which Construction, Real Estate	8,6%	6,6%	7,8%	8,0%	7,4%	5,4%	5,3%	7,0%	7,1%	6,8%
	of which Manufacturing	44,5%	47,0%	46,0%	46,7%	46,0%	46,0%	43,0%	42,2%	39,1%	36,3%
	of which Services (incl. Transp. & Comm.)	46,6%	46,1%	45,9%	45,1%	46,6%	48,7%	51,7%	50,8%	53,6%	56,8%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	tal Foreign Equity as % of Tot. Gross Inv. Fund	14,9%	4,1%	8,2%	3,8%	12,0%	21,2%	14,5%	8,1%	17,1%	6,2%
Domestic Equity	Agriculture, Mining, Quarrying	562,0	269,2	181,7	164,5	96,5	92,8	121,9	105,1	115,4	118,6
	Real Estate & Real Estate Dev. & Public Utilitie	8.623,7	10.105,0	12.055,5	11.928,1	10.009,9	9.555,7	11.375,9	15.980,1	20.272,4	22.889,5
	Manufacturing	6.199,6	6.654,8	7.064,7	6.848,6	7.270,0	7.653,2	7.699,2	8.786,0	9.978,1	10.563,0
	Transport & Communication	3.260,4	3.517,8	3.621,7	4.117,0	4.350,1	4.783,9	7.227,4	8.736,7	9.873,6	11.056,7
	General Commerce	6.637,7	7.050,6	6.760,9	6.311,1	6.176,5	6.540,2	6.998,6	8.198,5	9.559,0	10.529,9
	Financial & Business Services	17.862,1	21.164,8	24.565,8	27.659,8	29.719,9	32.180,6	32.810,0	39.318,5	46.560,9	49.751,0
	Other Services	308,5	268,1	252,9	245,9	485,8	665,2	705,3	796,3	1.454,2	1.897,2
	TOTAL Equity by Singaporeans	43.454,0	49.030,4	54.503,2	57.274,9	58.108,6	61.471,5	66.938,3	81.921,3	97.813,6	106.805,7
	of which primary sector	1,3%	0,5%	0,3%	0,3%	0,2%	0,2%	0,2%	0,1%	0,1%	0,1%
	of which Construction, Real Estate	19,8%	20,6%	22,1%	20,8%	17,2%	15,5%	17,0%	19,5%	20,7%	21,4%
	of which Manufacturing	14,3%	13,6%	13,0%	12,0%	12,5%	12,4%	11,5%	10,7%	10,2%	9,9%
	of which Services (incl. Transp. & Comm.)	64,6%	65,3%	64,6%	66,9%	70,1%	71,9%	71,3%	69,6%	69,0%	68,6%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	l Domestic Equity as % of Tot. Gross Inv. Fund	28,2%	20,2%	15,4%	8,9%	2,5%	10,9%	15,7%	30,8%	31,7%	19,2%
Abroad	Singapore's Investment Abroad	9.211,0	10.140,9	11.738,3	14.804,5	15.247,6	14.066,1	14.266,6	23.834,2	29.983,1	32.838,7
	Total Abroad as % of Tot. Gross Inv. Fund	3,2%	3,4%	4,5%	9,8%	1,3%	-3,8%	0,6%	19,6%	12,3%	6,1%

Real Private Investments 1965-99

	in S$million (Stocks, end of period)	1992	1993	1994	1995	1996	1997	1998	1999
	An italics typeset means that the number has been interpolated.								
Foreign Equity	Agriculture, Mining, Quarrying	126,6	40,9	41,7	28,9	33,4	31,3	36,3	28,4
	Construction & Real Estate & Real Estate Dev.	4.366,9	4.049,0	3.356,7	5.395,3	6.899,0	7.586,4	7.280,7	6.967,8
	Manufacturing	20.392,5	21.669,0	25.948,7	31.331,4	35.256,3	42.047,1	49.654,9	54.062,4
	Transport & Communication	2.133,9	2.408,8	2.843,4	2.551,2	3.227,6	3.882,3	4.944,6	5.480,7
	General Commerce	8.370,0	9.188,5	11.018,1	11.040,1	12.147,0	13.776,0	17.671,2	21.816,9
	Financial & Business Services	26.884,7	28.926,4	31.342,9	33.854,3	39.177,6	47.260,1	56.651,8	68.308,2
	Other Services	143,0	159,1	30,1	76,6	156,8	148,0	158,4	43,3
	TOTAL Foreign Equity	62.417,5	66.441,6	74.581,6	84.277,9	96.897,8	114.731,2	136.397,9	156.707,7
	of which primary sector	0,2%	0,1%	0,1%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which Construction, Real Estate	7,0%	6,1%	4,5%	6,4%	7,1%	6,6%	5,3%	4,4%
	of which Manufacturing	32,7%	32,6%	34,8%	37,2%	36,4%	36,6%	36,4%	34,5%
	of which Services (incl. Transp. & Comm.)	60,1%	61,2%	60,7%	56,4%	56,5%	56,7%	58,2%	61,0%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	tal Foreign Equity as % of Tot. Gross Inv. Fund	3,9%	7,7%	10,5%	12,4%	15,5%	17,8%	15,7%	19,8%
Domestic Equity	Agriculture, Mining, Quarrying	145,0	111,2	164,5	106,7	138,3	296,7	155,6	126,7
	Real Estate & Real Estate Dev. & Public Utilitie	24.363,7	27.578,3	33.327,6	49.242,4	56.128,7	58.770,5	59.085,1	62.884,9
	Manufacturing	12.634,8	14.345,7	15.535,8	15.513,2	16.666,4	19.067,0	19.426,2	17.817,1
	Transport & Communication	13.673,2	14.998,5	16.605,4	18.711,2	19.949,6	22.923,5	32.173,3	33.044,5
	General Commerce	9.408,7	11.061,0	12.579,9	15.481,9	16.831,1	17.226,6	22.692,7	18.851,1
	Financial & Business Services	55.901,6	63.544,3	73.210,7	82.282,8	97.202,9	109.495,3	121.425,0	135.579,8
	Other Services	1.890,7	1.853,9	1.689,3	2.316,0	2.783,1	3.146,9	4.399,3	3.128,3
	TOTAL Equity by Singaporeans	118.017,7	133.493,0	153.113,2	183.654,1	209.700,2	230.926,5	259.357,3	271.432,6
	of which primary sector	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,0%
	of which Construction, Real Estate	20,6%	20,7%	21,8%	26,8%	26,8%	25,4%	22,8%	23,2%
	of which Manufacturing	10,7%	10,7%	10,1%	8,4%	7,9%	8,3%	7,5%	6,6%
	of which Services (incl. Transp. & Comm.)	68,5%	68,5%	68,0%	64,7%	65,2%	66,2%	69,7%	70,2%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	l Domestic Equity as % of Tot. Gross Inv. Fund	27,7%	29,7%	25,3%	39,0%	32,1%	21,1%	20,6%	11,8%
Abroad	Singapore's Investment Abroad	34.118,4	37.966,5	18.270,5	26.718,9	47.214,9	54.882,4	78.338,4	74.569,1
	Total Abroad as % of Tot. Gross Inv. Fund	3,2%	7,4%	-25,4%	10,8%	25,2%	7,6%	17,0%	-3,7%

Real Private Investments 1965-99

in S$million (Stocks, end of period)	*Incr. 64-99*	*Overall*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
An italics typeset means that the number has been interpolated.										
SUMMARY Total Private	673.717,3	6.723.133	11.705,2	12.945,7	14.383,0	16.066,9	18.181,4	20.995,3	26.274,4	30.547,1
of which primary sector	-0,1%	0,3%	10,6%	8,9%	7,4%	6,2%	5,0%	4,0%	3,1%	2,4%
of which Construction, Real Estate	14,9%	14,3%	7,9%	8,2%	8,5%	8,7%	8,9%	8,7%	7,5%	7,4%
of which Manufacturing	11,2%	13,8%	10,4%	10,7%	10,9%	11,0%	12,1%	16,7%	22,1%	25,0%
of which Services	47,8%	46,0%	53,4%	53,9%	54,1%	54,2%	53,6%	51,7%	45,4%	43,7%
of which Overseas	22,9%	20,3%	9,6%	9,8%	9,9%	10,0%	9,9%	9,7%	9,3%	8,9%
of which not able to allocate	3,3%	5,3%	8,1%	8,6%	9,1%	9,9%	10,4%	9,1%	12,5%	12,5%
Total Private as % of Tot. Gross Inv. Fund	55,3%			110,2%	91,8%	58,8%	46,0%	60,5%	62,2%	40,7%
Annual Flows Total Private				1.240,6	1.437,2	1.683,9	2.114,5	2.813,9	5.279,1	4.272,7
of which Housing, Construction, Real Estate				135,7	156,7	181,3	210,2	206,4	163,2	293,6
of which Manufacturing				170,4	188,6	193,0	440,8	1.305,4	2.305,5	1.825,2
of which Services				722,6	814,9	920,0	1.039,7	1.111,2	1.078,8	1.401,0
of which Overseas				140,3	158,9	180,5	205,8	235,6	406,2	278,6
Not-Traceable				71,7	118,1	209,0	218,1	(44,6)	1.325,5	474,3
Real estate as % of total flow				10,9%	10,9%	10,8%	9,9%	7,3%	3,1%	6,9%
Manu				13,7%	13,1%	11,5%	20,8%	46,4%	43,7%	42,7%
Services				58,2%	56,7%	54,6%	49,2%	39,5%	20,4%	32,8%
Overseas				11,3%	11,1%	10,7%	9,7%	8,4%	7,7%	6,5%
Not-Traceable				5,8%	8,2%	12,4%	10,3%	-1,6%	25,1%	11,1%

Real Private Investments 1965-99

	in S$million (Stocks, end of period)	*1972*	*1973*	*1974*	*1975*	*1976*	*1977*	*1978*	*1979*	*1980*	*1981*
	An italics typeset means that the number has been interpolated.										
SUMMARY	Total Private	36.160,4	41.539,2	43.625,5	48.409,3	52.955,9	63.630,7	71.024,2	83.404,9	88.396,3	111.969,2
	of which primary sector	1,8%	1,5%	1,4%	1,1%	1,0%	0,7%	0,7%	0,6%	0,5%	0,7%
	of which Construction, Real Estate	7,4%	10,3%	10,9%	11,2%	11,4%	10,6%	10,0%	9,3%	10,2%	11,2%
	of which Manufacturing	27,3%	25,6%	25,7%	25,5%	25,2%	22,6%	22,0%	21,9%	21,4%	18,6%
	of which Services	41,9%	42,3%	46,8%	47,2%	48,9%	46,1%	46,6%	46,4%	45,6%	44,8%
	of which Overseas	8,4%	8,0%	8,5%	8,5%	7,1%	13,3%	13,7%	14,6%	14,3%	16,9%
	of which not able to allocate	13,1%	12,3%	6,6%	6,5%	6,2%	6,7%	7,1%	7,3%	8,0%	7,8%
	Total Private as % of Tot. Gross Inv. Fund	55,1%	49,5%	17,7%	41,4%	35,5%	86,4%	45,5%	62,9%	25,6%	92,6%
Annual Flows	Total Private	5.613,3	5.378,7	2.086,3	4.783,8	4.546,6	10.674,9	7.393,4	12.380,7	4.991,4	23.572,9
	of which Housing, Construction, Real Estate	405,5	1.613,3	472,5	641,1	651,0	672,7	342,8	649,8	1.267,4	3.510,6
	of which Manufacturing	2.233,6	767,6	575,6	1.136,4	1.011,7	994,8	1.259,1	2.647,9	658,8	1.951,4
	of which Services	1.810,3	2.404,8	2.849,7	2.447,8	3.064,0	3.437,4	3.759,0	5.549,3	1.688,2	9.769,5
	of which Overseas	325,8	271,1	397,4	381,0	(348,8)	4.710,8	1.248,0	2.465,6	458,7	6.328,6
	Not-Traceable	838,2	321,9	(2.208,8)	177,5	168,8	859,1	784,4	1.068,2	918,4	2.012,7
	Real estate as % of total flow	7,2%	30,0%	22,6%	13,4%	14,3%	6,3%	4,6%	5,2%	25,4%	14,9%
	Manu	39,8%	14,3%	27,6%	23,8%	22,3%	9,3%	17,0%	21,4%	13,2%	8,3%
	Services	32,3%	44,7%	136,6%	51,2%	67,4%	32,2%	50,8%	44,8%	33,8%	41,4%
	Overseas	5,8%	5,0%	19,0%	8,0%	-7,7%	44,1%	16,9%	19,9%	9,2%	26,8%
	Not-Traceable	14,9%	6,0%	-105,9%	3,7%	3,7%	8,0%	10,6%	8,6%	18,4%	8,5%

Real Private Investments 1965-99

	in S$million (Stocks, end of period)	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*
	An italics typeset means that the number has been interpolated.										
SUMMARY	Total Private	124.772,5	139.421,9	159.900,9	172.624,4	186.482,1	203.021,8	221.353,6	267.180,1	288.382,6	303.327,2
	of which primary sector	0,5%	0,3%	0,2%	0,2%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%
	of which Construction, Real Estate	12,8%	13,5%	14,5%	13,9%	12,1%	10,7%	10,6%	11,8%	12,8%	13,6%
	of which Manufacturing	17,7%	17,0%	15,7%	15,1%	14,8%	15,7%	14,9%	13,4%	13,4%	12,8%
	of which Services	46,9%	46,6%	44,3%	43,1%	42,3%	42,6%	42,7%	40,4%	43,6%	45,1%
	of which Overseas	14,1%	14,8%	17,9%	20,0%	23,3%	23,3%	23,3%	27,2%	24,7%	23,4%
	of which not able to allocate	8,1%	7,9%	7,4%	7,7%	7,5%	7,6%	8,4%	7,1%	5,4%	5,0%
	Total Private as % of Tot. Gross Inv. Fund	53,6%	52,9%	57,7%	40,7%	40,8%	53,4%	52,7%	94,1%	42,3%	31,9%
Annual Flows	Total Private	12.803,3	14.649,4	20.479,0	12.723,5	13.857,8	16.539,7	18.331,8	45.826,5	21.202,5	14.944,6
	of which Housing, Construction, Real Estate	3.438,0	2.844,4	4.388,0	841,8	(1.436,5)	(949,7)	1.885,7	8.056,6	5.303,1	4.466,3
	of which Manufacturing	1.149,2	1.614,7	1.468,2	917,2	1.569,7	4.321,0	1.170,7	2.676,0	2.887,4	167,5
	of which Services	8.413,2	6.372,6	5.909,8	3.622,8	4.410,0	7.680,6	8.016,4	13.462,7	17.674,7	11.134,4
	of which Overseas	(1.418,1)	3.050,9	7.988,5	5.957,8	8.857,2	3.994,7	4.093,1	21.313,6	(1.548,8)	(350,9)
	Not-Traceable	1.220,9	766,8	724,5	1.383,8	457,3	1.493,1	3.166,0	317,5	(3.113,9)	(472,6)
	Real estate as % of total flow	26,9%	19,4%	21,4%	6,6%	-10,4%	-5,7%	10,3%	17,6%	25,0%	29,9%
	Manu	9,0%	11,0%	7,2%	7,2%	11,3%	26,1%	6,4%	5,8%	13,6%	1,1%
	Services	65,7%	43,5%	28,9%	28,5%	31,8%	46,4%	43,7%	29,4%	83,4%	74,5%
	Overseas	-11,1%	20,8%	39,0%	46,8%	63,9%	24,2%	22,3%	46,5%	-7,3%	-2,3%
	Not-Traceable	9,5%	5,2%	3,5%	10,9%	3,3%	9,0%	17,3%	0,7%	-14,7%	-3,2%

Real Private Investments 1965-99

	in S$million (Stocks, end of period)	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*
	An italics typeset means that the number has been interpolated.								
SUMMARY	Total Private	328.182,3	353.768,3	370.448,6	428.118,4	499.787,1	569.475,9	640.953,3	685.422,5
	of which primary sector	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,0%
	of which Construction, Real Estate	13,5%	14,5%	15,5%	18,5%	18,4%	17,4%	15,5%	14,8%
	of which Manufacturing	11,9%	11,7%	12,5%	12,4%	11,8%	11,7%	11,5%	11,2%
	of which Services	45,3%	46,0%	49,4%	47,8%	47,1%	46,4%	47,4%	47,9%
	of which Overseas	24,7%	23,4%	18,0%	17,0%	19,2%	20,7%	22,2%	22,7%
	of which not able to allocate	4,6%	4,4%	4,6%	4,2%	3,5%	3,8%	3,3%	3,4%
	Total Private as % of Tot. Gross Inv. Fund	61,3%	49,2%	21,5%	73,7%	88,3%	69,4%	51,9%	43,4%
Annual Flows	Total Private	24.855,0	25.586,0	16.680,3	57.669,8	71.668,6	69.688,8	71.477,4	44.469,2
	of which Housing, Construction, Real Estate	2.823,1	7.107,1	6.188,4	21.753,4	12.654,5	6.975,5	369,5	2.246,4
	of which Manufacturing	205,6	2.194,9	5.005,8	6.784,2	5.847,1	7.813,7	7.220,2	2.998,1
	of which Services	11.842,6	14.042,6	20.257,4	21.812,7	30.550,7	28.912,1	39.878,3	24.363,2
	of which Overseas	10.124,8	1.643,6	(16.083,6)	6.363,8	22.781,3	21.977,1	24.409,2	13.152,2
	Not-Traceable	(141,1)	597,9	1.312,2	955,8	(164,9)	4.010,4	(399,9)	1.709,3
	Real estate as % of total flow	11,4%	27,8%	37,1%	37,7%	17,7%	10,0%	0,5%	5,1%
	Manu	0,8%	8,6%	30,0%	11,8%	8,2%	11,2%	10,1%	6,7%
	Services	47,6%	54,9%	121,4%	37,8%	42,6%	41,5%	55,8%	54,8%
	Overseas	40,7%	6,4%	-96,4%	11,0%	31,8%	31,5%	34,1%	29,6%
	Not-Traceable	-0,6%	2,3%	7,9%	1,7%	-0,2%	5,8%	-0,6%	3,8%

Real Public Investments 1965-99

Constant 1990 S$dollars (after GDPdeflator)

	in S$million (Stocks, end of period)	**Incr. 64-99**	**Overall**	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**	**1971**
G	Loans Housing	60.937,0	504.066	841,2	987,3	1.160,4	1.273,5	1.794,9	1.862,8	1.966,2	2.213,3
	Loans Manufacturing	2.231,3	12.833	14,1	66,0	287,0	0,0	0,0	17,2	59,5	108,3
	Loans Transportation	(28,5)	4.247	28,5	26,3	24,4	22,8	21,1	111,9	197,4	199,3
	Loans Communication	(29,6)	136	29,6	15,1	12,4	8,4	4,4	0,9	(0,0)	(0,0)
	Loans Other Services (Tourism, Education,	(0,0)	23.693	0,0	0,0	0,0	0,0	116,5	144,4	255,1	317,1
	Loans Other (incl. overseas)	66,5	4.673	0,4	0,4	0,3	0,3	0,2	0,2	0,1	0,1
o	Advances repayble to gov for Housing	356,9	9.787	14,2	13,8	16,7	22,0	28,3	39,3	45,4	45,9
	Cap Exp. Agri + Mining + Quarrying	44,0	851								
	Cap. Exp. Housing	3.103,9	58.910								
v	Cap. Exp. Education, Health, Social Sec.	3.475,4	66.369								
	Cap. Exp. Transportation & Communication	4.650,5	88.864								
	Cap. Exp. Others	5.018,5	89.989								
e	Cap. Exp., which can not be allocated	61.729,9	496.750	505,1	1.004,2	1.622,4	2.368,6	3.062,9	3.538,6	4.356,2	5.688,8
	Quoted Investments	116.441,4	820.166	2,7	5,0	321,5	1.555,8	2.517,8	2.996,3	3.857,1	3.537,4
r	Unquoted Investments	26.177,1	269.740								
	Other Assets	(691,4)	18.921	1.025,0	903,1	841,9	875,1	1.575,8	551,3	189,7	153,5
n	Advances repay. to gov other than Housing	432,9	3.255	34,4	55,2	53,2	41,4	38,9	41,1	43,4	45,8
	Public Funds administered by Ministries etc.	0,0	7.225								
m	TOTAL GOVERNMENT	283.915,8	2.480.477	2.495,1	3.076,2	4.340,2	6.168,0	9.160,9	9.303,9	10.970,2	12.309,4
	of which primary sector	0,016%	0,034%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
e	of which Housing	22,7%	23,1%	34,3%	32,5%	27,1%	21,0%	19,9%	20,4%	18,3%	18,4%
	of which Manufacturing	0,8%	0,5%	0,6%	2,1%	6,6%	0,0%	0,0%	0,2%	0,5%	0,9%
n	of which Services (incl. Transp. & Comm.)	2,8%	7,4%	2,3%	1,3%	0,8%	0,5%	1,6%	2,8%	4,1%	4,2%
	of which not able to allocate	73,7%	69,0%	62,8%	64,0%	65,4%	78,5%	78,5%	76,6%	77,0%	76,6%
t	Total Gov. as % of Tot. Gross Inv. Fund	23,3%		n/a	51,6%	80,7%	63,9%	65,0%	3,1%	19,6%	12,8%
	Additional Gov Assets without final Inv. Decision:										
	Cash	49.519,4	478.358	41,7	62,4	44,6	129,5	95,1	94,9	241,1	1.162,8
	Gov stocks	87.952,7	675.026	476,8	427,9	362,7	124,8	392,9	1.265,7	1.536,8	2.400,8
	Deposit with Investment Agents	1.641,7	21.400	8,0	20,5	45,5	49,3	57,3	360,3	165,1	190,3

Real Public Investments 1965-99

	Constant 1990 S$dollars (after GDPdeflat in S$million (Stocks, end of period)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Government	Loans Housing	2.659,6	3.058,3	3.542,4	4.691,1	5.716,5	6.341,8	6.712,2	6.992,9	6.954,8	7.600,3
	Loans Manufacturing	135,9	125,4	86,0	90,5	113,4	126,4	68,4	54,6	85,3	130,0
	Loans Transportation	199,0	176,6	168,2	165,8	151,1	378,1	424,3	384,0	326,9	291,8
	Loans Communication	(0,0)	8,6	10,0	9,7	9,6	9,4	8,7	7,7	6,4	5,5
	Loans Other Services (Tourism, Education,	399,1	924,0	1.032,7	1.100,0	1.025,1	925,8	768,9	991,3	1.835,9	2.605,9
	Loans Other (incl. overseas)	0,0	0,0	0,0	0,0	0,0	0,0	294,3	373,1	83,7	0,0
	Advances repayble to gov for Housing	54,3	51,8	46,0	47,6	51,6	55,3	59,1	65,7	65,1	56,7
	Cap Exp. Agri + Mining + Quarrying						1,2	2,7	7,5	13,1	18,5
	Cap. Exp. Housing						226,7	536,5	842,9	1.077,6	1.329,4
	Cap. Exp. Education, Health, Social Sec.						119,4	330,8	514,6	709,5	1.048,0
	Cap. Exp. Transportation & Communication						262,9	627,2	1.049,3	1.525,4	1.925,7
	Cap. Exp. Others						129,0	282,2	471,3	663,3	1.137,7
	Cap. Exp., which can not be allocated	5.789,0	5.452,8	5.119,1	5.517,3	6.283,4	6.417,5	6.266,4	5.957,7	5.343,6	5.008,4
	Quoted Investments	3.605,4	4.185,1	4.605,5	3.619,3	3.250,0	3.387,6	3.214,1	4.177,0	6.316,8	10.236,3
	Unquoted Investments				1.408,2	2.373,9	2.559,7	3.999,3	3.960,0	3.675,2	6.272,0
	Other Assets	150,5	132,4	109,7	72,4	59,6	56,1	54,6	67,7	160,9	298,9
	Advances repay. to gov other than Housing	47,0	44,8	38,2	28,7	21,2	23,6	27,0	45,7	57,4	69,9
	Public Funds administered by Ministries etc.	89,4	134,9	138,2	137,4	144,7	156,1	162,0	189,6	194,1	215,1
	TOTAL GOVERNMENT	13.129,2	14.294,7	14.896,0	16.888,1	19.200,1	21.176,7	23.838,6	26.152,5	29.095,1	38.250,1
	of which primary sector	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which Housing	20,7%	21,8%	24,1%	28,1%	30,0%	31,3%	30,7%	30,2%	27,8%	23,5%
	of which Manufacturing	1,0%	0,9%	0,6%	0,5%	0,6%	0,6%	0,3%	0,2%	0,3%	0,3%
	of which Services (incl. Transp. & Comm.)	4,6%	7,8%	8,1%	7,6%	6,2%	8,0%	9,1%	11,3%	15,1%	15,4%
	of which not able to allocate	73,7%	69,6%	67,2%	63,9%	63,2%	60,1%	60,0%	58,3%	56,7%	60,8%
	Total Gov. as % of Tot. Gross Inv. Fund	8,0%	10,7%	5,1%	17,3%	18,1%	16,0%	16,4%	11,8%	15,1%	36,0%
	Additional Gov Assets without final Inv. Deci										
	Cash	1.837,5	2.405,3	3.324,1	4.833,7	7.021,8	8.704,5	9.549,9	10.411,0	10.117,5	5.653,4
	Gov stocks	2.692,7	2.089,2	1.370,8	1.294,6	1.410,7	2.334,3	2.590,1	2.946,7	3.183,3	4.002,5
	Deposit with Investment Agents	185,8	51,0	20,5	16,1	6,9	51,5	364,6	466,3	200,1	31,4

Real Public Investments 1965-99

	Constant 1990 S$dollars (after GDPdeflat in S$million (Stocks, end of period)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Government	Loans Housing	9.240,6	11.985,1	12.434,8	16.322,7	21.495,5	22.399,6	20.425,0	17.904,5	16.788,6	16.788,7
	Loans Manufacturing	202,9	131,3	111,7	42,1	15,4	15,5	103,0	170,0	214,8	263,0
	Loans Transportation	265,5	228,5	200,6	164,6	63,7	32,4	9,9	2,8	2,4	2,1
	Loans Communication	4,8	4,2	3,7	3,3	2,9	0,7	(0,0)	(0,0)	(0,0)	(0,0)
	Loans Other Services (Tourism, Education,	2.823,3	2.681,8	2.537,8	1.927,3	806,3	257,6	123,7	61,5	21,2	6,7
	Loans Other (incl. overseas)	0,0	52,7	144,2	216,2	262,9	281,7	269,1	256,7	235,2	276,6
	Advances repayble to gov for Housing	136,0	238,0	342,7	600,0	805,3	887,0	844,3	770,5	679,5	627,2
	Cap Exp. Agri + Mining + Quarrying	27,4	30,7	31,9	46,6	57,3	58,4	55,0	52,5	50,0	48,4
	Cap. Exp. Housing	1.610,7	1.823,3	2.096,1	2.344,1	3.732,6	4.119,2	3.879,0	3.699,9	3.526,0	3.410,1
	Cap. Exp. Education, Health, Social Sec.	1.506,9	2.137,3	3.073,6	3.918,1	4.539,6	4.612,1	4.343,2	4.142,7	3.948,0	3.818,2
	Cap. Exp. Transportation & Communication	2.258,4	2.676,1	3.326,8	4.460,1	5.891,3	6.171,7	5.811,9	5.543,5	5.283,0	5.109,3
	Cap. Exp. Others	1.632,4	2.033,3	2.911,1	4.449,0	6.286,6	6.660,0	6.271,7	5.982,2	5.701,0	5.513,5
	Cap. Exp., which can not be allocated	4.803,5	4.625,3	4.593,4	4.652,3	4.718,3	9.525,0	13.495,0	17.064,7	19.808,7	22.581,4
	Quoted Investments	10.871,3	14.938,2	18.533,9	20.783,8	23.399,5	23.777,3	23.592,9	25.137,3	28.023,4	30.705,9
	Unquoted Investments	5.094,8	4.307,4	5.483,6	5.130,9	5.423,7	7.677,4	10.104,1	13.417,8	13.953,9	13.611,2
	Other Assets	420,2	516,0	624,6	668,8	653,7	626,7	581,1	558,5	523,3	1.884,9
	Advances repay. to gov other than Housing	12,0	0,3	73,2	103,9	100,6	90,1	88,3	105,6	112,6	109,4
	Public Funds administered by Ministries etc.	226,5	279,2	344,3	401,5	422,8	422,0	398,2	417,4	472,3	478,6
	TOTAL GOVERNMENT	41.137,2	48.688,8	56.868,2	66.235,2	78.678,0	87.614,4	90.395,4	95.288,3	99.343,7	105.235,1
	of which primary sector	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,0%
	of which Housing	26,7%	28,8%	26,2%	29,1%	33,1%	31,3%	27,8%	23,5%	21,1%	19,8%
	of which Manufacturing	0,5%	0,3%	0,2%	0,1%	0,0%	0,0%	0,1%	0,2%	0,2%	0,2%
	of which Services (incl. Transp. & Comm.)	16,7%	15,9%	16,1%	15,8%	14,4%	12,6%	11,4%	10,2%	9,3%	8,5%
	of which not able to allocate	56,1%	54,9%	57,5%	55,0%	52,5%	56,0%	60,6%	66,1%	69,3%	71,4%
	Total Gov. as % of Tot. Gross Inv. Fund	12,1%	27,3%	23,0%	29,9%	36,6%	28,8%	8,0%	10,0%	8,1%	12,6%
	Additional Gov Assets without final Inv. Deci										
	Cash	8.005,4	6.285,0	4.431,6	6.302,8	6.353,2	7.428,8	9.089,7	13.278,2	18.364,7	20.514,7
	Gov stocks	6.789,6	10.538,3	14.156,8	18.062,8	23.988,7	28.547,1	28.391,8	26.014,6	28.345,4	33.184,1
	Deposit with Investment Agents	3,5	8,4	31,2	24,4	53,0	208,1	469,4	536,9	680,3	635,5

Real Public Investments 1965-99

Constant 1990 S$dollars (after GDPdeflat in S$million (Stocks, end of period)	1992	1993	1994	1995	1996	1997	1998	1999
Government								
Loans Housing	17.126,2	18.142,6	21.526,8	26.248,4	32.381,1	41.802,8	53.746,7	61.778,1
Loans Manufacturing	736,9	847,5	870,3	892,4	1.129,8	1.456,0	1.831,4	2.245,4
Loans Transportation	1,8	1,5	1,2	0,9	0,2	(0,0)	(0,0)	(0,0)
Loans Communication	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)
Loans Other Services (Tourism, Education,	3,6	0,8	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)
Loans Other (incl. overseas)	290,3	275,6	264,1	258,2	254,7	251,0	264,1	66,9
Advances repayble to gov for Housing	580,7	481,8	397,0	348,8	307,6	275,5	329,4	371,1
Cap Exp. Agri + Mining + Quarrying	47,8	45,3	43,4	42,5	41,9	41,3	43,4	44,0
Cap. Exp. Housing	3.367,7	3.196,7	3.063,4	2.995,1	2.954,3	2.911,2	3.063,4	3.103,9
Cap. Exp. Education, Health, Social Sec.	3.770,8	3.579,3	3.430,1	3.353,6	3.307,9	3.259,6	3.430,1	3.475,4
Cap. Exp. Transportation & Communication	5.045,8	4.789,7	4.589,9	4.487,6	4.426,5	4.361,8	4.589,9	4.650,5
Cap. Exp. Others	5.445,1	5.168,6	4.953,1	4.842,7	4.776,7	4.707,0	4.953,1	5.018,5
Cap. Exp., which can not be allocated	25.775,0	27.941,9	29.427,6	32.156,0	37.679,6	43.200,2	53.670,2	62.235,0
Quoted Investments	35.955,5	48.154,5	53.427,4	57.991,1	62.970,8	71.034,9	93.035,8	116.444,0
Unquoted Investments	13.218,4	14.843,9	15.909,3	21.501,6	22.516,0	22.374,6	24.746,2	26.177,1
Other Assets	1.841,9	1.308,9	876,4	364,6	212,7	268,8	403,5	333,6
Advances repay. to gov other than Housing	96,1	83,9	80,2	83,5	275,5	332,3	352,0	432,9
Public Funds administered by Ministries etc.	496,6	554,3	600,0	150,3	0,0	0,0	0,0	0,0
TOTAL GOVERNMENT	113.800,2	129.416,7	139.460,2	155.717,3	173.235,4	196.276,9	244.459,3	286.376,4
of which primary sector	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
of which Housing	18,5%	16,9%	17,9%	19,0%	20,6%	22,9%	23,4%	22,8%
of which Manufacturing	0,6%	0,7%	0,6%	0,6%	0,7%	0,7%	0,7%	0,8%
of which Services (incl. Transp. & Comm.)	7,8%	6,5%	5,8%	5,0%	4,5%	3,9%	3,3%	2,8%
of which not able to allocate	73,0%	76,0%	75,7%	75,4%	74,3%	72,4%	72,6%	73,6%
Total Gov. as % of Tot. Gross Inv. Fund	21,1%	30,0%	13,0%	20,8%	21,6%	23,0%	35,0%	40,9%
Additional Gov Assets without final Inv. Deci								
Cash	24.282,2	27.313,1	33.196,4	38.798,3	44.368,8	46.811,2	48.284,6	49.561,2
Gov stocks	39.620,5	37.663,1	35.808,5	38.985,8	47.692,2	58.260,0	80.120,6	88.429,4
Deposit with Investment Agents	1.043,6	1.545,6	2.795,9	2.494,7	2.357,3	2.581,1	1.998,6	1.649,7

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	*Incr. 64-99*	*Overall*	*1964*	*1965*	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*
DBS	Loans & Equity Agriculture	0,0	826							9,4	9,4
	Loans & Equity Housing & Construction	23.059,4	95.719							0,2	24,7
	Loans & Equity Manufacturing	5.177,2	55.309						227,8	261,4	408,2
	Loans & Equity Transport & Communication	3.055,1	26.475							15,4	49,7
	Loans & Equity General Commerce	3.629,2	25.617							31,8	30,3
	Loans & Equity Other Services	5.060,8	32.049							0,0	0,0
	Loans & Equity Others	8.482,3	52.169						13,1	100,3	138,2
	Real Estate	1.691,8	16.684						20,8	54,8	73,0
	Overseas Gov Securities	1.037,6	4.969								
	Other Assets (sundry debtors, other fixed as	893,8	22.693						(11,1)	12,8	11,4
	TOTAL DBS (Not founded until 1969)	52.087,2	332.509						250,5	486,2	744,9
	of which primary sector	0,0%	0,2%						0,0%	1,9%	1,3%
	of which Housing, Construction, Real Estate	47,5%	33,8%						8,3%	11,3%	13,1%
	of which Manufacturing	9,9%	16,6%						90,9%	53,8%	54,8%
	of which Services (incl. Transp. & Comm.)	22,5%	25,3%						0,0%	14,1%	13,9%
	of which overseas	2,0%	1,5%						0,0%	0,0%	0,0%
	of which not able to allocate	18,0%	22,5%						0,8%	23,3%	20,1%
	Total DBS as % of Tot. Gross Inv. Fund	4,3%							5,4%	2,8%	2,5%
	Additional DBS Assets without final Inv. Decision:										
	Loans & Equity Financial Institutions, Investi	4.438,8	51.619							21,3	23,3
		64-99									
POSBank	Loans (largely mortgages)	0,0	69.907								
	Staff Loans (largely housing)	0,0	74								
	Real Estate	0,0	1.948								
	Listed and unlisted shares	0,0	6.702								
	Bonds and Debentures	0,0	12.567								
	Overseas Gov Securities	(59,2)	189	59,2	57,2	51,1	40,5	40,6	0,0		
	Other Assets (sundry debtors, other fixed as	(0,0)	11.041	0,00	0,01	0,00	0,2	1,2	0,3	0,6	0,7
	Total POSBank (acquirred by DBS in 1998)	(59,2)	102.428	59,2	57,2	51,1	40,7	41,8	0,3	0,6	0,7
	of which Housing, Real Estate	0,0%	70,2%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which overseas	100,0%	0,2%	100,0%	100,0%	100,0%	99,5%	97,1%	0,0%	0,0%	0,0%
	of which not able to allocate	0,0%	29,6%	0,0%	0,0%	0,0%	0,5%	2,9%	100,0%	100,0%	100,0%
	otal POSBank as % of Tot. Gross Inv. Fund	0,0%			-0,2%	-0,4%	-0,4%	0,0%	-0,9%	0,0%	0,0%

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
DBS	Loans & Equity Agriculture	7,9	8,5	5,8	4,9	3,8	33,4	33,5	8,8	95,0	104,5
	Loans & Equity Housing & Construction	52,5	96,0	89,3	87,6	178,8	130,5	186,0	209,2	253,4	460,7
	Loans & Equity Manufacturing	513,1	628,0	656,0	761,3	794,3	975,8	1.076,7	908,4	1.141,9	1.533,6
	Loans & Equity Transport & Communication	179,2	185,0	148,4	130,8	124,6	167,6	287,3	523,7	930,5	1.265,4
	Loans & Equity General Commerce	37,1	75,5	73,7	87,4	67,4	81,0	153,6	236,9	366,7	412,7
	Loans & Equity Other Services	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Loans & Equity Others	429,2	472,6	453,7	456,3	532,4	197,4	279,1	407,6	501,8	839,8
	Real Estate	141,1	182,0	219,4	245,4	297,9	337,6	336,9	259,3	223,4	255,2
	Overseas Gov Securities							130,6	132,5	157,1	139,2
	Other Assets (sundry debtors, other fixed as	85,0	127,2	120,9	131,1	373,2	369,9	232,8	375,7	347,1	388,8
	TOTAL DBS (Not founded until 1969)	1.445,2	1.774,9	1.767,2	1.904,8	2.372,3	2.293,3	2.716,6	3.062,0	4.017,0	5.399,7
	of which primary sector	0,5%	0,5%	0,3%	0,3%	0,2%	1,5%	1,2%	0,3%	2,4%	1,9%
	of which Housing, Construction, Real Estate	13,4%	15,7%	17,5%	17,5%	20,1%	20,4%	19,2%	15,3%	11,9%	13,3%
	of which Manufacturing	35,5%	35,4%	37,1%	40,0%	33,5%	42,6%	39,6%	29,7%	28,4%	28,4%
	of which Services (incl. Transp. & Comm.)	19,8%	20,4%	20,1%	21,5%	16,2%	16,0%	25,1%	38,1%	48,6%	43,5%
	of which overseas	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	4,8%	4,3%	3,9%	2,6%
	of which not able to allocate	35,6%	33,8%	32,5%	30,8%	38,2%	24,7%	18,8%	25,6%	21,1%	22,8%
	Total DBS as % of Tot. Gross Inv. Fund	6,9%	3,0%	-0,1%	1,2%	3,7%	-0,6%	2,6%	1,8%	4,9%	5,4%
	Additional DBS Assets without final Inv. Dec										
	Loans & Equity Financial Institutions, Investi	69,8	101,5	132,8	191,5	191,5	118,9	240,8	405,2	655,2	669,8
POSBank	Loans (largely mortgages)		58,8	162,7	324,3	439,2	517,0	1.318,6	1.723,5	1.958,8	1.983,9
	Staff Loans (largely housing)										
	Real Estate		0,0	0,0	1,8	4,4	5,3	6,2	7,1	6,4	6,8
	Listed and unlisted shares	4,2	5,0	6,1	10,2	18,0	27,9	52,8	81,0	90,4	63,6
	Bonds and Debentures	0	0,0	0,0	3,0	77,4	224,2	252,8	199,8	132,3	279,0
	Overseas Gov Securities										
	Other Assets (sundry debtors, other fixed as	7,1	5,3	14,1	12,7	13,4	17,3	78,0	87,4	155,9	156,7
	Total POSBank (acquirred by DBS in 1998)	11,3	69,2	183,0	352,1	552,5	791,7	1.708,3	2.098,8	2.343,8	2.490,1
	of which Housing, Real Estate	0,0%	85,0%	88,9%	92,6%	80,3%	66,0%	77,5%	82,5%	83,8%	79,9%
	of which overseas	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which not able to allocate	100,0%	15,0%	11,1%	7,4%	19,7%	34,0%	22,5%	17,5%	16,2%	20,1%
	otal POSBank as % of Tot. Gross Inv. Fund	0,1%	0,5%	1,0%	1,5%	1,6%	1,9%	5,6%	2,0%	1,3%	0,6%

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
DBS	Loans & Equity Agriculture	158,1	78,7	83,5	91,0	38,8	30,8	12,5	7,8	0,0	0,0
	Loans & Equity Housing & Construction	671,9	985,2	1.136,7	1.243,1	1.103,8	851,0	728,7	1.061,6	1.988,0	2.235,6
	Loans & Equity Manufacturing	1.640,6	2.024,6	1.705,9	1.381,1	1.247,6	1.513,9	1.526,0	1.639,2	1.470,7	1.701,2
	Loans & Equity Transport & Communication	1.289,1	1.258,6	1.095,8	722,4	458,0	404,1	317,6	405,9	385,4	349,0
	Loans & Equity General Commerce	524,1	613,0	638,8	525,0	510,4	700,5	722,5	905,5	983,9	817,9
	Loans & Equity Other Services	0,0	0,0	0,0	0,0	0,0	0,0	971,6	1.287,9	1.531,6	1.679,4
	Loans & Equity Others	1.122,5	1.009,5	1.128,7	1.544,3	1.600,3	1.858,2	1.170,5	1.263,0	1.368,7	1.689,6
	Real Estate	1.085,4	1.170,2	1.621,1	821,4	861,7	242,8	286,8	224,5	274,6	370,7
	Overseas Gov Securities	180,4	229,7	128,8	378,2	88,8	46,8	40,4	47,1	54,7	82,9
	Other Assets (sundry debtors, other fixed as	413,3	535,4	563,6	721,5	677,9	1.017,2	1.108,8	1.482,6	979,5	1.389,0
	TOTAL DBS (Not founded until 1969)	7.085,4	7.904,7	8.102,9	7.427,8	6.587,3	6.665,2	6.885,3	8.325,2	9.037,0	10.315,2
	of which primary sector	2,2%	1,0%	1,0%	1,2%	0,6%	0,5%	0,2%	0,1%	0,0%	0,0%
	of which Housing, Construction, Real Estate	24,8%	27,3%	34,0%	27,8%	29,8%	16,4%	14,7%	15,4%	25,0%	25,3%
	of which Manufacturing	23,2%	25,6%	21,1%	18,6%	18,9%	22,7%	22,2%	19,7%	16,3%	16,5%
	of which Services (incl. Transp. & Comm.)	38,6%	34,5%	32,5%	28,9%	29,8%	37,8%	49,0%	53,2%	65,8%	57,2%
	of which overseas	2,5%	2,9%	1,6%	5,1%	1,3%	0,7%	0,6%	0,6%	0,6%	0,8%
	of which not able to allocate	21,7%	19,5%	20,9%	30,5%	34,6%	43,1%	33,1%	33,0%	26,0%	29,8%
	Total DBS as % of Tot. Gross Inv. Fund	7,1%	3,0%	0,6%	-2,2%	-2,5%	0,3%	0,6%	3,0%	1,4%	2,7%
	Additional DBS Assets without final Inv. Dec										
	Loans & Equity Financial Institutions, Investi	919,9	859,5	897,3	898,9	995,7	1.415,4	1.364,0	1.826,5	3.042,8	3.053,5
POSBank	Loans (largely mortgages)	2.207,8	2.232,5	2.228,8	2.291,0	2.673,9	2.560,6	3.541,4	3.374,6	3.409,0	3.383,3
	Staff Loans (largely housing)		2,6	3,8	5,3	6,1	6,2	8,3	7,4	6,4	6,2
	Real Estate	11,8	50,2	71,1	86,9	93,0	100,2	119,3	115,2	117,5	131,5
	Listed and unlisted shares	51,2	45,2	52,8	41,4	41,2	68,0	223,1	245,0	344,4	551,3
	Bonds and Debentures	194,2	145,3	111,9	100,4	60,4	364,6	341,2	384,4	889,9	1.140,8
	Overseas Gov Securities										
	Other Assets (sundry debtors, other fixed as	201,2	899,2	1.104,4	1.559,8	1.805,0	1.797,4	181,0	190,6	187,5	194,9
	Total POSBank (acquirred by DBS in 1998)	2.666,2	3.375,0	3.572,8	4.084,7	4.679,5	4.896,9	4.414,3	4.317,2	4.954,6	5.408,0
	of which Housing, Real Estate	83,3%	67,7%	64,5%	58,3%	59,3%	54,5%	83,1%	81,0%	71,3%	65,1%
	of which overseas	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which not able to allocate	16,7%	32,3%	35,5%	41,7%	40,7%	45,5%	16,9%	19,0%	28,7%	34,9%
	otal POSBank as % of Tot. Gross Inv. Fund	0,7%	2,6%	0,6%	1,6%	1,8%	0,7%	-1,4%	-0,2%	1,3%	1,0%

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	1992	1993	1994	1995	1996	1997	1998	1999
DBS	Loans & Equity Agriculture	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Loans & Equity Housing & Construction	3.065,3	2.968,5	5.748,6	6.713,9	8.886,7	11.184,6	20.317,2	23.059,4
	Loans & Equity Manufacturing	2.004,2	2.366,0	2.950,9	3.179,1	3.326,0	4.738,6	5.830,2	5.177,2
	Loans & Equity Transport & Communication	510,9	646,6	1.532,9	1.778,5	2.052,8	2.809,0	3.395,3	3.055,1
	Loans & Equity General Commerce	1.205,1	940,5	1.667,1	1.911,9	2.000,8	2.483,0	3.183,6	3.629,2
	Loans & Equity Other Services	2.226,9	2.968,5	2.433,6	2.756,7	3.144,1	3.582,5	4.405,6	5.060,8
	Loans & Equity Others	2.184,1	2.497,7	2.399,3	2.638,7	2.881,6	3.552,4	8.955,8	8.482,3
	Real Estate	455,7	547,5	555,7	574,5	893,5	903,0	1.456,1	1.691,8
	Overseas Gov Securities	210,0	147,2	76,7	75,9	435,6	232,2	917,0	1.037,6
	Other Assets (sundry debtors, other fixed as	1.035,0	1.882,2	1.574,6	1.541,8	1.821,5	1.951,6	538,7	893,8
	TOTAL DBS (Not founded until 1969)	12.897,2	14.964,6	18.939,5	21.171,0	25.442,6	31.436,8	48.999,5	52.087,2
	of which primary sector	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which Housing, Construction, Real Estate	27,3%	23,5%	33,3%	34,4%	38,4%	38,5%	44,4%	47,5%
	of which Manufacturing	15,5%	15,8%	15,6%	15,0%	13,1%	15,1%	11,9%	9,9%
	of which Services (incl. Transp. & Comm.)	50,8%	50,6%	46,1%	49,5%	45,9%	46,0%	35,2%	31,1%
	of which overseas	1,6%	1,0%	0,4%	0,4%	1,7%	0,7%	1,9%	2,0%
	of which not able to allocate	25,0%	29,3%	21,0%	19,7%	18,5%	17,5%	19,4%	18,0%
	Total DBS as % of Tot. Gross Inv. Fund	6,4%	4,0%	5,1%	2,9%	5,3%	6,0%	12,8%	3,0%
	Additional DBS Assets without final Inv. Dec								
	Loans & Equity Financial Institutions, Investi	2.606,8	3.012,6	3.104,2	4.023,9	4.469,4	5.598,3	6.269,9	4.438,8
POSBank	Loans (largely mortgages)	3.154,0	3.187,9	4.997,6	5.934,7	6.869,0	9.373,5		
	Staff Loans (largely housing)	5,9	4,7	3,2	3,3	2,8	2,3		
	Real Estate	136,5	161,6	156,6	169,0	195,1	194,2		
	Listed and unlisted shares	600,6	564,7	708,5	756,8	1.030,4	1.018,1		
	Bonds and Debentures	834,0	1.323,6	1.475,8	1.289,7	1.318,9	1.423,4		
	Overseas Gov Securities								
	Other Assets (sundry debtors, other fixed as	277,6	318,5	335,5	452,0	477,0	508,3		
	Total POSBank (acquirred by DBS in 1998)	5.008,5	5.561,0	7.677,3	8.605,5	9.893,2	12.519,8		
	of which Housing, Real Estate	65,8%	60,3%	67,2%	71,0%	71,4%	76,4%		
	of which overseas	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%		
	of which not able to allocate	34,2%	39,7%	32,8%	29,0%	28,6%	23,6%		
	otal POSBank as % of Tot. Gross Inv. Fund	-1,0%	1,1%	2,7%	1,2%	1,6%	2,6%		

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	Incr. 64-99	Overall	1964	1965	1966	1967	1968	1969	1970	1971
		65-99									
CPF	Fixed Assets	143,1	2.115	3,1	2,9	2,7	2,5	6,4	6,2	10,7	17,6
	Staff Loans (largely housing)	3,2	63	0,0	0	0,0	0,0	0,0	0,0	0	0,0
	Portfolio Investment	1.110,9	6.392	0,0	0	0,0	0,0	0,0	0,0	0	0,0
	Debtors & Deposits	235,3	752	0,2	0,3	0,4	0,4	0,8	0,9	1,0	0,9
	Overseas Gov Securities	(39,8)	106	*39,8*	39,8	37,6	29,0	0,0	0,0	0	0
	TOTAL CPF	1.452,7	9.429	43,1	43,0	40,6	31,9	7,2	7,1	11,7	18,5
	of which Housing	0,2%	0,7%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which overseas	-2,7%	1,1%	92,3%	92,6%	92,5%	90,9%	0,0%	0,0%	0,0%	0,0%
	of which not able to allocate	102,5%	98,2%	7,7%	7,4%	7,5%	9,1%	100,0%	100,0%	100,0%	100,0%
	Total CPF as % of Tot. Gross Inv. Fund	0,1%		n/a	0,0%	-0,1%	-0,3%	-0,5%	0,0%	0,1%	0,1%
MAS	Foreign Reserves (incl. Gold, IMF Drawing F	97.405,3	905.095								1.473,9
	Fixed Assets	92,6	331								
	Overseas Investment (BIS participation)	48,1	129								
	Staff Loans	10,7	24								
	Other Assets	62,0	13.389								69,8
	TOTAL MAS (not founded until 1971)	97.618,7	918.969								1.543,7
	of which Housing	0,0%	0,0%								0,0%
	of which overseas	99,8%	98,5%								95,5%
	of which not able to allocate	0,2%	1,5%								4,5%
	Total MAS as % of Tot. Gross Inv. Fund	8,0%									14,7%
BCCS	External Assets	16.904,2	215.588				1.090,9	1.343,5	1.605,4	1.841,3	2.048,8
	Real Estate	53,8	465								
	Other Assets (sundry debtors, other fixed as	29,9	106				0,0	0,0	0,0	0,0	0,0
	TOTAL BCCS (not founded until 1967)	16.988,0	216.159				1.090,9	1.343,5	1.605,4	1.841,3	2.048,8
	of which Real Estate	0,3%	0,2%				0,0%	0,0%	0,0%	0,0%	0,0%
	of which overseas	99,5%	99,7%				100,0%	100,0%	100,0%	100,0%	100,0%
	of which not able to allocate	0,2%	0,0%				0,0%	0,0%	0,0%	0,0%	0,0%
	Total BCCS as % of Tot. Gross Inv. Fund	1,4%					38,1%	5,5%	5,6%	2,8%	2,0%
Add. For Res.	Official Foreign Reserves	110.043,4	1.239.623	3.034,9	3.196,9	3.597,4	4.291,0	5.592,3	6.301,5	7.579,0	9.548,5
	above MAS + BCCS For Res.	(4.266,1)	118.941	3.034,9	3.196,9	3.597,4	3.200,1	4.248,8	4.696,1	5.737,7	6.025,9

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
CPF	Fixed Assets	25,8	37,9	52,0	67,9	88,4	66,5	65,5	59,8	51,3	46,1
	Staff Loans (largely housing)	0	0	0,0	0	0,0	0	0	0,0	0,0	0,0
	Portfolio Investment	0	0	0,0	0	0,0	0	0	0,0	0,0	0,0
	Debtors & Deposits	0,8	1,2	0,7	0,7	0,7	21,2	27,0	1,2	1,0	4,7
	Overseas Gov Securities	0	0	0,0	0	0,0	0	0	0,0	0,0	0
	TOTAL CPF	26,6	39,1	52,8	68,5	89,1	87,8	92,6	61,0	52,3	50,8
	of which Housing	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which overseas	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which not able to allocate	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
	Total CPF as % of Tot. Gross Inv. Fund	0,1%	0,1%	0,1%	0,1%	0,2%	0,0%	0,0%	-0,2%	0,0%	0,0%
MAS	Foreign Reserves (incl. Gold, IMF Drawing I	2.782,7	3.504,2	4.276,3	6.081,1	8.726,9	11.083,8	13.114,3	13.690,0	14.346,4	10.997,6
	Fixed Assets										
	Overseas Investment (BIS participation)										
	Staff Loans										
	Other Assets	127,1	185,1	150,7	203,3	359,1	852,1	875,6	1.903,0	1.111,3	584,8
	TOTAL MAS (not founded until 1971)	2.909,7	3.689,3	4.426,9	6.284,4	9.086,0	11.935,9	13.990,0	15.593,0	15.457,6	11.582,4
	of which Housing	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which overseas	95,6%	95,0%	96,6%	96,8%	96,0%	92,9%	93,7%	87,8%	92,8%	95,0%
	of which not able to allocate	4,4%	5,0%	3,4%	3,2%	4,0%	7,1%	6,3%	12,2%	7,2%	5,0%
	Total MAS as % of Tot. Gross Inv. Fund	13,4%	7,2%	6,2%	16,1%	21,9%	23,1%	12,6%	8,1%	-0,7%	-15,2%
BCCS	External Assets	2.423,6	2.407,0	2.465,4	2.994,2	3.462,8	3.908,6	4.430,1	4.748,0	4.683,8	4.629,3
	Real Estate										
	Other Assets (sundry debtors, other fixed as	0,2	0,5	1,1	0,6	0,1	0,4	0,4	0,4	1,1	6,7
	TOTAL BCCS (not founded until 1967)	2.423,8	2.407,5	2.466,5	2.994,8	3.462,9	3.909,0	4.430,5	4.748,4	4.684,8	4.636,0
	of which Real Estate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which overseas	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	99,9%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,1%
	Total BCCS as % of Tot. Gross Inv. Fund	3,7%	-0,2%	0,5%	4,6%	3,7%	3,6%	3,2%	1,6%	-0,3%	-0,2%
Add. For Res.	Official Foreign Reserves	10884,99	11.372,9	11.078,2	12435,22	13499,18	14.506,3	18.012,2	18.749,9	18417,27	19.436,8
	above MAS + BCCS For Res.	5.678,7	5.461,8	4.336,5	3.359,9	1.309,5	(486,2)	467,8	311,9	(612,9)	3.809,8

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
CPF	Fixed Assets	40,8	38,7	39,3	39,0	39,3	37,5	39,2	35,4	63,8	70,5
	Staff Loans (largely housing)	0,0	1,6	3,3	5,9	7,2	7,3	4,8	5,5	3,8	3,5
	Portfolio Investment	0,0	0	0,0	0,0	0	0,0	81,5	138,1	149,0	221,7
	Debtors & Deposits	7,8	5,2	5,2	10,4	3,4	4,1	3,8	6,3	5,7	5,8
	Overseas Gov Securities	0,0	0	0,0	0,0	0	0,0	0	0,0	0,0	0,0
	TOTAL CPF	48,6	45,5	47,8	55,3	49,9	48,9	129,3	185,3	222,4	301,5
	of which Housing	0,0%	3,4%	6,9%	10,7%	14,4%	14,9%	3,7%	3,0%	1,7%	1,2%
	of which overseas	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which not able to allocate	100,0%	96,6%	93,1%	89,3%	85,6%	85,1%	96,3%	97,0%	98,3%	98,8%
	Total CPF as % of Tot. Gross Inv. Fund	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,2%	0,1%	0,1%	0,2%
MAS	Foreign Reserves (incl. Gold, IMF Drawing I	16.187,2	15.948,4	16.041,7	20.662,9	25.159,0	30.150,5	29.504,5	28.308,5	36.466,6	41.531,4
	Fixed Assets										
	Overseas Investment (BIS participation)										
	Staff Loans										
	Other Assets	544,1	633,9	561,3	602,6	483,2	397,0	599,6	419,8	366,2	315,3
	TOTAL MAS (not founded until 1971)	16.731,2	16.582,3	16.603,0	21.265,5	25.642,2	30.547,5	30.104,1	28.728,3	36.832,8	41.846,6
	of which Housing	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which overseas	96,7%	96,2%	96,6%	97,2%	98,1%	98,7%	98,0%	98,5%	99,0%	99,2%
	of which not able to allocate	3,3%	3,8%	3,4%	2,8%	1,9%	1,3%	2,0%	1,5%	1,0%	0,8%
	Total MAS as % of Tot. Gross Inv. Fund	21,6%	-0,5%	0,1%	14,9%	12,9%	15,8%	-1,3%	-2,8%	16,2%	10,7%
BCCS	External Assets	5.576,2	5.627,9	6.041,1	6.953,3	8.804,3	9.245,4	8.324,8	7.985,0	7.993,3	8.403,8
	Real Estate								15,0	14,3	22,8
	Other Assets (sundry debtors, other fixed as	0,0	0,0	0,0	0,0	0,0	0,0	0,0	(15,0)	13,4	20,8
	TOTAL BCCS (not founded until 1967)	5.576,2	5.627,9	6.041,1	6.953,3	8.804,3	9.245,4	8.324,8	7.985,0	8.021,0	8.447,5
	of which Real Estate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,2%	0,2%	0,3%
	of which overseas	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	99,7%	99.5%
	of which not able to allocate	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	-0,2%	0,2%	0,2%
	Total BCCS as % of Tot. Gross Inv. Fund	3,9%	0,2%	1,2%	2,9%	5,4%	1,4%	-2,6%	-0,7%	0,1%	0,9%
Add. For Res.	Official Foreign Reserves	21.561,9	22.891,4	26.200,2	31.551,2	33.283,1	35562,73	36.607,9	40511,23	48.521,3	53.967,9
	above MAS + BCCS For Res.	(201,5)	1.315,1	4.117,4	3.935,0	(680,2)	(3.833,2)	(1.221,4)	4.217,8	4.061,4	4.032,7

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	1992	1993	1994	1995	1996	1997	1998	1999
CPF	Fixed Assets	103,6	126,0	138,0	131,1	131,5	137,9	146,8	146,1
	Staff Loans (largely housing)	3,9	2,9	2,6	1,8	2,0	1,6	2,3	3,2
	Portfolio Investment	303,5	315,0	453,3	605,7	936,2	1.047,3	1.029,7	1.110,9
	Debtors & Deposits	8,1	14,2	4,8	9,5	37,8	144,6	176,2	235,6
	Overseas Gov Securities	0,0	0,0	0,0	0	0,0	0	0,0	0
	TOTAL CPF	419,1	458,2	598,7	748,1	1.107,4	1.331,5	1.355,0	1.495,7
	of which Housing	0,9%	0,6%	0,4%	0,2%	0,2%	0,1%	0,2%	0,2%
	of which overseas	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which not able to allocate	99,1%	99,4%	99,6%	99,8%	99,8%	99,9%	99,8%	99,8%
	Total CPF as % of Tot. Gross Inv. Fund	0,3%	0,1%	0,2%	0,2%	0,4%	0,2%	0,0%	0,1%
MAS	Foreign Reserves (incl. Gold, IMF Drawing F	49.259,5	53.222,1	57.511,0	60.802,9	69.276,7	76.706,1	90.873,6	97.405,3
	Fixed Assets					64,3	84,7	89,9	92,6
	Overseas Investment (BIS participation)						33,9	47,5	48,1
	Staff Loans						5,3	8,5	10,7
	Other Assets	328,6	367,5	410,6	326,2	235,5	182,3	131,8	62,0
	TOTAL MAS (not founded until 1971)	49.588,1	53.589,5	57.921,6	61.129,2	69.576,5	77.012,2	91.151,3	97.618,7
	of which Housing	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	of which overseas	99,3%	99,3%	99,3%	99,5%	99,6%	99,6%	99,7%	99,8%
	of which not able to allocate	0,7%	0,7%	0,7%	0,5%	0,4%	0,3%	0,2%	0,2%
	Total MAS as % of Tot. Gross Inv. Fund	19,1%	7,7%	5,6%	4,1%	10,4%	7,4%	10,3%	6,3%
BCCS	External Assets	9.542,5	10.817,1	9.805,3	11.246,2	10.671,0	12.994,8	14.568,9	16.904,2
	Real Estate	52,5	52,0	50,4	49,8	50,8	50,4	53,1	53,8
	Other Assets (sundry debtors, other fixed as	5,9	1,6	(2,4)	11,3	8,6	8,6	11,5	29,9
	TOTAL BCCS (not founded until 1967)	9.600,9	10.870,7	9.853,3	11.307,4	10.730,5	13.053,8	14.633,5	16.988,0
	of which Real Estate	0,5%	0,5%	0,5%	0,4%	0,5%	0,4%	0,4%	0,3%
	of which overseas	99,4%	99,5%	99,5%	99,5%	99,4%	99,5%	99,6%	99,5%
	of which not able to allocate	0,1%	0,0%	0,0%	0,1%	0,1%	0,1%	0,1%	0,2%
	Total BCCS as % of Tot. Gross Inv. Fund	2,8%	2,4%	-1,3%	1,9%	-0,7%	2,3%	1,1%	2,3%
Add. For Res.	Official Foreign Reserves	62.835,1	70.595,5	73.992,6	82.681,9	90.281,2	98.760,2	108.240,1	113.078,3
	above MAS + BCCS For Res.	4.033,2	6.556,3	6.676,3	10.632,7	10.333,5	9.059,3	2.797,7	(1.231,2)

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	Incr. 64-99	Overall	1964	1965	1966	1967	1968	1969	1970	1971
SUMMARY	Total Gov, DBS, POS, CPF, MAS, BCCS	447.737,2	4.178.910,9	5.632,3	6.373,2	8.029,3	10.531,5	14.802,3	15.863,3	19.047,6	22.691,8
	of which primary sector	0,01%	0,04%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,05%	0,04%
	of which Housing, Construction, Real Estate	19,9%	18,1%	15,2%	15,7%	14,7%	12,3%	12,3%	12,1%	10,9%	10,4%
	of which Manufacturing	1,7%	1,6%	0,3%	1,0%	3,6%	0,0%	0,0%	1,5%	1,7%	2,3%
	of which Services	4,4%	6,4%	1,0%	0,6%	0,5%	0,3%	1,0%	1,6%	2,7%	2,7%
	of which Overseas	24,8%	29,8%	n/a	51,7%	45,9%	41,4%	38,1%	39,7%	39,8%	42,1%
	of which not able to allocate	49,6%	44,5%	n/a	30,9%	35,4%	46,0%	48,7%	45,0%	44,9%	42,5%
	Total Gov ... as % of Tot. Gross Inv. Fund	36,8%		n/a	65,8%	105,8%	87,4%	92,8%	22,8%	37,5%	34,7%
Annual Flows	Total Gov, DBS, POS, CPF, MAS, BCCS				741,0	1.656,1	2.502,2	4.270,7	1.061,1	3.184,2	3.644,3
	of which Housing, Construction, Real Estate				146	176	118	528	100	144	290
	of which Manufacturing				52	221	(287)	-	17	42	49
	of which Services				(17)	(5)	(6)	111	115	264	99
	of which Overseas				160	392	674	1.272	669	1.277	1.970
	Not-Traceable (incl.Agri)				400	871	2.002	2.360	161	1.457	1.237
	Real estate as % of total flow				19,7%	10,6%	4,7%	12,4%	9,4%	4,5%	8,0%
	Manu				7,0%	13,3%	-11,5%	0,0%	1,6%	1,3%	1,3%
	Services				-2,2%	-0,3%	-0,2%	2,6%	10,8%	8,3%	2,7%
	Overseas				21,6%	23,7%	27,0%	29,8%	63,0%	40,1%	54,0%
	Not-Traceable (incl Agri.)				54,0%	52,6%	80,0%	55,3%	15,1%	45,7%	33,9%

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
SUMMARY	Total Gov, DBS, POS, CPF, MAS, BCCS	25.624,5	27.736,4	28.128,9	31.852,7	36.072,5	39.708,2	47.244,3	52.027,6	55.037,9	66.218,9
	of which primary sector	0,03%	0,03%	0,02%	0,02%	0,01%	0,09%	0,08%	0,03%	0,20%	0,19%
	of which Housing, Construction, Real Estate	11,3%	12,4%	14,4%	16,9%	18,5%	19,2%	19,4%	19,4%	19,1%	17,7%
	of which Manufacturing	2,5%	2,7%	2,6%	2,7%	2,5%	2,8%	2,4%	1,9%	2,2%	2,5%
	of which Services	3,5%	5,3%	5,6%	5,3%	4,4%	5,2%	6,0%	7,9%	11,5%	12,4%
	of which Overseas	42,5%	41,0%	39,4%	39,0%	37,4%	36,5%	38,4%	36,3%	33,7%	29,6%
	of which not able to allocate	58,8%	55,3%	55,2%	55,9%	61,1%	64,5%	60,7%	61,9%	58,8%	53,3%
	Total Gov ... as % of Tot. Gross Inv. Fund	28,8%	19,4%	3,3%	32,3%	32,9%	29,4%	46,3%	24,3%	15,5%	43,9%
Annual Flows	Total Gov, DBS, POS, CPF, MAS, BCCS	2.932,7	2.111,9	392,5	3.723,8	4.219,8	3.635,8	7.536,1	4.783,2	3.010,3	11.181,1
	of which Housing, Construction, Real Estate	551	539	613	1.338	1.291	926	1.541	945	439	1.153
	of which Manufacturing	28	(11)	(39)	4	23	13	(58)	(14)	31	45
	of which Services	264	587	95	120	(116)	494	779	1.271	2.244	1.868
	of which Overseas	1.337	488	(295)	1.357	1.064	1.007	3.637	739	(308)	1.002
	Not-Traceable (incl.Agri)	753	508	19	905	1.958	1.196	1.638	1.841	605	7.113
	Real estate as % of total flow	18,8%	25,5%	156,2%	35,9%	30,6%	25,5%	20,4%	19,8%	14,6%	10,3%
	Manu	0,9%	-0,5%	-10,0%	0,1%	0,5%	0,4%	-0,8%	-0,3%	1,0%	0,4%
	Services	9,0%	27,8%	24,1%	3,2%	-2,8%	13,6%	10,3%	26,6%	74,5%	16,7%
	Overseas	45,6%	23,1%	-75,1%	36,4%	25,2%	27,7%	48,3%	15,5%	-10,2%	9,0%
	Not-Traceable (incl Agri.)	25,7%	24,0%	4,9%	24,3%	46,4%	32,9%	21,7%	38,5%	20,1%	63,6%

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
SUMMARY	Total Gov, DBS, POS, CPF, MAS, BCCS	73.043,3	83.539,4	95.353,1	109.956,8	123.761,0	135.185,2	139.031,8	149.047,0	162.472,9	175.586,7
	of which primary sector	0,25%	0,13%	0,12%	0,13%	0,08%	0,07%	0,05%	0,04%	0,03%	0,03%
	of which Housing, Construction, Real Estate	20,5%	22,1%	20,9%	21,6%	24,9%	23,1%	21,5%	18,2%	16,5%	15,4%
	of which Manufacturing	2,5%	2,6%	1,9%	1,3%	1,0%	1,1%	1,2%	1,2%	1,0%	1,1%
	of which Services	13,1%	12,5%	12,3%	11,5%	10,7%	10,1%	9,8%	9,5%	9,4%	8,4%
	of which Overseas	29,8%	27,7%	27,6%	29,0%	27,0%	26,3%	26,4%	27,2%	29,9%	30,8%
	of which not able to allocate	55,4%	56,1%	57,6%	59,5%	61,7%	67,2%	69,4%	71,7%	74,2%	76,9%
	Total Gov ... as % of Tot. Gross Inv. Fund	28,6%	37,9%	33,3%	46,7%	40,6%	36,9%	11,1%	20,6%	26,8%	28,0%
Annual Flows	Total Gov, DBS, POS, CPF, MAS, BCCS	6.824,3	10.496,1	11.813,8	14.603,6	13.804,3	11.424,1	3.846,6	10.015,2	13.426,0	13.113,8
	of which Housing, Construction, Real Estate	3.271	3.524	1.450	3.782	7.059	395	(1.336)	(2.659)	(371)	172
	of which Manufacturing	73	(72)	(20)	(70)	(27)	0	88	67	45	48
	of which Services	1.367	867	1.315	845	648	327	70	512	1.022	(362)
	of which Overseas	2.166	1.379	3.208	5.600	1.443	2.238	1.039	3.910	8.018	5.475
	Not-Traceable (incl.Agri)	(54)	4.798	5.860	4.446	4.681	8.465	3.986	8.185	4.713	7.781
	Real estate as % of total flow	47,9%	33,6%	12,3%	25,9%	51,1%	3,5%	-34,7%	-26,5%	-2,8%	1,3%
	Manu	1,1%	-0,7%	-0,2%	-0,5%	-0,2%	0,0%	2,3%	0,7%	0,3%	0,4%
	Services	20,0%	8,3%	11,1%	5,8%	4,7%	2,9%	1,8%	5,1%	7,6%	-2,8%
	Overseas	31,7%	13,1%	27,2%	38,3%	10,5%	19,6%	27,0%	39,0%	59,7%	41,7%
	Not-Traceable (incl Agri.)	-0,8%	45,7%	49,6%	30,4%	33,9%	74,1%	103,6%	81,7%	35,1%	59,3%

Real Public Investments 1965-99

	in S$million (Stocks, end of period)	1992	1993	1994	1995	1996	1997	1998	1999
SUMMARY	Total Gov, DBS, POS, CPF, MAS, BCCS	195.347,2	221.417,0	241.126,8	269.311,1	300.319,2	340.690,4	403.396,3	453.334,9
	of which primary sector	0,02%	0,02%	0,02%	0,02%	0,01%	0,01%	0,01%	0,01%
	of which Housing, Construction, Real Estate	14,3%	13,0%	15,1%	16,0%	17,5%	19,6%	19,6%	19,9%
	of which Manufacturing	1,4%	1,5%	1,6%	1,5%	1,5%	1,8%	1,9%	1,6%
	of which Services	7,9%	7,2%	7,0%	6,8%	6,5%	6,5%	6,3%	5,4%
	of which Overseas	32,3%	31,9%	30,7%	30,7%	30,2%	29,1%	27,1%	25,2%
	of which not able to allocate	78,7%	77,8%	76,7%	76,3%	77,3%	76,3%	79,1%	79,7%
	Total Gov ... as % of Tot. Gross Inv. Fund	48,7%	50,1%	25,4%	36,0%	38,2%	40,2%	45,5%	48,8%
Annual Flows	Total Gov, DBS, POS, CPF, MAS, BCCS	19.760,5	26.069,8	19.709,8	28.184,3	31.008,1	40.371,2	62.705,9	49.938,6
	of which Housing, Construction, Real Estate	969	798	7.756	6.537	9.504	14.162	12.272	11.095
	of which Manufacturing	474	111	23	22	237	326	375	414
	of which Services	536	568	820	1.554	1.089	2.693	3.180	(965)
	of which Overseas	8.994	7.697	3.327	8.688	7.959	8.309	10.178	4.959
	Not-Traceable (incl.Agri)	8.788	16.896	7.785	11.382	12.219	14.882	36.700	34.435
	Real estate as % of total flow	4,9%	3,1%	39,3%	23,2%	30,6%	35,1%	19,6%	22,2%
	Manu	2,4%	0,4%	0,1%	0,1%	0,8%	0,8%	0,6%	0,8%
	Services	2,7%	2,2%	4,2%	5,5%	3,5%	6,7%	5,1%	-1,9%
	Overseas	45,5%	29,5%	16,9%	30,8%	25,7%	20,6%	16,2%	9,9%
	Not-Traceable (incl Agri.)	44,5%	64,8%	39,5%	40,4%	39,4%	36,9%	58,5%	69,0%

Real Private Investments 1965-99

	Constant 1990 S$dollars (after GDPdeflator) in S$million (Stocks, end of period)	Incr. 64-99	Overall	1964	1965	1966	1967	1968	1969	1970	1971
BANKS	Loans Agriculture	81,2	3.164	*87,3*	*85,6*	*84,1*	*82,5*	*81,0*	70,4	92,6	80,1
	Loans Housing & Construction	28.481,6	288.962	*41,8*	*54,5*	*71,1*	*92,6*	*120,7*	119,7	121,5	112,8
	Loans Manufacturing	4.118,0	142.420	*893,8*	*983,7*	*1.082,6*	*1.191,4*	*1.311,2*	937,4	1.576,0	1.569,7
	Loans Transport & Communication	240,1	15.755						0,0	(14,2)	(44,6)
	Loans General Commerce	13.077,2	323.709	*854,7*	*985,4*	*1.136,1*	*1.309,8*	*1.510,1*	1.566,4	1.658,9	1.909,1
	Loans Non-Bank Financial Institutions	14.035,6	158.502	*66,8*	*83,5*	*104,3*	*130,3*	*162,7*	163,4	184,1	324,5
	Loans Other Services	13.679,7	156.437	*268,5*	*305,5*	*347,6*	*395,5*	*450,0*	661,4	696,8	678,3
	Loans Others	2.012,1	57.071	*185,0*	*255,2*	*352,0*	*485,6*	*669,8*	588,7	1.963,0	2.167,9
	Fixed and Other Assets	10.526,2	83.783	*334,0*	*362,0*	*392,3*	*425,2*	*460,9*	*499,5*	362,7	471,7
	Overseas	76.511,5	694.248	*10,0*	*14,5*	*21,0*	*30,4*	*44,1*	*63,8*	227,4	233,1
	Non-gov Securities	2.879,7	59.260	*128,8*	*147,4*	*168,6*	*193,0*	*220,8*	*252,7*	283,0	367,6
	TOTAL COMMERCIAL BANKS (Excl. DBS)	165.642,6	1.983.311,3	*2.870,6*	*3.277,2*	*3.759,6*	*4.336,2*	*5.031,3*	*4.923,4*	7.151,9	7.870,4
	of which primary sector	0,0%	0,2%	3,0%	2,6%	2,2%	1,9%	1,6%	1,4%	1,3%	1,0%
	of which Housing, Construction	17,2%	14,6%	1,5%	1,7%	1,9%	2,1%	2,4%	2,4%	1,7%	1,4%
	of which Manufacturing	2,5%	7,2%	31,1%	30,0%	28,8%	27,5%	26,1%	19,0%	22,0%	19,9%
	of which Services (incl. Transp. & Comm.)	24,8%	33,0%	41,5%	41,9%	42,2%	42,3%	42,2%	48,6%	35,3%	36,4%
	of which overseas	46,2%	35,0%	0,3%	0,4%	0,6%	0,7%	0,9%	1,3%	3,2%	3,0%
	of which not able to allocate	9,3%	10,1%	22,6%	23,3%	24,3%	25,5%	26,9%	27,2%	36,5%	38,2%
	Total Banks as % of Tot. Gross Inv. Fund	13,6%			36,1%	30,8%	20,1%	15,1%	-2,3%	26,3%	6,9%
Non-Banks	Finance Companies' Housing Loans	2.931,3	43.444	*149,7*	*167,9*	*188,3*	*211,1*	*236,7*	*265,4*	222,5	291,4
	Finance Companies' Hire-Purchase/Lease Fina	3.749,2	54.998	*137,0*	*153,5*	*172,1*	*192,9*	*216,2*	*242,3*	239,6	293,7
	Merchants' Banks' deposits with Non-Sing Banl	4.182,6	62.474	*0,5*	*0,7*	*1,0*	*1,6*	*2,4*	*3,6*	*5,5*	*8,3*
	Finance + Insurance Companies' Domestic Sec	1.412,8	26.586	*76,2*	*86,6*	*98,4*	110,5	104,9	108,5	183,4	246,4
	Fixed and Other Assets	1.475,1	76.218	*85,4*	*104,6*	*128,2*	191,3	215,9	227,6	250,6	276,9
	TOTAL NON-BANK FIN INST.	13.751,0	263.719,6	448,8	513,3	587,9	707,3	776,0	847,4	901,6	1.116,7
	of which Housing	21,3%	16,5%	33,4%	32,7%	32,0%	29,8%	30,5%	31,3%	24,7%	26,1%
	of which Private Consumption	27,3%	20,9%	30,5%	29,9%	29,3%	27,3%	27,9%	28,6%	26,6%	26,3%
	of which overseas	30,4%	23,7%	0,1%	0,1%	0,2%	0,2%	0,3%	0,4%	0,6%	0,7%
	of which not able to allocate	21,0%	39,0%	36,0%	37,2%	38,5%	42,7%	41,3%	39,7%	48,1%	46,9%
	Total Non-Banks as % of Tot. Gross Inv. Fund	1,1%			5,7%	4,8%	4,2%	1,5%	1,5%	0,6%	2,1%