

**SOCIAL ACCOUNTING MATRICES AND COMPUTABLE
GENERAL EQUILIBRIUM MODELLING IN SOUTH
AFRICA WITH REFERENCE TO THE FINANCIAL
SECTOR**

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**Thesis submitted to meet the requirements of the degree PHILOSOPHIAE
DOCTOR in Economics in the Faculty of Economic and Management Sciences at
the Potchefstroom University for Christian Higher Education.**

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Potchefstroom

Mei 1993

ACKNOWLEDGEMENTS

A problem facing students of social accounting matrices and computable general equilibrium models is that they have to be a "Jack of all trades". Shoven and Whalley (1984:1047) point out that "[they] *must know general equilibrium theory so that their models have a sound theoretical basis; they must know how to solve their models; they need to be able to program; they must understand the policy issues on which they work; they have to know about data sources and all their associated problems; and they have to be conversant with the relevant literature.*"

The completion of this study thus required the assistance of a large number of friends, colleagues and acquaintances. Without implicating them, I wish to acknowledge with gratitude their contributions.

A special word of thanks is due to Professor Jan van Heerden for his assiduous support in his capacities as my supervisor and Head of the Department of Economics. I am grateful for the dedication and promptness with which he read and commented on earlier drafts of this study.

I am indebted to Professor Graham Pyatt, from the University of Warwick, for the stimulating conversations we had during the first semester of 1991, and also for unintentionally inspiring this study.

I thank Mr. Dirk Ernst van Seventer, from the Development Bank of Southern Africa, for his assistance with the compilation of the financial social accounting matrices and the interesting discussions we had on the applications of SAMs in South Africa.

I am grateful to Dr. Jeff Round, from the University of Warwick, for his helpful comments and suggestions on an earlier version of part of chapter 5.

SAMs and CGE models cannot be applied without knowledge of computers and computer software. In this regard I would like to thank Dr. Peter Brixen, from the University of Copenhagen, for his assistance with HERCULES and the interpretation of the experiments performed on HERCULES. I am also grateful to Professor Bill Gibson from the University of Vermont for his assistance and advice with TKSOLVER, as well as for his views on the necessity of having computing skills in economics.

Dr. David Demery, director of the Centre for Computing in Economics at the University of Bristol, likewise gave useful suggestions and advice on computer-related aspects.

Professor Lance Taylor, from the Massachusetts Institute of Technology, inspired the use of the Gap model in chapter 9. For this and for the stimulating discussions we have had on modelling in less developed countries I would like to thank him.

Chapter 4 benefited from comments by Professors Hasse Ekstedt and Tim Mount, respectively from the University of Göteborg and Cornell University.

I would like to thank Dr. David Porteous, from Yale University, for his suggestions on the role of money and finance in a regional context and for making available to me an unpublished paper of his in this regard.

I am grateful to my colleague Dr. Paul Styger for his useful suggestions on practical matters relating to the writing of a Ph.D. thesis.

Professor Shantayan Devarajan from the Kennedy School of Government, Harvard University, made useful suggestions (during a World Bank workshop in Johannesburg during July 1992) concerning the model in chapter 5.

I would like to thank the members of the Economics Trends Research Group for comments and suggestions on an earlier draft of chapter 9 during their biannual conference at the University of Cape Town, June 1992.

Mr. Dawie de Jongh and colleagues at the Industrial Development Corporation made useful comments on an earlier draft of chapter 5. For this and for their interest in my

work, as well as the opportunity to present some of the material in chapter 5 at a seminar on 30 November 1992, I am thankful.

I would like to thank Mr. Johan Geertsema, from the English Department at Potchefstroom University, for his assistance in editing my English spelling and grammar. A word of thanks is also due to Mrs. Engela van der Walt from the Ferdinand Postma library for her advice and comments on the format of the bibliography.

I am ever grateful to my parents for their love and support during my academic career, which started in January 1974 when they accompanied me to my first day at school. This study crowns the schooling process they initiated.

Finally, I would like to thank my wife, Valerie, for her support and patience in enduring many lonely evenings when I disappeared into the study, and for her help in printing and proof-reading the manuscript. I dedicate this study to her.

J.J.

Pagina crescere tibus crescat gloria Deo

Potchefstroom

May 1993

ABSTRACT

A significant challenge facing South African economists is the formulation of appropriate policies to redress the unequal distribution of income and wealth. In many other developing countries, a similar challenge has led to the use of Social Accounting Matrices (SAMs) and Computable General Equilibrium (CGE) models to give quantitative support in the formulation of income redistribution policies. A SAM can be defined as a numerical representation of the economic cycle with emphasis on income distribution. A CGE model can be defined as an economy-wide model that includes the interaction between demand, income and production structure, and where all prices are adjusted until decisions made in production are consistent with decisions made in demand. SAMs and CGE models are particularly well suited for analyses of issues such as income redistribution, since they impart a general equilibrium approach to analyses, as opposed to the traditional partial equilibrium approach.

A SAM and CGE culture is lacking, however, in South Africa. This is implied by the fact that almost 35 developing countries already had SAMs before South Africa did, that the most recent South African SAMs, for the year 1988, are "preliminary" and that applications of the SAMs are limited. One of the reasons noted for the limited use of the South African SAMs is their omission of the financial sector. Since South Africa is characterised by a "first world" economy alongside a "third world" economy, the interactions between the developed financial sector and the rest of the economy may be complex. Because these interactions could affect income redistribution policies they should be taken into account, preferably through a general equilibrium framework.

The primary objective of this study is to contribute towards a suitable framework for analysing income redistribution and growth in South Africa by extending the present South African SAMs to include the financial sector. The secondary objective of this study is to contribute towards establishing a SAM and CGE modelling culture in South Africa.

The primary objective is achieved by illustrating how the national financial accounts can be rearranged and incorporated into a SAM. This method is used to compile four different financial SAMs for South Africa. Two financial SAMs are for 1988 and contain only flow of financial variables, while the other two are for 1990 and contain both initial and end of the period stocks of financial variables in addition.

The secondary objective is achieved by first tracing the origins and development of SAMs and CGE models and arguing that SAMs and CGE models are a culmination of developments on respectively the inductive and deductive sides of economics. Second, the principles of SAMs are discussed and a basic SAM derived from fundamental economic principles. It is shown that a SAM represents the economic cycle, and is therefore suitable to serve as a consistent database for a CGE model. Third, South Africa's existing SAMs are critically discussed, and the results for income redistribution policies from simple CGE models based on these SAMs are presented. Fourth, it is shown how the South African SAMs can be used as a basis for an extended CGE model. Fifth, the SAMs' weakness of omitting the financial sector is illustrated by discussing the role of the financial sector in an economy. Special reference is made to the role of the financial sector in developing countries. This discussion also serves to determine the theoretical foundations of the national financial accounts and to determine the possible issues that can be investigated through a financial SAM. Finally a simple CGE model, based on a financial SAM, is used to investigate income redistribution policy in South Africa. The results are combined and

contrasted with those obtained from CGE models based on the existing South African SAMs. One contribution made by using a financial SAM is to warn of the danger of income redistribution policies turning into a "populist" experiment over the short term. The results also suggest that redistribution in South Africa should be a long-term strategy that should be accompanied by a better provision of education and a restructuring of the economy. Indications from the models on the form this restructuring can take are noted.

The most important issues identified as worthy of further research are the (i) construction of large, multi-sector models based on the financial SAMs; (ii) the provision of a comprehensive manual on compiling and using SAMs in South Africa; (iii) the compilation of a SAM for South Africa for 1990 that includes a distinction between rural/urban households; (iv) the construction of a "structuralist" CGE model for South Africa to be contrasted with the Walrasian, neo-classical models that were discussed in this study; (v) the compilation of updated real as well as financial SAMs for different regions in South Africa; (vi) the use of regional financial SAMs to investigate the effects of a "regional liquidity reserve" for banks; (vii) the compilation of more accurate data on the stocks of financial assets and liabilities owned by the major institutions in South Africa; (viii) the investigation of ways through which liquidity preference in South Africa could be lowered; and (ix) the investigation of the effects of diminishing the high degree of concentration in South Africa's financial sector.

It is concluded that although SAMs and CGE models are capable of providing fresh insights on policy options, they remain auxiliary instruments to assist policy makers, and cannot replace human ingenuity and compassion in the search for appropriate policies to redress the unequal distribution of income and wealth in South Africa.

SAMEVATTING

'n Uitdaging waarvoor Suid-Afrikaanse ekonome te staan kom is die formulering van geskikte ekonomiese maatreëls om die ongelyke verdeling van inkomste en rykdom aan te spreek. Soortgelyke uitdagings het in meeste ander ontwikkelende lande gelei tot die gebruik van Sosiale Rekening Matrikse (SRM) en Toegepaste Algemene Ewewig (TAE) modelle om inkomste herverdelings maatreëls kwantitatief te evalueer.

'n SRM kan vir doeleindes van hierdie studie gedefinieer word as 'n kwantitatiewe voorstelling van die ekonomiese kringloop met die klem op inkomste verdeling.

'n TAE model kan vir doeleindes van die studie gedefinieer word as 'n algemene ewewigmodel wat die skakel en terugvoer effekte tussen vraag, inkomste en produksie insluit, en waar pryse aanpas totdat vraag en aanbod in alle markte gelyk is. TAE modelle benodig 'n konsekwente databasis soos wat deur 'n SRM voorsien word.

In teenstelling met meeste ander ontwikkelende lande word SRMe en TAE modelle relatief min in Suid-Afrika aangewend om beleidsmaatreëls mee te evalueer. Een van die moontlike redes wat hiervoor aangevoer word, is dat die bestaande Suid-Afrikaanse SRMe nie die finansiële sektor insluit nie. Die finansiële sektor behoort in Suid-Afrika in ag geneem te word in die formulering van inkomste herverdelings maatreëls aangesien hierdie sektor ontwikkel is en die fondament van Suid-Afrika se "eerstewêreld" komponent is. Die bestaan van 'n ontwikkelde finansiële sektor te midde van armoede en

onderontwikkeling kan 'n beduidende rol in enige herverdelings en ontwikkelingsbeleid speel. Hierdie rol behoort binne 'n algemene ewewigsraamwerk ontleed te word.

Die primêre doelstelling van hierdie studie is om 'n bydrae te lewer om 'n geskikte raamwerk vir die evaluering van inkomste herverdelings maatreëls in Suid-Afrika daar te stel deur die finansiële sektor by die bestaande Suid-Afrikaanse SRMe in te sluit.

Die nuwe doelstelling van die studie is om 'n bydrae te maak om 'n SRM en TAE model - tradisie in Suid-Afrika te vestig.

Die primêre doelstelling word bereik deur 'n metode daar te stel waardeur die nasionale finansiële rekeninge herrangskik kan word en by die bestaande SRMe geïnkorporeer kan word. Die metode word gebruik om vier verskillende finansiële SRMe vir Suid-Afrika saam te stel. Twee van hierdie finansiële SRMs is vir 1988 en bevat slegs die vloei van finansiële bates en laste terwyl die ander twee vir 1990 is en ook die aanvanklike en eindsaldo's van finansiële bates en laste insluit.

Die nuwe doelstelling word bereik deur eerstens die oorsprong en ontwikkeling van SRMe en TAE modelle na te vors. Daar word geargumenteer dat SRMe en TAE modelle 'n samesmelting van ontwikkelinge op die induktiewe en deduktiewe gebiede van die ekonomie verteenwoordig. Tweedens word die beginsels onderliggend aan SRMe bespreek en 'n basiese SRM uit fundamentele ekonomiese beginsels afgelei. Derdens word die Suid-Afrikaanse SRMe krities bespreek, en die resultate van eenvoudige TAE modelle wat op hierdie SRMe gebaseer is, voorgehou. Vierdens word aangetoon hoe 'n SRM as basis vir 'n gevorderde, multi-sektorale TAE model gebruik kan word. Vyfdens word die tekortkoming van die SRMe om die finansiële sektor buite rekening te laat, in perspektief geplaas deur deur die rol van die finansiële sektor in 'n ekonomie te bespreek. Spesifieke

verwysing word gemaak na die rol van die finansiële sektor in 'n ontwikkelende land. Uit hierdie bespreking kom die teoretiese grondslae van die nasionale finansiële rekeninge ook na vore, en word 'n aantal onderwerpe geïdentifiseer wat met behulp van 'n finansiële SRM ontleed kan word. Laastens word 'n eenvoudige TAE model op een van die finansiële SRMe gebaseer en die effek van sekere inkomste herverdelingsmaatreëls op die Suid-Afrikaanse ekonomie gesimuleer. Die resultate word gekombineer en gekontrasteer met die wat op die bestaande Suid-Afrikaanse SRMe gebaseer is. Een van die bydraes wat deur die finansiële SRM gemaak word, is om teen die potensiaal dat 'n "populistiese eksperiment" in Suid-Afrika kan ontstaan, te waarsku.

Gesamentlik impliseer die resultate van die modelle wat voorgehou word dat inkomste herverdeling in Suid-Afrika hoofsaaklik oor die langtermyn behoort te geskied, en met groter verskaffing van onderwys en opleiding as wat tans die geval is, gepaard behoort te gaan. Die ekonomie behoort ook herstruktureer te word sodat inkomste herverdelingsmaatreëls tot ekonomiese groei aanleiding kan gee. Die wyses waarop die herstrukturering kan plaasvind, word aangedui.

'n Aantal onderwerpe word vir verdere studie geïdentifiseer, naamlik (i) die konstruksie van 'n multi-sektorale TAE model wat op 'n finansiële SRM gebaseer is; (ii) die skryf van 'n omvattende handleiding oor die samestelling en gebruik van SRMe; (iii) die samestelling van 'n SRM vir Suid-Afrika wat tussen landelike en stedelike huishoudings onderskei; (iv) die konstruksie van 'n "struktureel" TAE model vir Suid-Afrika; (v) die samestelling van streeks-finansiële SRMe vir Suid-Afrika; (vi) die gebruik van 'n streeks-finansiële SRM om 'n "streeks-likiedebate vereiste" vir finansiële instellings te evalueer; (vii) die insameling en publikasie van meer akkurate inligting omtrent die voorrade van finansiële bates en laste wat deur ondernemings, huishoudings en die owerheid besit word; (viii) 'n ondersoek na wyses waarop likiediteitsvoorkeur in Suid-

Afrika verminder kan word; en (ix) 'n ondersoek na die uitwerking van maatreëls om die hoë vlak van konsentrasie in die die Suid-Afrikaanse finansiële sektor te verminder.

Ten slotte word gestel dat, alhoewel SRMe en TAE modelle nuttige bydraes kan maak om insig in die uitwerking van ekonomiese beleidsmaatreëls te verskaf, hul slegs hulpmiddels in die formulering en evaluering van ekonomiese beleid is. Hul mag nie as plaasvervangers vir menslike oordeel in die formulering van beleidsmaatreëls om die ongelyke verdelinge van inkomste en rykdom aan te spreek, beskou word nie.

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"Mathematical definitions cannot be erroneous. For the conception is given only in and through the definition, and thus it contains only what has been cogitated in the definition"

(Immanuel Kant, *Critique of Pure Reason*, 1781, p. 419)

This chapter consists of five sections. In section 1.1 the reasons for undertaking this study are set out. In section 1.2 the objectives of the study are stated. Some concepts are defined in section 1.3. The research methodology is described in section 1.4. In section 1.5 an outline of the study is given.

1.1 MOTIVATION

A significant challenge facing South African economists is the formulation of appropriate policies to redress the unequal distribution of income and wealth. According to statistical measures of income inequality, such as the Gini-coefficient, South Africa has one of the most unequal income distributions of income in the world (Lachman & Bercuson, 1992:4). This led Shire (1992:1) to remark that "... the gross income and wealth disparities between black and white will remain through the 1990s and beyond, and will dominate the political debate irrespective of which party or parties govern and the nature of the political system".

The growing consensus in South Africa seems to be that the government would have to play an important role in the formulation of policies to redress the unequal distribution of income and wealth (Moll, 1991; Van der Berg, 1992:128; Shire, 1992:5). Bundy (1992:36-37) summarises this view by stating that "...state policy has been influential in entrenching inequalities - and in reducing others. Unless the future could somehow be

uncoupled from the past, state intervention and policies specifically concerned to redress historical inequalities will be *sine qua non* of a more equitable 'New South Africa'.

Ways in which the government can intervene to redress the unequal distribution of income and wealth have been the topic of many discussions in South Africa (e.g. Moll, 1990; Wilson, 1990; Moll et al., 1991; Natrass, 1992; Shire, 1992). Besides rectifying the unequal distribution of income and wealth from a moral point of view, it has recently been claimed that income redistribution in South Africa may be beneficial for economic growth (A.N.C., 1990). Commenting on this proposition, Moll (1991:314) states that "proponents of this strategy tend not to explain exactly where the envisaged growth through redistribution will come from. The conclusions are asserted but the mechanisms are not spelled out in detail".

Moll's criticism against the proponents of the growth through redistribution strategy can be generalised against most research on income distribution and growth issues in South Africa, because a rigorous and consistent framework to underpin the analyses are often missing. Iyengar and Porter (1990:2) share this view by maintaining that "most research into apartheid is political, sociological, historical or philosophical in nature; and what little there is about the economic implications is seldom quantitative". More recently Eckert et al. (1992:244) stressed that "the need for quantitative analysis of macroeconomic policy options and their distributional consequences is now greater than ever".

In contrast to South Africa, the need for quantitative analysis of income redistribution policies has given rise to increasingly sophisticated empirical models in many other developing countries (Bandara, 1991:3) These models are of a general equilibrium, as opposed to a partial equilibrium nature, since it is recognised that economies are complex systems subject to considerable interdependence between sectors. Income redistribution

policies might have significant feedback effects which should be taken into account together with the mechanisms through which they affect the economy (Devarajan, 1987:1).

During the 1950s and 1960s, when the emphasis was on expanding production and not so much on income distribution, input-output models were used in developing countries to analyse the interdependence between different economic sectors and to help promote balanced growth without bottlenecks (Drud & Kendrick, 1990:i). In the late 1960s and 1970s four developments caused developing countries to prefer computable general equilibrium (CGE) models to input-output models (Bandara, 1991:8). The first was a shift in policy orientation in less developed countries towards income distribution issues and basic needs. Second, Scarf (1967) developed a solution algorithm to solve for equilibrium prices in an applied model. Third, advances in computer technology and software facilitated the implementation of CGE models. Fourth, it was realised that econometric models may not be well-suited as analytical frameworks in developing countries because reliable data for long periods are often in short supply in these countries. Also, frequent changes in policy regimes may make econometric estimation in these countries subject to the Lucas critique (de Melo, 1988:217; Robinson & Roland-Holst, 1988:354; Wallis & Whitley, 1991:284).

CGE models require a consistent database, i.e. one that gives a consistent picture of production, income generation and income distribution, consumption, savings, investments, and foreign trade. The database must be disaggregated into several production sectors and commodities, several factors of production and several consumer groups, and must be consistent at the disaggregate level. The social accounting matrix (SAM) is such a database, and Braber (1990:1) states that "De belangrijkste databron voor een toegepast algemeen ewewichtsmodel is de SAM". Cohen (1988:253) declares

that SAMs have demonstrated their ability to analyse the underlying growth and equity properties of developing countries, while the CEAS (1986:13) point out that "one of the major concerns of the developers of social accounting matrices was to understand how the living standards of different economic groups were being affected, how these groups related to each other economically, and how individual standards of living influenced other economic phenomenon".

Despite the fact that four different SAMs exist for South Africa, the uses of these SAMs for analyses of income redistribution policies have been limited. This may point to the absence of a SAM and CGE modelling culture in South Africa (Brixen & Naudé, 1993:1). This conclusion is supported by the observation that more than 35 developing countries already had SAMs before South Africa (Cohen, 1987:93), and that the two most recent SAMs are designated "preliminary". Furthermore, the uses of the SAMs have until recently been limited to first generation CGE models. Moreover, these models have all been based on the 1978 SAM, the more recent SAMs being almost unused up to date¹.

Although the greater use of SAMs and CGE models in supporting analyses of income redistribution policies in South Africa has been called for (e.g. Roukens de Lange and Van Seventer, 1990, Van Seventer, 1990 and Eckert *et al.*, 1992), the limited use of SAMs in South Africa might be explained with reference to their shortcomings. Amongst these McGrath (1987) lists the absence of a distinction between rural and urban households and formal and informal activities in the SAMs. Recently Naudé (1993a) pointed to the absence of these SAMs to contain detailed information about the financial sector in South Africa as a shortcoming limiting the relevance of the SAMs.

¹ The exception is the CGE model of Brixen & Naudé (1993) which is based on a 1988 SAM.

Naudé's (1993a) criticism against the omission of the financial sector should be seen in the light of McGrath's (1987) criticism, which points to the duality in the South African economy. As such South Africa is often said to consist of a well developed "first world" sector alongside a less developed "third world" sector (Herbst, 1992:77-78). Any income redistribution strategy should take this duality into account since the existence of a first world sector could play an important role in the development and upliftment of the third world sector. If one considers that the financial sector is the core of South Africa's first world economy (Roux & Donaldson, 1992:504), then one has to determine what role this financial sector could play in economic growth and development.

The role of the financial sector in a developing country seems to depend on the stage of development the economy finds itself in (Patrick, 1966; Goldsmith, 1969; Gupta, 1984; Chick & Dow, 1988). During the early stages of development the financial sector can be supply leading, i.e. stimulate economic growth and development by allowing investments to be undertaken more efficiently and by encouraging a switch in savings from unproductive to productive assets (Roubini & Sala-i-Martin, 1992:16-17). During the latter stages of development, as the financial sector becomes more sophisticated and powerful - and also more concentrated (Chick & Dow, 1988) - it may either facilitate economic growth and development, or it may be destabilising (Minsky, 1982).

Given the duality of the South African economy the conclusion can be made that the encouragement of South Africa's financial sector, especially in the less developed areas, may have supply-leading effects; however, given the developed nature of the South African financial system, and its degree of concentration, it may also be destabilising (Porteous, 1991). A general equilibrium framework is needed to take this complex interaction between the real and the financial sectors in South Africa into account.

Traditionally developing countries have made use of the national financial accounts to quantitatively analyse the influence of financial policies (Roe, 1985:70). By themselves, however, the national financial accounts reflect only the financial side of the economy. Subsequently uses of the national financial accounts have been limited (Meiselman, 1967). The South African national financial accounts can also be considered under-utilised. Amongst the descriptions given by Uys (1991) of the potential applications of the national financial accounts, none refers to economic growth and development.

From the preceding discussion a case can be made out for the extension of the South African SAMs to include the financial sector. This may allow income redistribution strategies in South Africa to be analysed through CGE models. By using the national financial accounts to extend the South African SAMs, better use may be made of South Africa's available statistics, and a SAM and CGE modelling culture may be encouraged in South Africa.

1.2 OBJECTIVES

The primary objective of this study is to provide a framework for analysing income redistribution and growth in South Africa by extending the present South African SAMs to include the financial sector. This objective will be reached by

- (i) Critically evaluating South Africa's present SAMs;
- (ii) Determining the role of the financial sector in the economy in order to determine the best way this sector can be included in a SAM ; and

- (iii) Illustrating a methodology whereby the national financial accounts can be used as a basis for a financial SAM.

The secondary objective of this study is to contribute towards establishing a SAM and CGE modelling culture in South Africa. This objective will be reached by

- (i) Discussing the principles and compilation of SAMs;
- (ii) Presenting evidence on income redistribution from analyses with South Africa's existing SAMs;
- (iii) Showing how a financial SAM can be used as a basis for a CGE model in South Africa.

1.3 CONCEPTS AND DEFINITIONS

For purposes of this study income redistribution can be defined as "a process whereby command over goods and services is transferred from one group of persons to another with or without the quid pro quo of exchange" (Collard, 1980:3). This definition stresses the dynamic nature of distribution as a process rather than a one-off event.

A SAM can be defined as a numerical representation of the economic cycle with emphasis on income distribution (Keuning & de Ruijter, 1987:71). A SAM extends the Leontief input-output tables into the general scheme of a country's national accounts. A SAM is a square matrix which resembles an "oversized chess board" (King, 1985:17) where incomes

of different institutions and activities are collected along the rows and the expenditures down the columns.

A financial SAM can be defined as a SAM with emphasis on the financial institutions transacting on the money and capital markets in different financial assets and liabilities. Data on these financial institutions and their transactions can be obtained from the national financial accounts.

The national financial accounts can be defined as "one component of the national accounts system, which shows the financial transactions between broad sectors of the economy, thus linking the savings and investment aggregates" (Bain, 1973:1055). According to Uys (1991:6) the purpose of the national financial accounts is to reflect "the financial flows generated by the surplus units seeking appropriate investment outlets, including those provided by the opportunity of financing the activities of the deficit units with their insufficient savings".

Cohen (1987:93) states that the objective of a SAM is twofold, namely to organise information of an economy and to form the basis for economic modelling.

With modelling is meant an organised set of relationships that describes the functioning of an economic entity under a set of simplifying assumptions (Todaro, 1971:6). Because a SAM represents the economic cycle, it is a suitable database for a CGE model.

A CGE model explore the interactions among economic agents making decentralised decisions (Bovenberg & Goulder, 1991:187). According to Dervis *et al.* (1982:132) a CGE model can be defined as an economy-wide model that includes the interaction

between demand, income and production structure, and where all prices are adjusted until decisions made in production are consistent with decisions made in demand.

CGE models follow the Walrasian general equilibrium approach. Braber (1990:3) state that "Het model is in de Walrasiaanse traditie : prijzen, lonen en wisselkoers zijn flexibel en er is ruiming op alle markten. Daarnaast worden alle instituties door dezelfde gedragsvergelijking beschreven". Shoven and Whalley (1984:1007) clarify the difference between the theoretical Walrasian approach and CGE models by stating that " ...the explicit aim [of CGE models] is to convert the Walrasian general equilibrium structure from an abstract representation of an economy into realistic models to evaluate policy options by specifying production and demand parameters and incorporating data reflective of real economies". In practice CGE modelling boils down to the use of numerical procedures for recomputing a SAM for a given economy when the system is perturbed by some exogenous shock or policy change (Taylor, 1992:27).

Thorbecke (1985) distinguishes between first generation and second generation CGE models. First generation are linear, demand driven models in the input-output tradition, and assumes prices to be fixed. Second generation models are price flexible, nonlinear models which allow for substitution effects in production.

1.4 RESEARCH METHODOLOGY

This study makes use of a literature survey and empirical research to achieve the objectives.

A literature survey is used to derive the principles of social accounting and to show how a SAM can be derived from basic economic principles. A survey of the literature on South

African SAMs and their application forms the basis of the criticism against the present South African SAMs. The literature on the role of the financial sector are surveyed to obtain guidelines for incorporating the national financial accounts into a SAM, and also to obtain guidelines for using a financial SAM for CGE modelling purposes.

Empirical methods are used to compile a financial SAM for South Africa and to use this SAM as the basis for a CGE model. Describing these methods is one of the ways in which the primary objective of the study are achieved. The financial SAMs are compiled using computer software such as Quattrro Pro and Excel for Windows. A CGE model based on the financial SAM is implemented through the computer software TKSOLVER.

1.5 OUTLINE OF THE STUDY

In chapter 2 the origins and historical development of SAMs and CGE models are traced. Starting with the contributions of William Petty and Gregory King, and tracing the development through the contributions of Walras and Leontief, it is shown that the historical development of SAMs and CGE models are related, and that the use of SAMs as bases for CGE models represents a convergence of developments on respectively the deductive and inductive side of quantitative economics. Special attention is given to input-output tables and input-output models, since they can be seen as the first empirical application of general equilibrium theory. Moreover, input-output models are still being used as bases for SAMs.

In chapter 3 the link between input-output tables and SAMs are further emphasised. It is argued that in a similar way that the requirements of input-output tables led to the 1968 System of National Accounts (SNA), the development of SAMs is giving rise to the revision of the present SNA. To illustrate the role of SAMs in the national accounts,

SAMs are defined and the objectives of SAMs are discussed. It is shown how a SAM format can be derived from fundamental economic principles. Eight basic steps for compiling a SAM are discussed, and the way in which a SAM can be used for multiplier decomposition is set out.

The existing South African SAMs are critically evaluated in chapter 4, and the need for a financial SAM stressed. There exists four SAMs for South Africa : two for 1978 which were compiled by the Central Economic Advisory Service and two for 1988, compiled by the Development Bank of Southern African and the Central Statistical Services. Lessons from first generation CGE models based on these SAMs are discussed against the background of the current structural distortions in the South African economy. In chapter 5 it is shown how the South African SAMs can be used as a basis for a second generation CGE model. The limitations of CGE modelling are identified. The results from such a CGE model of the South African economy are contrasted with that of first generation models. Through these results, the lack of a mechanism in the existing SAMs of detailing the interactions between the real and financial sectors , is reiterated.

Because the construction and use of financial SAMs cannot be separated from role of the financial sector in an economy, this role is discussed in chapter 6. Since South Africa is a developing country, the role of money and finance in economic development is emphasised. The implications of financial sector development for economic stability and regional development are also discussed.

In chapter 7 the national financial accounts are discussed. This is necessary because these accounts are the primary tool that has been used in the past by developing countries to quantify the influence of the financial sector on the economy. After defining and describing the origins of the national financial accounts and their contributions to economic theory,

the traditional applications of the national financial accounts are detailed. Subsequently a novel application of the national financial accounts in South Africa is proposed, namely to serve as the basis for a financial SAM. To serve as such a basis, it is argued that the national financial accounts should be rearranged into a sector-claim format. Because this format is a square matrix, and contains vectors of savings and investment through which it can be linked to the real sector, the national financial accounts can be integrated into a financial SAM.

The methodology outlined in chapter 7 is used in chapter 8 to compile four different financial SAMs for South Africa. These include a simple financial SAM for 1988, designated "simple" because it contains only the flows of financial variables. Furthermore, an institution by institution financial SAM for 1988 is compiled in which provision is explicitly made for income distributional issues to be investigated by distinguishing between low-skilled and high-skilled households. The remaining two financial SAMs are both for 1990, and both contain initial and end of the period stocks of financial assets in addition to the financial flows. Compiling these SAMs necessitated the making of a number of assumptions.

In chapter 9 an application of the financial SAMs is illustrated through a simple CGE model for the South African economy. The model is related to the gap models popularised by Chenery and Strout (1966). Two experiments are performed with this model, namely the imposition of a social wage as part of an income redistribution programme, and an adverse external shock to the South African economy through an increase in foreign interest rates. The results from these experiments are compared to the results from the models reviewed in chapter 4 and 5. It is pointed out that the contribution of including the financial sector is that the inflationary effects of an income redistribution policy can be determined. This warns that the potential of income redistribution to degenerate into a

populist experiment in South Africa should be taken seriously. Finally, the results from this model is combined with those of early chapters to gather that income redistribution in South Africa should be of a long-term nature and should be accompanied by restructuring the economy. According to the SAM-based models discussed in this study, this restructuring should involve (i) expanding South Africa's exports of manufactured goods, (ii) diminishing South Africa's dependence on imported intermediate and capital goods and (iii) increasing the effectiveness of government involvement in the economy through political deregulation. It is suggested that although the SAM-based approach has limitations, it may be fruitfully applied to investigate the mechanisms through which this restructuring will effect the economy.

The results of the study are summarised in chapter 10.

THE ORIGINS OF SOCIAL ACCOUNTING AND COMPUTABLE GENERAL EQUILIBRIUM MODELLING²

2.1 INTRODUCTION

CGE models need for their implementation a consistent database. Such a database is provided by the SAM. The historical development of CGE models and SAMs are thus related. The purpose of this chapter is to give an overview of the origin and historical development of CGE models and SAMs. This overview is necessary to illustrate that CGE models and SAMs lie "at the heart of economic science" (Rutten, 1991). Furthermore, SAM-based CGE models represent a convergence of two strands of quantitative developments in economics, and as such represent a culmination of the "mathematisation" of economics (Debreu, 1990). The first strand of quantitative development of economics are developments on the deductive side of economics such as the mathematical theories of general equilibrium of Walras, von Neumann, and Arrow-Debreu. The second strand of quantitative development are developments on the inductive side of economics, such as social accounting, econometrics and statistics.

Because SAM-based CGE models represent a culmination of the mathematisation of economics it is imperative that economic policy makers in South Africa take note of the historical achievements of social accounting and CGE modelling. Such knowledge may have the effect of (i) diminishing the prejudice against mathematics of the politicians

² An abridged version of this chapter was published in *Development Southern Africa* (see Naudé, 1993a).

responsible for policy implementation (Naudé, 1993a) and (ii) prevent policy makers in South Africa from "falling behind the state of the art in that they continue to use obsolete models simply because they have not kept up with the quickly advancing theory" (Mankiw, 1988:438).

In section 2.2 Petty and King's contributions in compiling the first SAMs are discussed. In section 2.3 Quesnay's Tableau Economique is shown to have been one of the first macroeconomic models to be based on the circular flow of income. Walras's contribution to economic modelling is discussed in section 2.4 after which its empirical application through Leontief's input-output tables is set out in section 2.5. Because input-output tables form the bases of SAMs, and because SAMs have been seen in some quarters as an extension of input-output tables (Robinson, 1989) reference is made in section 2.5 to the South African input-output tables. In section 2.6 the development of second-generation CGE models is described. The chapter concludes with a summary.

2.2 WILLIAM PETTY AND GREGORY KING

Sir William Petty (1623-1687) gave the first known estimates of what may be called social or national accounts in "Verbum Sapienti" (Basson,1991; Schachter,1991:317). This set of social accounts is presented in table 1.

Table 1: William Petty's estimates of the English economy, 1664 (millions of Pounds)

INCOME		EXPENSE	
From land	8	Food, Housing, Clothes	
From other personal estates	7	and all other necessities	40
From the labour of the people	25		
TOTAL	40	TOTAL	40

(Source : Stone, 1985:7)

From table 1 can be seen that Petty's figures were limited to a number of basic magnitudes. Expenditure consist of expense for food, housing, clothes and all other necessities. Petty estimated total expense to be equal to 40 million pounds for the population of Wales and England, which was estimated at 6 million. On the income side Petty estimated the income from land to equal 8 million pounds and the income from personal estates to equal 7 million pounds. Applying the "only fundamental law of economics" (Pyatt,1988:328), namely that for every expenditure there exists a corresponding income, Petty balanced his national accounts be deducing that the labour of the people had to supply 25 million pounds of income.

One of Petty's followers was Gregory King (Stone, 1986:7). King's contribution was his accounts for income, expenditure and saving for England in 1688. King disaggregated these accounts into 26 social classes ranging from temporal lords to vagrants. A version of this table is presented in Appendix A on page 271.

King's aim in compiling these accounts was to calculate the contribution of the various groups in society to national wealth. Appendix A can be used to deduce that just less than half the population, with a combined income of 34.5 million pounds saved, thereby increasing the wealth of the nation. In contrast, more than half of the population, with a total income of 9 million pounds dissaved, thereby decreasing the wealth of the nation.

King also used these accounts to make a comparison of the English economy with the French and Dutch economies. From this he observed that savings in all three countries declined during wartime. King projected his estimates to 1698 and concluded that due to a lack of funds the war could not continue beyond that date. King was proven to be correct: the War of the League of Augsburg ended in 1697 (Stone, 1986).

While Adam Smith did not agree with Petty and King's quantitative approach to economics, Richard Cantillon and Francois Quesnay adopted, expanded and refined the approach. Cantillon believed that the basis of any science must be numerical. Yet, Cantillon failed to organise his thoughts into a coherent system as Quesnay finally did (Schumpeter, 1954: 217-218).

2.3 FRANCOIS QUESNAY

Between the contributions of Petty and King and the contribution of Quesnay, only sporadic attempts were made to improve social accounting. The most important were by Pierre de Boisguillebert and Marshal Vauban who published estimates of the national income of France to support their contention that the French tax system was injurious to the welfare of the country³ (Stone, 1986: 9).

A conceptual innovation in social accounting was made by Francois Quesnay (1694-1774), Louis XV's physician, in 1758. This was the *Tableau Economique*, which is now regarded as the beginning of the analysis of intersectoral flows. Schumpeter (1954:242)

³ These developments were subsequently suppressed by the French King Louis XIV. It is a testimony to the relevance of social accounting for human society that social upheavals could have been predicted through an analysis of the social accounts. In addition to de Boisguillebert and Vauban's insights into the pre-revolutionary French system one thinks of King's prediction of the sustainability of the War of the League of Augsburg. In modern times Pyatt warned in the early 1970s about a coming revolution in Iran from an analysis of Iran's social accounts (Pyatt, 1991).

sees the Tableau as the first method ever devised to convey an explicit conception of the nature of economic equilibrium, while Leontief (1941:9) introduces his own input-output table for the United States by explicitly recognising the similarity between his method and that of Quesnay. Quesnay can therefore be considered the first economic model builder (Finkelstein & Thimm, 1973:191).

Because the Tableau satisfied the circular flow of income, Phillips (1955) re-arranged the Tableau to illustrate that it was the first square SAM. The Tableau in SAM format is presented in table 2.

Table 2: The Tableau Economique in SAM format

	PURCHASING FARMERS	INDUSTRY PROPRIETORS	ARTISANS	TOTAL
FARMERS	2	1	2	5
PROPRIETORS	2	0	0	2
ARTISANS	1	1	0	2
TOTAL	5	2	2	

(Source : Phillips, 1955:141)

From table 2 can be seen that Quesnay distinguished three classes in society, namely a productive class consisting of farmers, a proprietor class consisting of rent receiving landowners and a class of artisans consisting of those engaged in manufacturing and commerce. According to the Physiocratic school of which Quesnay was a member, only farmers could produce a surplus over cost.

Table 2 can be interpreted in the same way as any SAM : farmers produce a total of 5 milliards, two of which they keep. One milliard is sold to proprietors and another 2 milliards is sold to artisans. Farmers purchase the two retained milliards of their own goods, two milliards of rental services from proprietors and one milliard of goods from

artisans. Proprietors produce 2 milliards of rental services, all of which is sold to farmers. Artisans produce two milliards of goods, half of which is purchased by proprietors and half to farmers.

Table 2 point to the fact that the Tableau Economique was devised as a tool by Quesnay to quantitatively indicate how the productive process flow creates a gross national product that is distributed to various classes; the Tableau can thus be seen as the first attempt to analyse income distribution (Finkelstein & Thimm, 1973: 192).

The Tableau preceded a important part of modern economics. In the Tableau, for the first time, an abstract model is created that takes the system's output for granted, but tries to analyse its structure and behaviour. As long as the input-output flows continues, this self-regulating system will always reach the equilibrium (steady-state) position at the end of the production period. System disturbance could either be introduced by authoritarian interference with the self-regulatory nature of the economy or by the unwillingness of one sector to consume the amount of money necessary to absorb the entire output. Thus Quesnay preceded Keynes in anticipating the destabilising effects of underconsumption. Quesnay also preceded Adam Smith and Karl Marx in realising that in order to break the status of a feudal society, it is necessary to have capital accumulation in agriculture (Schumpeter, 1954:243). Finally, Quesnay preceded Leon Walras by marking the beginning of general equilibrium theories (Eltis, 1975:167).

2.4 LEON WALRAS

In 1874 Walras published a book entitled *Elements de economie politique pure*. While Quesnay had perceived the essential interrelatedness of households, firms, prices of final goods, prices of factors of production and of quantities supplied and quantities demanded

of all final and intermediate goods, Walras was the first to express this perception as a concise system of simultaneous equations (Finkelstein & Thimm, 1973:197). Walras can therefore be said to have made the transition for partial to general equilibrium analysis (Miernyk, 1965:5).

Walras' general equilibrium model assumes a market economy made up of households and firms with no government or foreign sector. Walras recognises that each household enters the market as both consumer and a supplier of production factors. Thus, because of the typical classical assumption of full employment that Walras followed, a constant flow exists between households and firms, in the manner first postulated by Quesnay. In an economy where money is merely a commodity used as an accounting standard, the total value of all goods demanded must be identical to the total value of all goods supplied, or the total amount earned by households in supplying the factors of production must equal the total demand for consumer goods. This statement is known as Walras Law, and is merely an extension of Say's Law, which states that supply must create its own demand.

There are two properties peculiar to all Walrasian general equilibrium models which should be noted, since they occur in all modern CGE models. The first property is that in a Walrasian general equilibrium model it is not possible to determine the absolute price level, due to the fact that all the supply and demand functions of the economy is homogeneous of degree zero. To obtain relative prices, one price in the economy is arbitrarily set equal to one. The good with price set equal to one is known as the numeraire, and all other prices are expressed as a proportion of this price (Dinwiddy & Teal, 1988:21).

The second property of Walrasian general equilibrium models has already been mentioned, namely Walras' Law. Walras' Law states that for a given set of prices, the sum of the

excess demands over all markets must be equal to zero. This implies that if there are n markets and $n-1$ are in equilibrium, then the n^{th} market will automatically also be in equilibrium. Dinwiddie and Teal (1988:28) presents a simple BASIC computer program which can be used to solve the above model and illustrate the properties of the Walrasian system.

Although Walras' accomplishment is important for economics, there are a number of areas in which his model are deficient. Walras was not able to demonstrate that an economically meaningful solution existed for his model. He relied on the fact that the unknowns and number of equations in his model were equal to deduce the existence of an equilibrating price vector. Also, Walras was not able to prove that a single stable equilibrium solution would follow. Furthermore he was not able to prove that the model is determinate, i.e. that the final equilibrium reached would be independent of the path followed in reaching that equilibrium. Moreover, in *tatonnement* the specification of an initial condition is necessary in order to determine the path that an economy follows to a particular equilibrium. Gale (1955) and Scarf (1973) showed that this process of *tatonnement* may not converge. Finally, Walras never gave cost, supply or the economics of the firm serious attention. On this point Walras followed Jevons and Menger, with their almost exclusive emphasis on marginal utility as the major force determining relative prices. It should be stated, however, that Walras' model were an improvement over the theory of value held by classical economists like Smit, Ricardo, Mill and Marx, where prices were driven by the cost of production. This is because Walras incorporated demand into the theory of value and took into account the relationship between markets (Duffie & Sonnenschein, 1989:575).

Walras' contribution was in laying the solid foundation for the development of economics on its deductive side (Debreu, 1990). Furthermore, Walras made the transition from partial to general equilibrium. Walras' interest was not limited however, to the general equilibrium of exchange; he was also interested in the general equilibrium of production. In his general equilibrium model he made use of coefficients of production, which measured the quantities of factors required to produce a unit of each kind of finished good. As such Walras' model showed the interdependence among the the producing sectors of the economy, and the competing demands of each sector for the factors of production. In this Walras was the immediate predecessor of Leontief. (Miernyk, 1965:5).

2.5 Wassily Leontief

Between Walras' general equilibrium model and Leontief's input-output table not much advance in modelling was made (the existence of an equilibrating vector for a general equilibrium remaining unproven). Finkelstein and Thimm (1973:207) ascribes this to the fact that the Walrasian theory seemed overtly abstract and mathematical, with little apparent practical relevance for applied economics. There was however, an improvement in the national income data and statistics of many countries. In 1937 Colin Clarke brought together estimates of income, output, consumer's expenditure, government revenue and expenditure, capital formation, saving, foreign trade and the balance of payments for the United Kingdom. Clark was the teacher of Richard Stone at Cambridge, and inspired Stone and Meade to publish estimates of the British national income and expenditure in 1941 (Stone, 1986:11). Later Stone initiated the Cambridge Growth Project for the British economy. The Cambridge Growth Project led to the United Nations System of National Accounts (SNA) in 1953. Under the influence of Leontief's input-output tables, this SNA was revised in 1968. Currently, the SNA is revised again, this time under the influence of CGE modelling. The aim of the revision is to enable countries to organise their national accounts data in the form of SAMs. The SNA and its relationship with SAMs and CGEs is discussed in chapter 3.

Leontief used the improvements in data availability to create an empirical general equilibrium model based on input output tables. Leontief wanted a empirical general equilibrium model to answer the following question (Leontief, 1941:2) : "How will the cessation of war purchases of planes, guns, tanks and ships - if not compensated by increased demand for other types of commodities-affect the national level of employment?" Leontief presented the theoretical framework for input-output models in 1936, and the first input-output table for the US economy in 1941 (Leontief, 1941).

Additional developments in Leontief's model are presented in Leontief (1953), Leontief and Strout (1963), Leontief (1966) and Leontief (1974). In general terms, the purpose of input-output modelling is to determine what repercussion a change in the level of production in one sector of the economy will have on all other sectors. Chenery and Clark (1959:1) defined input-output analysis as follows : "Input-output economics is concerned with quantitative analysis of the interdependence of producing and consuming units in a modern economy. In particular, it studies the interrelations among producers as buyers of each other's output, as users of scarce resources, and as sellers to final consumers".

2.5.1 Principles of input-output modelling

Today, input-output tables are a central building block of SAMs, and input-output type models, based on input-output tables and SAMs, have been the most frequently used general equilibrium models in South Africa to date. These are discussed in chapter 4. All users of SAMs and CGE models therefore need to have a knowledge of the fundamental aspects of input-output tables, such as their compilation, data sources, interpretation and possible uses. These aspects are discussed below. Special reference is made to the compilation, interpretation and data sources of South Africa's input-output tables.

The basic principles of input-output tables and models may be illustrated with reference to a hypothetical input-output table such as is presented in table 3 :

Table 3 : A hypothetical input-output table (R millions)

Input from	Output to	Intersectoral Demand			Final Demand	Total Output
	Agriculture	Mining	Other			
Agriculture	1	4	2	1	8	
Mining	4	2	2	4	12	
Other	2	2	2	2	8	
Value added	1	4	2			
Total input	8	12	8		28	

From table 3 can be seen that each row in the input-output table shows the distribution of the output of a particular production activity to other production activities, i.e. intermediate input and to final demand. Final demand consist of of private consumption expenditure, government expenditure, investment demand and inventory changes and exports. Each column shows the value of each production activity's use of raw materials, semi-finished goods and services, i.e. intermediate inputs obtained from other production activities, and gross value added, which in table 3 is assumed to consist only of the remuneration of labour, but may in practice also include the gross operating surplus of firms. Indirect taxes net of subsidies is also usually shown in these rows. In table 3, the mining sector's output is equal to Rm 12. This output is sold as intermediate inputs to agriculture (Rm 4), other mines (Rm 2) and also to other industries (Rm 2). Final use of mining products equal Rm 4. In order to produce this Rm 12 of mining output, mines need intermediate inputs to the value of Rm 8, while value added equals Rm 4 payed in salaries and wages to labour.

In table 3, the matrix defined by rows and columns 1-3 is known as the input-coefficient matrix. This matrix shows the input of the i^{th} commodity needed to produce one unit of the j^{th} commodity (in accordance with the general practice in matrix algebra the i -subscript will refer to the rows of a matrix and the j -subscript to the columns). Thus, if the input coefficient matrix is denoted by A with cell entries z_{ij} , and the total output of sector j by that sectors column sum by Y_j , then the input coefficients a_{ij} can be obtained as follows :

$$(2.1) \quad a_{ij} = z_{ij}/Y_j$$

In case of table 3, the matrix A of input coefficients can be written as :

$$(2.2) \quad A = (a_{ij}) = \begin{pmatrix} 1/8 & 4/8 & 2/8 \\ 4/8 & 2/8 & 2/8 \\ 2/8 & 2/8 & 2/8 \end{pmatrix}$$

Thus the matrix of input-coefficients indicates that for one Rand's value of agricultural output, 12.5 cents of inputs from agriculture, 50 cents from mining and 25 cents from other industries are needed. The input-output table can be written in mathematical notation as

$$X = AX + F$$

where

F = the column vector of final demands.

In the present case $F = \begin{bmatrix} 1 \\ 4 \\ 2 \end{bmatrix}$

To use this input-output table for modelling some restrictive assumptions are needed. These are that the input-output coefficients stays constant, that production decisions do not depend on prices and that no supply bottlenecks will arise. It should be noted that Leontief precluded many of the adjustments characterising the Walrasian concept of general equilibrium. Leontief for instance reduced all effects of price on consumer demand, intermediate demands and on the supply of production factors, because the existence of a market-clearing price vector could not yet be proven. From table 3 can be seen that Leontief also reduced the dimensionality of Walras' model by aggregating firms and consumers into economic sectors. The interdependence of economic activity is now expressed by an input-output matrix which shows the flows of sector outputs alongside the rows to other industries where it is needed as intermediate demands in the production process, and to final consumption by government, households, investment demand and net export demand. The flows of sector inputs is shown down the columns as intermediate inputs plus payments for factor services. Input-output models assume consumption and investment as given; this further reduces the Walrasian model to a model that focusses on production (Finkelstein and Thimm, 1973:207).

2.5.2 Sector disaggregation in the input-output table

In the hypothetical input-output table of table 3, only three production activities are distinguished. In actual input-output tables the number of production activities distinguished are determined by the statistical data available and the analytical uses for which it is required (CSS, 1978:23). The South African input-output tables identify 93 production activities, of which 77 belong to manufacturing. According to the Central Statistical Services (CSS, 1978:22-23) there is no ideal size of the table. The more production activities that are distinguished, however, the greater is the possibility that

inconsistencies in the basic statistics used in the compilation will be exposed. This knowledge can then be used to improve the statistics (CSS, 1978:23). The classification of industries is based on the Standard Industrial Classification of all economic activities (SIC), which is prescribed by the United Nations (UNSO, 1968). The unit for classification of production activities is the establishment, as defined in CSS (1978:23).

It should be clear that, because 77 of the 93 production activities identified in the input-output table relate to manufacturing, the table may be seen as biased in favour of manufacturing. This ignores the growth in importance of tertiary production activities in South Africa over the past two decades. Furthermore, by reflecting agriculture as a single production activity ignores the possibility that a large number of production activities in manufacture depend on agriculture both as a source as well as a destiny of intermediate production. In this regard Davis and Goldberg (1957) refers to agribusinesses which includes firms that supply and process agricultural commodities. In order to undertake any meaningful analysis of agribusinesses it may be necessary to disaggregate agriculture to highlight its diversity to allow compatibility with the already disaggregated food processing activities. Attempts by Faux (1990), and the recent agricultural input-output tables for South Africa (RSA, 1992), are encouraging steps in this direction. On a worldwide scale however, the focus of input-output accounts on production activities (to the detriment of humans and their living standards) has led to a decline in the popularity of input-output analysis, and has led to the adoption by more countries of SAMs (Pyatt, 1989:4).

2.5.3 Sources of data

In the previous section it was mentioned that the level of disaggregation and detail contained in the input-output model is partly determined by available statistics. This

section describes the data sources used for compiling the South African input-output tables.

The most important source used to compile the South African input-output tables, is the census of economic production activities. Although census data may not necessarily relate to the relevant input-output base year, they are usually converted to the appropriate calendar year (Van Seventer, 1991:1). For agriculture, the results of agricultural censuses of the CSS are supplemented with data obtained from the sample surveys and cost studies of the RSA Department of Agricultural Economics and Marketing (CSS, 1978:26-27). The main source for mining is the census of mining of the CSS and the survey of stores consumed by large mines for operating and capital purposes available at the RSA Department of Mineral and Energy Affairs (CSS,1978:27). The manufacturing census covers, inter alia, detailed particulars of "materials purchased" and "manufactured articles" sold for a large number of manufacturing subactivities, which are aggregated into 77 input-output subactivities (CSS,1978:27).

Another important source used for input-output tables is the census of wholesale and retail trade of the CSS from which the trade margins are calculated separately for the wholesale and retail trade. A similar approach is followed to determine transport margins. In this case the SA Transport Services supplies the details.

The macroeconomic information contained in the South African input-output tables is in principle compatible with the national accounts published by the Reserve Bank. For example, the sum of the row totals of final demand is equal to the sum of the column totals of the primary inputs, which is in turn equal to gross domestic product. Other control totals such as value added of the main production activities may differ slightly, due to the CSS's conversion of information from financial to calendar years (CSS,1978:28-29).

Furthermore, unlike the national accounts the input-output tables do not include adjustment for inventory valuation since it is impossible to obtain a breakdown of this item according to production activities.

From the above discussion it can be seen that input-output tables in South Africa are currently only compiled from the input side, with the output side subsequently derived from these inputs. An alternative way of constructing input-output tables is to collect industrial data according to not only an industry account but also according to a commodity account. This method has the advantage of allowing secondary production activities to be considered. If there are no secondary production in a particular industry, then the industry and commodity accounts will give identical estimates (Miller & Blair, 1985:160). Using commodity accounts may also enhance the accuracy of the compilation of the South African input-output table since the censuses of the various production activities which are used as a source of information are more likely to show commodity inputs and commodity output rather than inputs from and outputs to other production activities. A separate commodity account would show the destiny of output of a production activity in terms of commodities, and could therefore serve as a cross check to the input structure that is determined in the usual way.

Although the size of the input-output table will drastically increase with the introduction of commodity accounts, this increase can be reduced to production activity dimension. The CSS (1978:33) discusses techniques available to do this, such as the industry technology, commodity technology and mixed technology techniques. A more comprehensive overview is provided by Miller and Blair (1985:159-174).

2.5.4 Input-output analysis and the development of linear programming

Soon after the establishment of input-output models the existence of a price vector that would ensure a general equilibrium was proved. This meant that Leontief's assumption of fixed prices were not necessary. However, although the existence of a price vector could now be proven, as yet no algorithm existed for the computation of equilibrating prices. This would only be given during the late 1960s. In the meantime, two theoretical developments generalised the input-output model. Samuelson (1952) showed how the possibility of substitution could be introduced into the input-output framework. Samuelson assumed that each industry produced only one commodity and used only one scarce primary factor which is homogeneous for all industries. Production was assumed to take place under constant returns to scale. With these assumptions, the Samuelson substitution theorem maintained that if each industry had a wide choice of possible production processes to use, it is optimal for each industry to use only one of the available processes. This process will be used regardless of the commodity composition of the output of all industries (Richardson, 1972:10). Still, input-output models did not take into account the usual economic microfoundations, such as utility and profit maximisation, which are central to the Walrasian model, and which allow price-determined behaviour.

The second development of input-output models was its use in linear programming and activity analysis by Dantzig (1951;1963). Linear programming is related to input-output models, and converts the latter into an optimisation procedure. Linear programming also introduces primary factor constraints and prices into their analysis.

In linear programming models, an explicit objective function has to be optimised subject to certain linear constraints ; in vector notation this behaviour can be represented by :

$$\begin{aligned}
 & \text{MAX } \phi Y \\
 (2.3) \quad & \text{subject to } AY \leq R \\
 & \text{and } Y \geq 0
 \end{aligned}$$

Where

ϕ = a vector of coefficients of the objective function

Y = a vector of gross output

A = a n by n matrix of input coefficients, a_{ij} .

R = a vector of resource constraints.

If the feasible set, $S = \{Y \mid AY \leq R, Y \geq 0\}$ is bounded and non-empty, then the solution vector Y^* can be obtained given data on A , R and ϕ . The solution of the optimal vector of Y^* satisfies the condition of $Y^* \in S$ and $\phi Y^* \geq \phi Y, \forall Y \in S$.

An important feature of LP models are associated with the duality theorem (Varian, 1984:62). The dual problem, against the primal problem set out above, can be written as in

(2.4):

$$\begin{aligned}
 & \text{MIN } \lambda R \\
 (2.4) \quad & \text{subject to } \lambda A \geq \phi \\
 & \text{and } \lambda \geq 0
 \end{aligned}$$

Where

λ = vector of dual variables. This vector can be interpreted as a scarcity indicator. As such shadow pricing and cost-benefit analysis rely to a great extent on linear programming.

Despite the fact that linear programming models have been widely used in academic exercises, they have not been widely used in developing countries, due to theoretical and practical limitations (Bandara, 1991:9). A theoretical problem is the interpretation of microeconomic behaviour following from the dual analysis. A practical problem is that linear programming cannot handle primary factor constraints and substitution effects realistically, despite the Samuelson substitution theorem. The development of CGE models can therefore be seen as an extension of input-output and linear programming models.

2.6 THE DEVELOPMENT OF CGE MODELS

The development of CGE models can be seen as a natural extension of input-output and linear programming models with the inclusion of an endogenous output and price system, substitutability in production and demand, the optimisation behaviour of individual economic agents, the inclusion of more than one consumer and a complete treatment of income flows in an economy (Bandara, 1991:11).

According to Srinivasan and Whalley (1986:4) "the major feature of the numerical general equilibrium approach is its attempt to blend theory and policy so as to both improve the analytical foundations of policy evaluation and to bring the theoretical work that already exist in the literature more fully into the policy debate".

Four breakthroughs were crucial in allowing policy analysts to apply the full Walrasian model empirically. The first was the proof that an equilibrating price vector exists for a competitive economy. The second was the establishment of a solution algorithm to solve for equilibrium prices in an applied model. The third was advances in computer technology and the growth of transferable software such as GEMPACK, GAMS, HERCULES, OCTASOL, MAQMOD and ASAP. The fourth was the construction of SAMs which extended input-output tables to include institutions such as households and government explicitly. In addition, policy orientation in less developed countries shifted towards basic needs and income distribution during the early 1970s. Following the first oil shock, structural adjustment and stabilisation have become important issues in most less developed countries. With this new pattern of policy priorities, a general equilibrium framework is a better analytical framework. Furthermore, in many less developed countries econometric techniques are not well suited as analytical frameworks because of the unavailability of reliable data for long periods, and because of frequent changes in policy regimes that require various structural models (de Melo, 1988:327).

Study of the existence problem began in the early 1930s when Neisser (1932), Stackelberg (1933), Zeuthen (1933) and Schlesinger (1935) identified several of its basic features. Under a number of restrictive assumptions, Wald (1936) obtained the first proof of a unique solution.

The problem Wald (1936) analysed was of determining the conditions under which the general equilibrium system has economically meaningful solutions, i.e. when all prices and quantities traded in the solution are non-negative. Wald (1936) deduced that certain changes had to be made to the Walrasian system to ensure that its solutions are economically meaningful. These changes consisted of substituting some of Walras' equations with inequalities. Thus, for example, the equations between the quantity

available and quantity utilised of each productive resource (see section 2.4) have to be replaced by a relation allowing for a rate of utilisation equal to or less than full capacity, with the additional condition that if a resource is not utilised at full capacity, then the equilibrium price of its service is zero. Analogously, the equation between the price and cost of each good had to be replaced with a relation allowing the cost to be greater than or equal to the price, with the additional condition that if the costs is greater than the price that good is not produced.

Although the first proof of the existence of a competitive equilibrium was obtained by Wald (1936), two papers by von Neumann (1928,1937) turned out to be of greater importance for the development of the subject. In the second of these papers von Neumann (1937) studied the problem of the existence of an equilibrium balanced growth path, and transformed it into an equivalent saddlepoint problem which was derived from his contribution to the theory of games (von Neumann & Morgenstern, 1944). In order to solve this new saddlepoint problem, von Neumann used Brouwer's fixed point theorem (Brouwer, 1912), which, in its generalisation by Kakutani (1941), became the most powerful tool for the proof of the existence of an economic equilibrium (Debreu, 1982:699).

Following the realisation of the usefulness of these theorems, the existence problem was taken up again by Arrow and Debreu (1954), McKenzie (1959), Gale (1955), Kuhn (1956), Nikaido (1956) and Uzawa (1962).

Arrow and Debreu's (1954) approach, which has remained central in leading to practical algorithms for solving CGE models, was directly influenced by Nash (1950) who used Kakutani's fixed point theorem to show the existence of equilibrium points in game theory.

Thus the development of game theory was fundamental in proving the existence of a market clearing price vector for a general equilibrium.

An important further stimulus to CGE modelling has been an algorithm for the numerical determination of equilibrium prices for the Walrasian system, developed by Scarf (1967). By using Brouwer's fixed point theorem, Scarf (1967) showed how an equilibrium price vector can be calculated from a numerical example.

Before Scarf's (1967) discovery, another branch of CGE models originated from Johansen (1960), who formulated an empirical price endogenous model. Johansen's model was the first successful implementation of a CGE model without the fixed coefficient assumptions of input-output models. Because no solution algorithm had as yet been provided in 1960, Johansen (1960) retained the fixed coefficient assumption in modelling the demands for intermediate goods, and employed log-linear Cobb-Douglas production functions in modelling the substitution between capital and labour services and technical change. Log-linear production functions imply that relative shares of inputs in the value of output are fixed, so that the unknown parameters characterising substitution between capital and labour inputs can be estimated from a single data point. In practice SAMs turned out to be better databases than input-output tables, containing detailed information about demand and consumption patterns in an economy.

Johansen's work inspired modellers in Australia to construct a CGE model of the Australian economy, called the ORANI model (Dixon *et al.*, 1982). This model was developed with the co-operation of a number of Australian government agencies with the explicit intention to apply general equilibrium models to policy analysis.

Scarf's algorithm led to pioneering work on non-linear CGE models by Adelman and Robinson (1978) on Korea and Taylor (1980) on Brazil. Soon newer and faster variants of Scarf's algorithm were developed, amongst others by Merrill (1972) and Eaves (1976). Recently a global version of the classical Newton-Raphson algorithm was developed for CGE analysis. The CGE models for the South African that are discussed in chapters 5 and 9 makes use of a Newton-Raphson algorithm.

The advances in computer technology during the past two decades led to a proliferation of CGE models for developed and developing countries. The application of CGE models in less developed countries was led by Adelman and Robinson (1978). Subsequently CGE models have been used to address a wide range of policy issues such as the choice of a development strategy, income distribution, trade policy, structural adjustments to external shocks, tax policy, and long run growth. Appendix B (p. 272) contains a list of some applications of CGE models in developing countries to date.

From Appendix B can be gathered that CGE models are developed to address specific policy issues, and that no all-purpose, general CGE model exists. Most CGE models share the following features (Bandara, 1991:12) :

- (i) They focus on the real side of the economy; only recently has there been a move towards incorporation of the financial side (see Robinson, 1991; Bourguignon *et al.*, 1992; Thorbecke, 1991).
- (ii) The supply and demand functions explicitly reflect the behaviour of profit maximising producers and utility maximising consumers;

(iii) The behavioural functions are non-linear and the system is solved using an solution algorithm on a computer.

The basic principles of CGE modelling are set out in Dervis *et al.* (1982) and Devarajan *et al.* (1991). The transactions value (TV) approach to CGE modelling, which makes explicitly use of the circular income and expenditure relationships contained in a SAM is discussed in chapter 5. A simplified CGE model, in the tradition of the Gap-models used by the World Bank and IMF, is described and applied for South Africa in chapter 9.

Although CGE models have their shortcomings, one of the most important being the omission of money and the financial sector, they are continuing to make contributions to the policy debate by providing more refined calculations of efficiency costs and distributional impacts than were previously available. In this regard Shoven and Whalley (1984:1046-1047) declare that " the point to be emphasized is not that these models are either right or wrong, but that policy decisions have to be made and that these models are capable of providing fresh insights on policy options not available from any other source...we would never advocate slavish and mechanistic use of any of these models in policymaking".

Recent extensions to CGE modelling include incorporation of dynamic optimisation (Ikeda & Ono, 1992), microsimulation of household and firm behaviour (Cohen & van Tongeren, 1987; Nelissen, 1989; van Tongeren, 1991) as well as CGE models of the whole world economy, known as "global models" (MacKibbin & Sachs, 1989; MacKibbin, 1990).

2.7 SUMMARY

In this chapter, an overview of the origin and historical development of SAMs and CGE modelling were given. The first set of social accounts was compiled by William Petty in 1664 for the British economy. Petty was followed by Gregory King who used social accounts of England, France and the Netherlands in 1688 to correctly predict the end of the War of Augsburg. In France, de Boisguillebert and Vauban used the French social accounts to conclude that the French tax system was unfair and would lead to public discontent. Francois Quesnay illustrated the circular flow in the economy in 1758 in his *Tableau Economique*. This *Tableau* can be seen as the first economic model, and Quesnay preceded Keynes in anticipating the destabilising effects of underconsumption and Marx in his realisation of the importance of capital accumulation.

In 1874 Leon Walras described the circular flow of income in an economy through an explicit system of simultaneous equations, and paved the way for the development of the deductive side of economics. Walras' model is based on profit maximising firms and utility maximising consumers, and trade in each market takes place only after an equilibrium price has been determined in that market through a process called *tatonnement*. Walras assumed that a vector of prices existed that would ensure a general equilibrium. Walras could not, however, prove the existence of such an equilibrating price vector.

Walras' accomplishment was paralleled in 1936 by Leontief's input-output table for the United States. In the absence of proof that an equilibrating price vector exists, Leontief assumed that production is not dependent on prices, and that prices remain constant. Notwithstanding these limiting assumptions, analyses based on input-output tables are still widely used. More significant for the inductive side of economics was the use of the input-output table by Richard Stone as central building block for the United Nations system of

national accounts. A pupil of Stone, Graham Pyatt, and his colleagues at the University of Warwick, extended the system of national accounts in the early 1970s and compiled the first social accounting matrix.

Because input-output tables are still important for modelling and social accounting, the basic principles of input output tables and its use for modelling, were discussed. Special reference was made to South Africa's input-output tables, since these tables are a building block of the South African SAMs that are discussed in chapter 4.

The extension of input-output modelling to linear programming by Dantzig was also discussed. It was pointed out that the development of CGE models can be seen as a natural extension of input output models and linear programming by including an endogenous output and price system, substitutability in production and demand, the optimisation behaviour of economic agents and the inclusion of more than one consumer. The development of CGE models was made possible by four breakthroughs in economic theory and practice. These were (i) the proof by Arrow and Debreu in 1954 of the existence of an equilibrating price vector, (ii) the establishment by Scarf in 1967 of a solution algorithm to solve equilibrium prices in an applied model, (iii) the improvement in computer technology and software such as GEMPACK, GAMS, HERCULES, OCTASOL, MAQMOD and ASAP and (iv) the construction of SAMs. It was noted that CGE models need a consistent database in order to represent the circular flow of income, and that a SAM provides such a database. The common features shared by most CGE models were noted, and recent extensions to CGE modelling, such as micro-simulation models and models of the whole world economy, were mentioned.

The application of CGE models in less developed countries was led by Adelman and Robinson in 1978. Since then there have been a proliferation of CGE models for less

developed countries, due to mainly three factors, namely (i) a shift in policy orientation in less developed countries from production and industrialisation towards basic needs and income distribution, (ii) the oil shocks of the 1970s which necessitated structural adjustment policies and (iii) the failure of traditional econometric models to underpin policy analysis in countries subjected to structural changes and where data availability and reliability are suspect.

The shortcomings of CGE models are discussed in chapter 5, where it is emphasised that one of the important shortcomings of most CGE models (especially those constructed in South Africa) is that the financial sector is omitted. In chapter 6 it is argued that the financial sector can have an influence on economic growth and income redistribution, and that external shocks are transmitted to an economy through the financial sector. For CGE models to maintain their relevance for policy analysis in less developed countries, they need to be based on a SAM which takes the financial sector into account. Before such a SAM is compiled, the basic principles of SAMs will be discussed.

3.1 INTRODUCTION

The development of economy-wide modelling from Quesnay and Walras to the modern CGE models was discussed in the previous chapter. It was shown that this development was closely related to developments in the national accounting system of countries. It was argued that multisector CGE models need to be based on a consistent database in order to represent the circular flow of income in a country.

The data requirements of Leontief's input-output model led to the United Nations' System of National Accounts (SNA). The SNA is described in UNSO (1968). It acknowledges the influence of economy-wide modelling on its development by stating that "...the work of the last fifteen years which is relevant to this report has proceeded in two directions : the elaboration and extension of national accounting and the construction of disaggregated economic models" (UNSO,1968:1.4).

In a similar manner that the development and requirements of input-output modelling had led to the development of the 1968 SNA, recent developments in CGE modelling, discussed in chapter 2 (see section 2.6), have led to the revision of the 1968 SNA which is currently underway. From a modern modelling perspective, the 1968 SNA have a number

⁴ The first part of this chapter, sections 3.1 to 3.3, relies on lecture notes taken between January and March 1991 at the University of Warwick during a MSc. -course on Social Accounting presented by Professor Graham Pyatt.

of features which imply that, as a database for economy-wide analysis, it is restricted (Pyatt, 1989:4). First, the 1968 SNA is too particular and complicated relative to the needs and capabilities of many countries. Second, it is not flexible enough to sustain the range and type of policy analyses which most countries would like to have at their disposal. Third, changes in economic circumstances and perspectives since 1968 have brought to the fore two important aspects, namely the emphasis on people, poverty and living standards on the one hand and the emphasis on prices, incentives and the role of the market versus that of the state on the other. Input-output modelling is ill-suited for analysing income distribution issues because it focusses on the interindustry and production relations in the economy. Input-output and linear programming models are also ill-suited to be used in a market economy where the interaction between demand, supply and income, and the resultant relative price changes, are important in determining the behaviour of economic agents (Cohen, 1987:101).

The development of price endogenous CGE models of the economy can be seen to be an attempt to emphasise people and living standards in the context of a market economy in which relative prices influence behaviour (Robinson, 1989). Recently Pyatt (1989) and van Bochove and Tuinen (1986) argued that since all models have a corresponding accounting framework, but that a specific accounting framework can support only a limited set of models, the new SNA should not be restricted to one particular accounting framework if it is to be flexible enough to support a broad range of models. Because all accounting frameworks can be presented in SAM framework, Pyatt (1988, 1989) suggested that a SAM approach should replace input-output tables as the central conceptualisation of a new SNA. The focus of such a SNA would be to guide countries in the compilation of different SAMs, each of which could support a CGE model aimed at analysing a specific problem. Hence SAMs and CGE models can be explicitly linked (Hanson & Robinson, 1989).

In this chapter, the fundamental properties of SAMs are explained, since these properties play an essential role in the compilation of financial SAMs for South Africa in chapter 8. The discussion begins by considering the question "What is a SAM?" in section 3.2, whereafter it is illustrated in section 3.3 how a SAM can be derived from fundamental economic principles and what steps need to be followed in practice to compile a SAM. In section 3.4 it is shown how a SAM can be used to model the effects of exogenous injections into the economy in a manner similar to the multiplier analysis of input-output modelling. The chapter concludes with a summary.

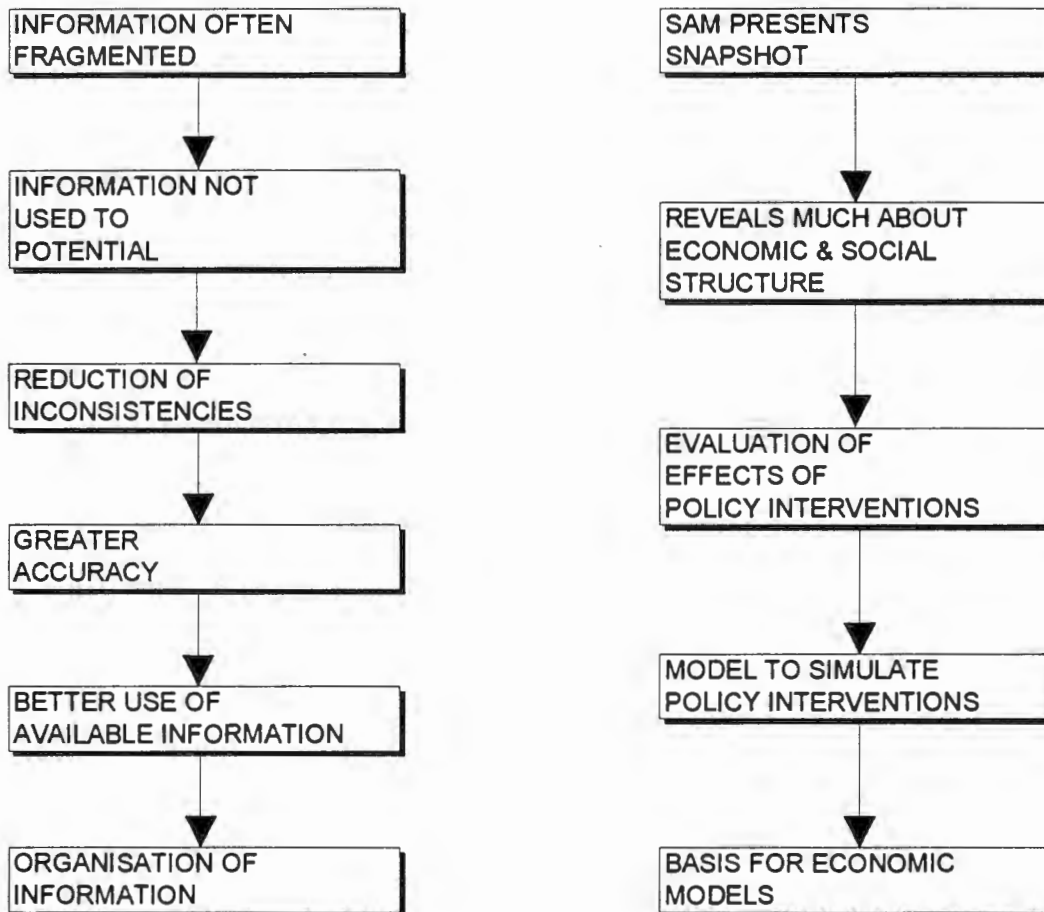
3.2 WHAT IS A SAM ?

A SAM can be defined as a numerical representation of the economic cycle with emphasis on distributive aspects (Keuning & de Ruijter, 1987:72). As such it represents a "snapshot" picture of the economy. The objectives of a SAM is illustrated with the help of diagram 1. The first objective of a SAM is to pool information regarding the economy from various data sources into a consistent database (King, 1985). This initial information may be fragmented, and is often inconsistent. The effort to put together a SAM is not trivial. Because conflicting sources of data must be reconciled, a SAM can lead to the improvement of a country's statistics. The concept of a SAM goes further than the improvement of economic statistics for their own sake : it could be said to be "the common ground of development economists on the one hand and statisticians on the other" (King, 1985:45). Since policy makers are more interested in analysing the impact of policy intervention measures, what is needed is a model that can simulate policy interventions. This gives the second objective of a SAM, namely to provide a suitable basis for economic policy models of various degrees of aggregation and complexity. The

CGE models that are supported by a SAM can be described as either "first generation" or "second-generation" models. These concepts were defined in chapter 1, section 1.3.

A SAM is based on the principle of double entry bookkeeping which results in a series of accounts for which incomings and outgoings must balance. Moreover, an incoming in one account must be an outgoing from another account. In a SAM double entries are achieved by a single entry in a matrix which resembles an "oversized chessboard" (King, 1985:17). A row across the board will reflect incomings or revenues while a column of the same account shows the outgoings or expenditure. By definition incomings and outgoings of the same account must be equal.

Diagram 1 : The objectives of a SAM



The above objectives can be illustrated by deriving a basic SAM format from fundamental economic principles. As is traditional with SAMs, this format contains only the real side of the economy, since the financial sector is not usually contained in a SAM.

3.3 DERIVATION AND COMPILATION OF A BASIC SAM

In this section, a basic SAM format is derived from fundamental economic principles. It is shown that in practice this SAM can be compiled in eight basic steps. It is also shown that a SAM provides a suitable basis for a CGE model because it represents the circular flow in an economy and thus the fundamental identities of national accounting.

3.3.1 Deriving a SAM from fundamental economic principles

Three fundamental principles that form the starting point in the derivation of a basic SAM framework are (i) institutions, (ii) assets and (iii) transactions. Institutions can be defined as legal entities which can own assets and liabilities and engage in transactions. Types of institutions commonly recognised in economics are households, companies, the government and the foreign sector. Assets can be divided into two types, namely real assets and financial assets. Real assets usually comprise physical assets such as plants, buildings and stocks, natural resources such as land, minerals and water, and human resources. Financial claims can consist of claims which one institution has on another and are denominated in monetary units. Examples are claims such as mortgages and loans against households, equity and loans against companies and securities and money against the government.

Transactions can be characterised as involving an institution and being valued in monetary terms. Types of transactions recognised in economics are unrequited transfers such as gifts, the sale or purchase of a good or service and the sale or purchase of a financial asset. Once residence and a time period (usually a year) are taken into account, all transactions within that period can be represented in a SAM as shown in table 4 :

Table 4 : An initial SAM

	OUTLAYS		TOTALS
	Institutions of our economy	Rest of the world	
Institutions of our economy	Domestic transactions	Receipts and borrowing from the rest of world	Financial resources
Rest of the world	Payments and loans to the rest of the world	*	Uses of foreign exchange
TOTALS	Uses of financial resources	Available foreign exchange	

The SAM in table 4 is a square matrix where the corresponding row and column totals are equal. Each institution in an economy can in principle be represented in the SAM, or can be grouped into categories considered meaningful for some particular purpose. An aggregate scheme often followed is to group institutions as households, firms and government. It should be emphasised that these categories may be further disaggregated; for example households can be divided according to socio-economic type, firms can be split according to their principle form of business or according to ownership. The government can be sub-divided into its departments. The particular level of disaggregation and classification used in a SAM will depend on the particular context and purpose to be investigated in each country.

The next step in the derivation of a basic SAM format is to recognise the different types of transactions in the context of table 4. Some of the transactions recorded in table 4 are payments by one institution for goods and services received from another. For economic analysis it can be useful to represent such payments as being intermediated by a set of markets. A market is therefore required for each good/service which is to be separately

distinguished. In a SAM context this is achieved by recording each of the single entries for the transactions between two institutions which derives from the sale/purchase of a good or service twice. Thus each particular transaction representing an exchange of some good/service that was previously recorded as taking place between institutions is now set at zero. In its place, the buying institution is now recorded as buying the good/service from the appropriate commodity market, and the seller is similarly recorded as selling to this same market. These adjustments are indicated by table 5 :

Table 5 : Introducing accounts for goods and services

	OUTLAYS			TOTALS
	Institutions of our economy	Domestic markets for goods/ services	Rest of the world	
Institutions of our economy	Domestic transfers	Sales at market prices	Transfers received	Financial resources
Domestic markets for goods/services	Purchases at market prices	Imports of goods/services	*	Demand for goods/services
Rest of the world				Uses of foreign exchange
TOTALS	Uses of financial resources	Supply of goods/services	Available foreign exchange	

From table 5 can be seen that the introduction of markets for commodities leads to a process of "double entry" in which institutions buy goods and services and pay the market for it; the market then pay that amount over to the institutions. It should be noted that any transaction which is not regarded as involving the exchange of a good or service is labelled a transfer. It follows from the above approach that international trade in goods and services is accounted for in the same detail as domestic commodity transactions. This does not preclude the possibility that, for any given commodity in terms of its physical

description, more than one account may be needed in table 5. This possibility arises because the same good in different places, or in different seasons, is not economically the same thing and may accordingly need its own account in the SAM. This has led to the law of one price becoming the most important principle for classifying commodities in national accounting (Pyatt, 1989:14; 1991:178). The law of one price requires that all the transactions grouped together in any row of commodities of the SAM should be sold at the same price.

When institutions buy goods and services in table 5, they may do so for several reasons. One is that the institution is engaged in some production activity where goods and services are bought as inputs to be transformed into different outputs of goods and services. Assuming that the inputs are bought and that the outputs are sold, then the transactions which are involved as a result of each production activity can be separated from the other transactions involving the corresponding institutions and given their own production activity accounts. Such accounts are introduced in table 6 :

Table 6 : Introducing activity accounts

	OUTLAYS				TOTALS
	Our Economy			Rest of the World	
	Institutions	Markets	Production Activities		
Institutions	Domestic Transfers	Domestic supply of factor services	0	Transfers received	Disposable Income
Markets	Domestic Final Demand	0	Intermediate demands	Exports	Demand for goods
Production Activities	0	Domestic production	0	0	Revenue
Rest of the World	Transfers to rest of World	Imports	Costs of production	Available foreign exchange	Uses of foreign exchange
TOTALS	Use of Income	Supply of goods	Cost of production	Available foreign exchange	

By comparing table 6 to table 5, it can be observed that the first difference from table 5 is that the domestic purchases of goods and services by institutions are split into those that are purchases of inputs by a production activity and those which are not. In table 6 the purchases of inputs for production activities are shown as intermediate purchases of goods and services, while the other purchases are referred to as domestic final expenditure on goods and services.

The distinction made in the tables so far between goods and services depend whether the item can be stored, in which case it is a good, or whether it is necessarily used or consumed at the time of its creation, in which case it is a service (Pyatt, 1989:28). Within

services a distinction is also drawn between factor and non-factor services. The former are the services of the factors of production, namely labour, capital and natural resources, while non-factor services refer to the services which are produced by the factors of production themselves, normally in combination with other inputs of goods and services. Thus the outputs of production activities are the goods and non-factor services which are generated by the economy. Table 6 shows the revenue of production activities as deriving from sales of products in row 3, column 2. As shown in column 2, this leaves income paid for factor services and net indirect taxes as a direct income of institutions which are received from the markets for goods and services.

Two extensions are needed to obtain a basic SAM format from table 6. The first is to provide two accounts for each institution, namely a current and a capital account. Second, the market accounts for goods and services is split into two stages, namely a market for factor services and a market for goods and non-factor services (product/commodity account). The result is a basic SAM presented in table 7.

The distinction between current and capital accounts for institutions is needed because institutions can either own a real asset, such as machinery, or financial assets, such as financial claims or other institutions. All transactions in assets are recorded in the capital accounts, while all other transactions are recorded in the current accounts. Thus loans and borrowing are treated as capital transfers, and domestic final demand is broken down into purchases of real assets and other purchases.

Table 7 : A basic SAM

	OUTLAYS					REST OF WORLD	TOTAL
	OUR ECONOMY						
	INSTITUTIONS						
	Current	Capital	Factors	Products	Activities		
Current	Current transfers	0	Factor Income	Taxes on products	Taxes on Activities	Current transfers from abroad	Current Disposable Income
Capital	Savings	Capital Transfers	0	0	0	Capital Transfers from abroad	Available Funds
Factors	0	0	0	0	Payments for Factor Services	Factor Incomes received from abroad	Factor Incomes
Products	Consumption Expenditure	Investment Expenditure	0	0	Intermediate Demand for Products	Exports of products	Demand for Products
Activities	0	0	0	Sales of Products	0	0	Revenue
Rest of World	Current transfers abroad	Capital transfers abroad	Factor Income Paid Abroad	Imports of products	0	0	Uses of Foreign Exchange
TOTALS	Use of income	Use of funds	Allocation of factor incomes	Supply of Products	Allocation of Revenue	Available foreign exchange	

Apart from foreign borrowing, all the receipts of institutions accrue to the current accounts. These are brought into balance in table 7 by defining savings as any excess of current income over consumption and current transfers. Savings are thus a balancing residual. It follows that, since the aggregate accounts for institutions in table 6 are balanced, and the current accounts in table 7 are balanced, that the capital accounts must also be in balance. This implies that for each institution $\text{savings} + \text{borrowing} = \text{real investment} + \text{loans}$. This property will be exploited in later chapters to derive a financial SAM. A financial SAM differs from the basic SAM above in that the capital account is

expanded to take account of financial portfolio's of institutions. The importance of the capital account and financial transactions is reflected in the property that in the basic SAM of table 7, there are two kinds of entries. First, there are entries which reflect flows across markets, with payment moving in one direction and some commodity moving in the opposite direction, as in accounts 1 to 3. Second, there are entries which represent nominal flows that have no real counterpart. These flows represent "transfers" since no productive activity occur. Robinson (1989:899) point out, however, that "financial flows and transfers represent important economic transactions, which reflects the institutional structure of the economy and assumptions about the behaviour of various actors. The flows largely define the macroeconomic structure of the economy and must be captured in any model that is concerned with distributional issues or macro adjustments".

A characteristic of the basic SAM in table 7 is that it distinguishes not only between current and capital accounts, but also between activities and commodities. In table 7, the activities accounts includes the sectors as defined in input-output tables. The matrix of intermediate flows (A in the input-output terminology) appears as cell (2,1). The commodity account can be seen as representing the domestic product market, buying domestic goods from activities and imports from the rest of the world, and selling the goods to all domestic purchasers. In this, exports are assumed to be sold directly to the rest of the world by activities. By defining the commodity account in this way, the column sum of commodities equals total absorption (Robinson, 1989:898). Cell (1,2) in the SAM represents the mapping from activities to commodities, and is known as the "make" matrix (Robinson, 1989:898). A SAM usually distinguishes between activities and commodities (products) to allow for two different effects to be studied. First, it permits more than one type of activity to produce the same commodity, thereby allowing for different production technologies. For example, small and large firms may produce the same crop, but with different factor intensities. In many developing countries, various commodities are made

by means of a number of distinct technologies which co-exists for a long time. An example is the formal/informal dichotomy. The distinction between activities and commodities is therefore essential for an assessment of the role of the informal sector (Keuning & de Ruijter, 1987:75). Second, this treatment addresses several problems that arise from dealing with imports. If imports are competitive with domestically produced goods, then domestic demand will consist of both types of goods. However, only domestic goods are exported. Separating activity accounts from commodity accounts enables this difference to be portrayed (Devarajan, *et al.*, 1991:3).

The remaining accounts of the SAM can be explained. From table 7 can be seen that the factor accounts receive payment from domestic production activities and from abroad, which are in turn either paid abroad or retained domestically as payments to those institutions which provide the various factor services. In particular, households receive wages because they provide labour services, and both households and companies receive profits which are earned by the production activities which they organise. The accounts for factor services can be interpreted to state that the factor incomes of domestic institutions consists of value added plus net factor income from abroad (Pyatt, 1989:32).

Before discussing the way in which a SAM embodies the fundamental identities of national income accounting and the circular flow of income in an economy, a few comments about the compilation of a SAM is in order.

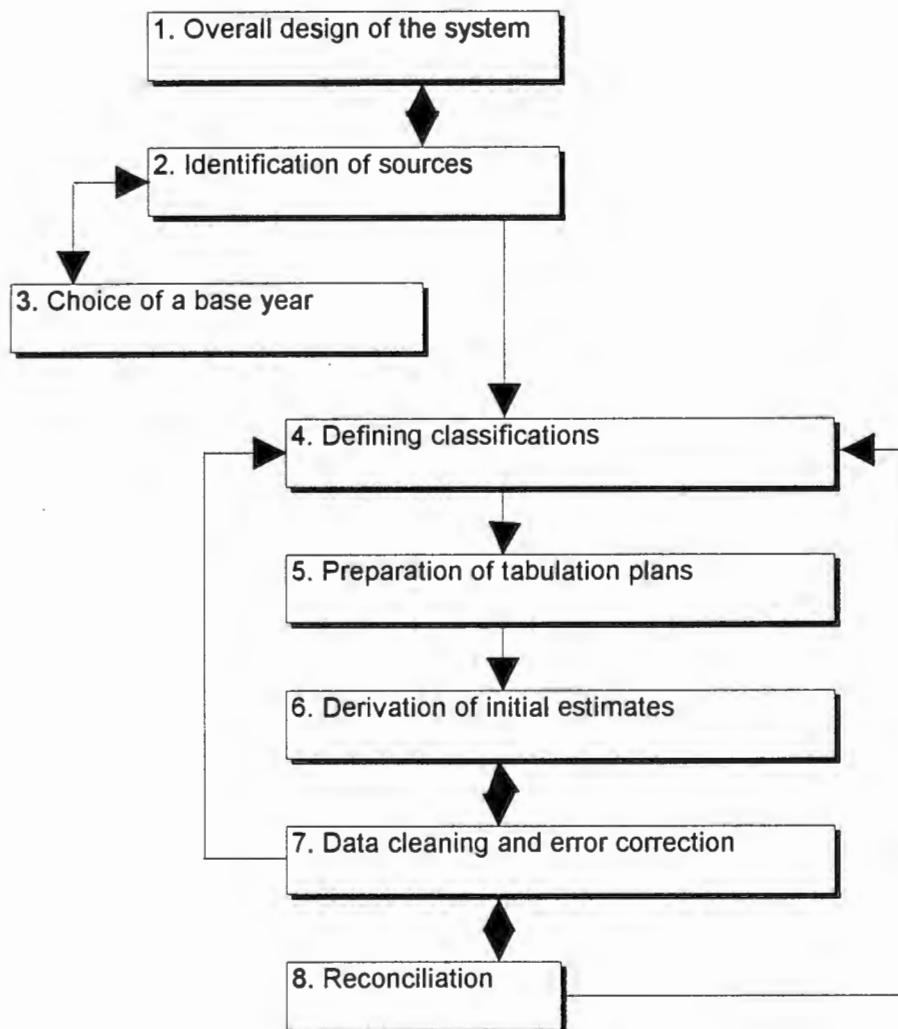
3.3.2 Compilation of a SAM

From the discussion on the objectives of a SAM, the advantage of using a SAM to mould data from different (and often inconsistent) sources into one consistent framework was pointed out. Keuning and De Ruijter (1987:73) point out that if more detail is included in

a SAM, more inconsistencies in a countries national statistics will become manifest. Thus, the more disaggregated the SAM, the more costly the compilation of a SAM will be (Pyatt & Round, 1977; Pyatt & Roe, 1977). This problem is compounded by the fact that no standardised handbook or published guidelines exist yet for the construction of a SAM. In light of this, some basic guidelines for compiling a SAM is set out in this section. These guidelines do not provide an elaborate blueprint for the compilation of SAM, but identifies eight basic steps (following Keuning & de Ruijter, 1987:74-93). It is suggested that this basic steps could serve as the basis for a future manual on SAMs.

The eight steps to be followed when compiling a SAM is set out in diagram 2 :

Diagram 2 : Basic steps in the compilation of a SAM:



Step 1, the overall design of the system, refers to the choice about the structure of the basic SAM, about the distinction between activities and commodities, the type of capital accounts, the type of institutions to be identified and the degree of information to be included on the foreign sector. The double arrows indicate that this choice will depend on data availability. In principle, step 2 require the use of all available socio-economic

statistics. These statistics should meet two basic requirements, namely that the information should cover a year close to the SAM reference year, and that it must be possible to classify the raw data in accordance with the taxonomies applied in the SAM. Usually the availability of the most recent data determines the choice of a base year, step 3, as the double arrows indicate. Basic sources for data are the input-output tables, the national income and production accounts, demographic data, survey data on wages and entrepreneurial income, household budget surveys, government data and financial flow data. Step 5, defining classifications, refers to the level of aggregation in the SAM. This choice depends on the planned uses of the SAM and the design of the system. Keuning and de Ruijter (1987:87) state that classifications for every account should meet the following requirements :

- (i) distinguish groups which are relatively homogeneous with regard to the main characteristic in the account under consideration;
- (ii) correctly reproduce the variety within society;
- (iii) be composed for groups which are recognisable for policy purposes and useful for socio-economic analysis;
- (iv) be based on comparatively stable characteristics which can be measured easily and reliably;
- (v) be derivable from a combination of existing data sources.

Step 5, the preparation of tabulation plans involves filling the submatrices of the SAM with data. Each submatrix total (control total) needs to be split into its component values. As soon as initial estimates are available during step 6, these should be tested for reliability during step 7. If necessary, data should be reconciled in step 8 with the bi-proportionality method (Bacharach, 1970) in order to obtain a balanced SAM.

In chapter 4 it is pointed out that the existing South African SAMs do not always fulfill the ideal as far as compilation is concerned. The recommendation for a comprehensive manual on the compilation of SAMs for South Africa can therefore be justified if a sound SAM methodology is to be established in South Africa.

Once a SAM's structure has been decided upon, based perhaps on some problem to be investigated, and the SAM has been compiled as described above, it can be used for policy modelling (Cohen, 1987,1988). The next section will discuss the potential of a SAM to serve as a databasis for a model by considering its representation of the economic cycle and the fundamental identities of national income.

3.3.3 SAMs and the circular flow of income

Table 7 embodies all the fundamental identities of national income accounting. This is illustrated in table 8, which is a simplification of table 7 : current institutions are limited to government and households, while factors and activities have been grouped together.

Table 8 : A basic SAM containing the macroeconomic identity

	ACTIVITIES	PRODUCTS	HOUSEHOLDS	GOVMENT	CAPITAL	REST OF WORLD	TOTAL
ACTIVITIES	0	X	0	0	0	0	GDP
PRODUCTS	0	0	C	G	Z	Ex	Aggregate Demand
HOUSEHO	Y	0	0	Gtrh	0	Etrh	Household income
GOVMENT	0	0	Th + trg	0	0	Etrg	Govt Income
CAPITAL	0	0	Sh	Sg	0	Se	Savings
REST OF WORLD	0	Mx	Mtrh	Mtrg	0	0	Imports
TOTAL	Domestic Income	Aggregate Supply	HH Expenditure	Govt Expenditure	Investment	Exports	

The SAM in table 8 represents the following macroeconomic identities

(3.1) $Y = X$: Domestic income = domestic product

(3.2) $X + Mx = C + G + Z + Ex$: Aggregate supply = aggregate demand

(3.3) $Y + Gtrh + Etrh = C + (Th+trg) + Sh + Mtrh$: Household income = household expenditure

(3.4) $(Th + trg) + Etrg = G + Gtrh + Sg + Mtrg$: Government income = government expenditure

(3.5) $Z = Sh + Sg + Se$: Investment = Savings

(3.6) $M = E + Se$: balance of trade = foreign savings

Where the different variables are defined as in table 9 :

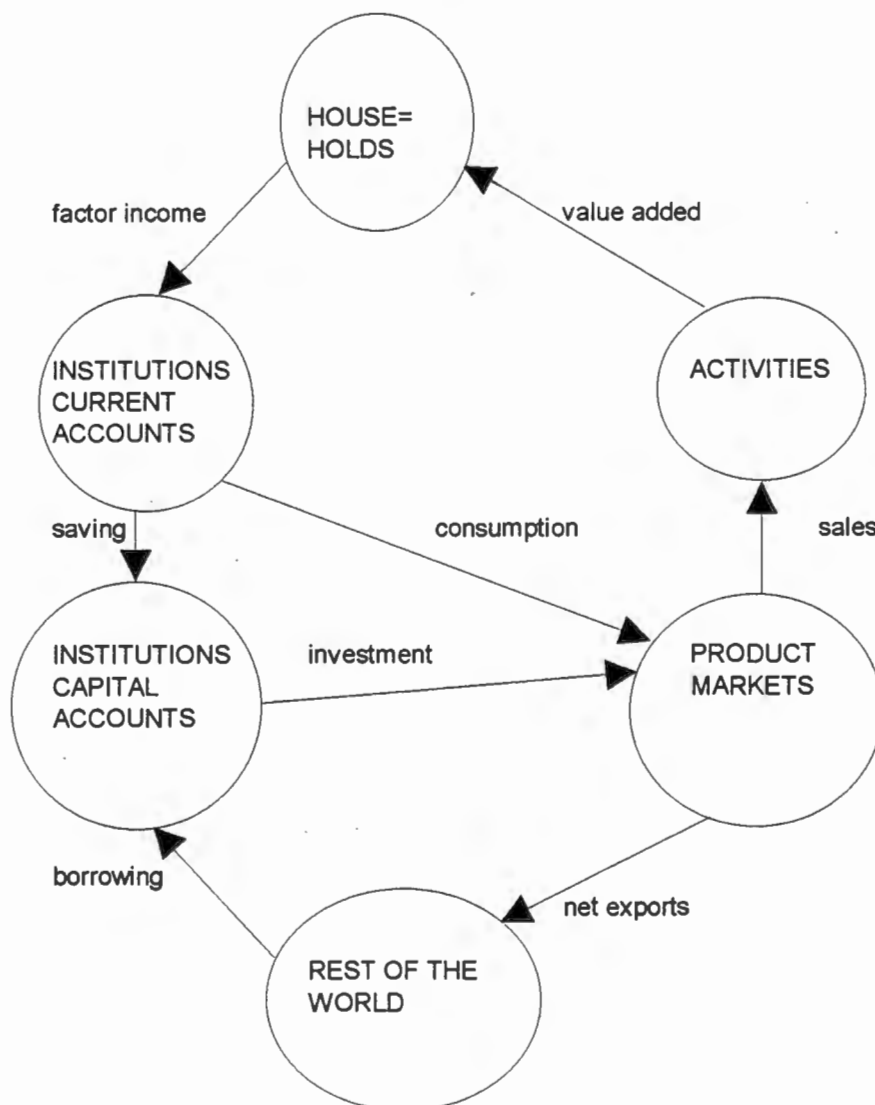
Table 9 : Definition of variables in basic SAM

VARIABLES	DESCRIPTION
X	Output (GDP)
C	Household consumption expenditure
G	Government consumption expenditure
Z	Gross domestic investment, which includes :
	-gross domestic fixed investment
	-inventory changes
Ex	Exports of goods and non-factor services
Y	Income (value added)
Gtrh	Government transfers to households, which includes :
	-interest on public debt
	-subsidies
	-current transfers to households
Etrh	Rest of the World transfers to households, which includes
	-rewards for domestic production factors employed in the rest of the world
	-current rest of the world transfers to households
Th+trg	Taxes and transfers, which include :
	-income from property
	-indirect taxes
	-direct taxes
	-current household transfers to government
	-current corporate transfers to government
Etrg	Rest of the World transfers to government
Sh	Private savings, which include
	-personal savings
	-corporate savings
	-provision for depreciation
Sg	Savings of the government
Se	Savings from rest of world, which includes :
	-net capital inflow from rest of world
	-change in gold and other foreign reserves
Mx	Imports of goods and non-factor services
Mtrh	Household transfers to the rest of the world, which includes :
	-rewards for rest of the world production factors employed in South Africa
	-current household transfers to rest of world
	-current corporate transfers to rest of the world
Mtrg	Current government transfers to rest of the world

In table 9, the variables have been described as they would be found in the national accounts for most countries. In South Africa, data on the above variables can be obtained

from the Reserve Bank's Quarterly Bulletin. The fact that table 7 contains the circular flow of income in a country, can be illustrated through diagram 3 :

Diagram 3 : The circular flow income inherent in a SAM



Since every general equilibrium model has a corresponding SAM, it follows from diagram 3 that the circular flow of income is fundamental to all general equilibrium models. In chapter 2 it was stressed that the circular flow of income underpinned the analyses of King, Quesnay and Walras. It was shown that a shortcoming of the Leontief

model was its emphasis on the production structure of an economy. Diagram 3 shows that a country's production structure and income distribution patterns are inextricably interwoven.

It should be emphasised at this point that a SAM in itself is not a model, as the CEAS (1986:4) maintains, but a large-scale identity. To arrive at a model, behavioural equations have to be added to describe the way in which the values of the SAM were obtained. The simplest way that this can be done is through first generation models such as multiplier analyses. The principles of multiplier analysis are discussed in the next section.

3.4 ACCOUNTING AND FIXED PRICE MULTIPLIERS IN A SAM FRAMEWORK

The essence of multiplier models based on SAMs is similar to that of the static open input-output model, namely to capture linkages in a general equilibrium framework that allows the computation of indirect as well as direct effects of an exogenous shock (Robinson, 1989:901). Multipliers thus characterise the extent to which exogenous shocks/changes in one part of the economy will work through to affect other parts of the economy.

To obtain a multiplier model from a SAM, the SAM has to be partitioned into matrices of endogenous and exogenous accounts. Assuming fixed coefficients for all endogenous variables, modelling proceeds by perturbing the exogenous accounts and then solving the model to yield multipliers through which changes in the endogenous accounts are translated into changes in the endogenous accounts. By decomposing the resultant multiplier effects one can obtain an indication of the importance of direct and indirect linkages in the economy. This decomposition is motivated by Hirschman's (1958) notion that a government should encourage investment in sectors that have significant forward and backward linkages. Decomposition of multipliers can be used to address questions such as "when is it feasible to ignore indirect linkages and stay with partial equilibrium analysis?" and "when is it important to consider the institutional linkages incorporated in a SAM, rather than capture only the linkages embodied in intermediate flows in an input-output table?"

A distinction is made between accounting and fixed-price multipliers. As will be shown, fixed-price multipliers differ from accounting multipliers insofar as the income elasticities of expenditure in the SAM differ from unity.

The first step to move from a SAM to a multiplier model is to divide the accounts into endogenous and exogenous ones. Standard practice is to pick one or more of the government, capital, and rest of the world accounts, justifying the choice on the basis of macroeconomic theory. The resulting multiplier model will be completely demand driven, and are thus Keynesian in spirit (Robinson, 1989:902). Because there are a choice among the exogenous accounts, there are seven different combinations of the exogenous accounts - each only singly, three pairwise combinations, plus all three together. Each of these choices defines a different closure rule to the model (Robinson, 1989:903). This issue will appear again in the context of a CGE model, and is a major bone of contention amongst modellers (Robinson & Roland-Holst, 1988:7), since the choice of closure in CGE models determines the macroeconomic causality of the model (see Dewatripont & Michel, 1987).

Conforming to practice the endogenous accounts of the basic SAM of table 7 are specified as factors, households and activities, while government, capital and the rest of the world are assumed to be exogenous. In SAM form this partitioning is presented in table 10. In table 10, the endogenous matrices are denoted with the letter T, of which the double subscripts denote respectively the row and column of the SAM where that submatrix is located. For example, subscript hh denotes the row and column for households, subscript aa the row and column for activities and subscript hf the row for households and column for factors.

Table 10 : Schematic representation of endogenous and exogenous accounts in a SAM

ENDOGENOUS					TOTAL
	HOUSEHOLD	FACTORS	ACTIVITIES	EXOGENOUS	
HOUSEHOLD	T_{hh}	T_{hf}	0	X_h	Y_h
FACTORS	0	0	T_{fa}	X_f	Y_f
ACTIVITIES	T_{ah}	0	T_{aa}	X_a	Y_a
EXOGENOUS	V_h	V_f	V_a		
TOTAL	Y_h	Y_f	Y_a		

The transactions between the endogenous accounts portray the circular flow of income between households, factors and activities, as well as the input-output transactions between various groups of households (T_{hh}). This can be seen clearly from arranging the endogenous matrix as follows :

$$(3.7) \quad A = \begin{bmatrix} T_{hh} & T_{hf} & 0 \\ 0 & 0 & T_{fa} \\ T_{ah} & 0 & T_{aa} \end{bmatrix} = \begin{bmatrix} 0 & T_{hf} & 0 \\ 0 & 0 & T_{fa} \\ T_{ah} & 0 & 0 \end{bmatrix} + \begin{bmatrix} T_{hh} & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & T_{aa} \end{bmatrix}$$

If a_{ij} is defined as T_{ij}/Y_j then the coefficient matrix of endogenous accounts becomes :

$$(3.8) \quad A = \begin{bmatrix} a_{hh} & a_{hf} & 0 \\ 0 & 0 & a_{fa} \\ a_{ah} & 0 & a_{aa} \end{bmatrix}$$

From table 10 it can be seen that one can, analogous an input-output model, relate the endogenous outputs Y , to exogenous injections (X) through a model of the form :

$$(3.9) \quad Y = (I-A)^{-1}X$$

or

$$(3.9.1) \quad Y = M_a X$$

With

$$M_a = (I - A)^{-1}$$

Where M_a is known as the accounting multiplier, because it can account for the results obtained in the SAM without explaining the process that led to them (Khan, 1989:57).

Accounting (as well as fixed-price) multipliers should be distinguished from the Leontief-inverse multiplier mentioned in the previous chapter. The reason is that accounting and fixed-price multipliers are derived from a SAM model. This SAM model is closed with respect to the determination of factor and household income distribution and the consumption behaviour of households. In terms of table 10, the Leontief inverse would just be

$$(3.10) \quad Y = (I - a_{aa})^{-1} X_a$$

Thus, the partitioned endogenous matrix from the SAM contains four additional matrices which permits a much higher degree of closure.

Pyatt and Round (1985:204) show that M_a can be multiplicatively decomposed into three components, namely

$$(3.11) \quad M_a = M_{a3} M_{a2} M_{a1}$$

Where each explains a different aspect of the linkage in the economy. More specifically, matrix M_{a1} shows what is labelled "intragroup" effects, i.e. the multiplier effects of an exogenous stimulus on the account of origin (Roukens de Lange & Van Severter, 1990:159). The matrix M_{a3} shows what is labelled "extragroup effects", the effects of the stimulus on the endogenous accounts (Roukens de Lange & Van Severter, 1990:159). Matrix M_{a2} shows "intergroup effects" which are the further compounding effects throughout the other endogenous accounts on the account where the stimulus originated (Cohen, 1987:101).

Stone (1985) presents an additive form of presenting the accounting multiplier decomposition, namely as

$$(3.12) \quad M_a = I + (M_{a1} - I) + (M_{a2} - I)M_{a1} + (M_{a3} - I)M_2M_1$$

Where

I = a matrix or vector of initial effects

$(M_{a1} - I)$ = the net contribution of intragroup effects

$(M_{a2} - I)$ = the net contribution of intergroup effects

$(M_{a3} - I)$ = the net contribution of extragroup effects

A limitation of the accounting multiplier M_a is that it implies unitary expenditure elasticities because the prevailing average expenditure propensities in A are assumed to apply to any incremental injection (Khan, 1989:37). A more realistic alternative is to specify a matrix of marginal expenditure propensities (C) corresponding to the observed

income and expenditure elasticities of the different agents, under the assumption that prices remain fixed. If it is assumed that each activity only delivers one commodity then the commodity and activities accounts can be joined, and the endogenous section of table 10 presented as follows:

Table 11 : Endogenous Matrix of Marginal Expenditure Propensities

	HOUSEHOLDS	ACTIVITIES	FACTORS	EXOGENOUS
HOUSEHOLDS	C ₁₁	0	C ₁₃	
ACTIVITIES	C ₂₁	C ₂₂	0	
FACTORS	0	C ₃₂	0	
EXOGENOUS				

From table 11 one can write in a similar fashion as for the accounting multiplier :

$$(3.13) \quad Y = CY + X$$

Expressing changes in income (ΔY) resulting from changes in injections (ΔX) gives

$$(3.14) \quad \Delta Y = C\Delta Y + \Delta X$$

$$\Delta Y = (I-C)^{-1}\Delta X$$

$$\Delta Y = M_C\Delta X$$

Where

M_C = the fixed-price multiplier matrix. The advantage of this multiplier is that it allows any non-negative income and expenditure elasticities to be reflected.

Since the patterns of zero and non-zero entries in the patterns of the A and C matrices are the same, the fixed-price multiplier can like the accounting multiplier be decomposed into three parts, namely

$$(3.15) \quad M_C = M_{C3}M_{C2}M_{C1}$$

With prices assumed fixed, the differences between corresponding elements of M_a and M_C are due to income effects. This relation between the accounting and fixed-price multiplier can be illustrated by noting that :

$$(3.16) \quad \Delta Y = C\Delta Y + \Delta X$$

$$\therefore \Delta Y = (C-A)\Delta Y + A\Delta Y + \Delta X$$

$$\therefore \Delta Y = (I-A)^{-1}[(C-A)\Delta Y + \Delta X]$$

$$\therefore \Delta Y = M_a(C-A)\Delta Y + M_a\Delta X$$

$$\therefore \Delta Y = [I-M_a(C-A)]^{-1}M_a\Delta X$$

$$\Rightarrow \Delta Y = M_y M_a \Delta X$$

Where

M_y is known as the transformation matrix.

From the result of (3.16) can be seen that if $C = A$, then $M_y = I$ so that $M_a = M_c$. It has already been stated that M_a contains average propensities which implies unitary income elasticities of expenditure. Thus M_a and M_c will only differ if income elasticities of expenditure differ from unity (Khan, 1989:58).

Multiplier models can reveal much about the structure of the economy and focus on the direct and indirect causal linkages in the economy. A major use of SAM multiplier models has been to explore issues of income distribution. Pyatt and Thorbecke (1976) and Thorbecke (1985) contains surveys of this work. For South Africa, Van Seventer (1990) used the 1978 SAM as a basis for multiplier decomposition to determine why income redistribution policies in South Africa might be unsuccessful. Although the applications of multiplier models have proven useful in the economic policy debate (Pyatt & Round, 1985:186) these models are subject to a number of limitations. These limitations are discussed by Stone (1985), Pyatt (1988), Robinson and Roland-Holst (1988) and Robinson (1989) and can be summarised as follows : (i) all the relationships postulated are linear and homogeneous; (ii) procedures are static and take no account of the time that it takes exogenous shocks to work through the economy, (iii) the partitioning of the SAM-accounts into endogenous and exogenous is *ad hoc* and (iv) all price adjustments are ignored, which implies that substitution possibilities in consumption, production and trade cannot be taken into account. Consequently multiplier models are limited in their ability to reflect the workings of a multi-market economy in which price adjustments play a role and in which there are important substitution possibilities in both production and demand (Dervis *et al.*, 1982:135; Robinson, 1989:906). In order to expand the scope and relevance of SAMs by capturing the features of a modern market economy in models, Pyatt (1988) suggested proceeding to models with more "economic content" such as second generation CGE models. The way in which a SAM can be used for a second generation CGE model is discussed in chapter 5; before doing so, it is necessary to set out and discuss the South

African SAMs. This is done in the next chapter. Special reference is made to results from first generation models based on these SAMs, since these results could illustrate the benefits of SAM-based models for economic policy evaluation and also point out shortcomings in South Africa's current social accounting and modelling capabilities.

3.5 SUMMARY

In this chapter it has been demonstrated that a SAM is an appropriate framework for integrating various statistical sources and for studying the static properties of the economy as well as the decomposition of its multipliers.

A SAM was defined as a numerical representation of the economic cycle with an emphasis on distributive aspects. Because of this, the first objective of SAMs is to provide a database for CGE models. The way in which a SAM represents the economic cycle was illustrated, and it was shown that a SAM contains all the basic macroeconomic identities.

To move from a SAM to a model, it is necessary to add behavioural equations to describe the way in which the values of the SAM were obtained. The different approaches towards specifying these equations have been labelled either as "first generation" or "second generation" models. First generation models refer to accounting and fixed-price multiplier models in the tradition of input-output modelling, while second generation models refer to price endogenous, multisector CGE models. Because most of the CGE models in South Africa to date are of the first generation type, it was illustrated how a SAM can be used for multiplier analysis and multiplier decomposition.

The second objective of SAMs was stated as the organisation of information. This objective was illustrated by describing how a SAM can be derived from basic principles and how a SAM can be compiled by following eight basic steps. These are (i) determining the overall design of the system; (ii) identifying the sources of data; (iii) choosing the base year; (iv) defining the classifications to be employed; (v) preparing tabulation plans; (vi) deriving initial estimates for the cell values; (vii) cleaning the data and correcting errors and (viii) reconciling different sources of data. Since a comprehensive manual on the compilation of SAMs does not exist, it was suggested that these steps be used as an organising framework for a manual. This could facilitate the establishment of a SAM and CGE modelling culture in South Africa.

The compilation and data source of four different SAMs for South Africa are discussed and compared in the next chapter, and the results from first generation models based on these SAMs are reviewed.

4.1 INTRODUCTION

In the previous chapter, the concept, purpose and fundamental properties of SAMs were explained. After defining a SAM as the numerical representation of the economic cycle with emphasis on distributive aspects, a basic SAM was derived from fundamental economic principles. It was shown that a SAM contains all the macroeconomic identities which emphasises the linkages between production and income distribution. It was argued that this characteristic of a SAMs makes it preferred to input-output models as an instrument for policy analysis in developing countries. Four SAMs exist for South Africa. The earliest, for 1978, was published by the Central Economic Advisory Service (CEAS, 1986) and includes a regional SAM. More recently the Development Bank for Southern Africa (Van Seventer *et al.*, 1992) as well as the CSS (1993) published SAMs for 1988.

In the previous chapter it was stated that SAMs can be used for two types of CGE models, namely first generation and second generation CGE models. For South Africa, the majority of CGE models so far are of the first generation type. In this chapter the lessons that can be learned from these models are discussed. Before doing so, however, it is

⁵ An abridged version of sections 4.4 and 4.5 was presented as a paper at the 5th *International Symposium on Economic Modelling* at the University of Göteborg, Sweden, on 20 August 1992 (see Naudé, 1992a).

necessary to present and discuss the different South African SAMs on which these models are based, since the model results obtained are dependent on the underlying SAM specification. A further motivation for discussing the South African SAMs is in order to judge their suitability for second generation CGE modelling.

In section 4.2 the 1978 SAMs are presented and discussed. The 1988 SAMs are presented and discussed in section 4.3. In section 4.4 descriptive studies based on the 1978 SAM are discussed after which results from first generation type of models based on the SAMs are set out in section 4.5. The chapter concludes with a summary.

4.2 THE 1978 SOUTH AFRICAN SAMs⁶

The 1978 South African SAMs were compiled by the CEAS, following the objective of the Ninth Economic Development Programme (RSA,1979:65) to take income distribution and regional development into account. These SAMs consist of a national or income SAM for South Africa (including the TBVC states), as well as a regional SAM providing details of household income and expenditures within each of eight economic development regions identified in the Regional Development Plan (RSA, 1981).

The choice of the year 1978 was determined by data availability. At the time, 1978 was the most recent year for which a national input-output table (CSS,1979) was available. According to McGrath (1987:301) this SAM is dated since changes in wage levels, the strength of Black Unions and the exchange rate of the Rand may have caused significant alterations in certain coefficients in the economy since 1978.

⁶ The primary sources on which this section is based are CEAS (1986) and McGrath (1987).

The input-output table, which provides a detailed description of South Africa's inter-industry accounts for 1978, was supplemented with data on the national accounts published by the South African Reserve Bank as well as data from the 1980 Population Census carried out by the CSS. This population census data were needed to reflect the mapping of factor income from production factors to households and other institutions. Households were classified by means of ethnicity, distinguishing between Whites, Blacks, Coloureds and Asians. Because the population census data were available only for 1980, the assumption was made that the income and employment distributions measured by the census did not differ significantly between 1978 and 1980 (CEAS,1986:5-6). In the previous chapter it was noted that most SAMs require data not too far away from the chosen year (Keuning & de Ruijter, 1987:86). Therefore, the use of 1980 population census data can be justified. A shortcoming of census data which the 1978 SAM did not take into account, is the possible under-reporting of incomes in any census (Spandau, 1971:28). For the 1960 census Spandau (1971) determined that the incomes of White and Coloured households suffered from the largest degree of underreporting. McGrath (1987:306) points out that if this pattern held for White households in the 1980 census, then the non-White shares of income may be overstated in the SAM.

Data on income and expenditure patterns of Blacks, Coloureds and Indians were obtained from the University of South Africa's Bureau of Market Research (BMR). Data on the income and expenditure patterns of Whites for 1975 were obtained from the CSS.

A number of adjustments were made to the data sources to obtain a consistent SAM. One of the most important from an income distribution point of view is that the single row for labour in the input-output table was disaggregated into forty rows in the SAM, consisting of 10 occupational classifications for each of the four races. The 10 occupational classes are based on that used by the CSS and consists of the following classes :

- professional
- technical
- other professional
- administrative
- clerical
- sales
- services
- farm workers
- labourers
- not classified

Each of the four household accounts was disaggregated into seven classes based on per capita income to allow income distribution issues to be investigated. The single column for private consumer demand in the input-output table is thus expanded to 28 columns in the SAM. The submatrix formed by the intersection of the 40 labour categories with the 28 household categories show in detail how factor income is mapped to the households who own them. Keuning and de Ruijter (1987:87) note that the classification of households according to income brackets, do not satisfy the criteria for classifications of accounts (see section 3.3.2 in chapter 3). McGrath (1987:305) criticise the classification of households into ethnic groups and suggests distinguishing rural and urban households since poverty and migration are acute problems in South Africa. Also, metropolitan Black incomes are more than three times higher than rural Black incomes. The Malaysian SAM (see Chander *et al.*, 1980) is an example of a SAM in which a distinction is made between rural and urban households. Notwithstanding the apparent shortcoming of the 1978 SAM in this regard, valuable lessons on income distribution in South Africa can still be learned from its

mapping. It should be added that households do not receive their income only from the 10 occupational categories, but also from dividends, interest receipts, transfer payments from government and transfer payments from relatives. Amongst Black households, which are divided into single member and multiple member households to reflect the system of migrant labour in South Africa, transfer payments are considerably more important as a source of income than for other households (Eckert & Crouch, 1986). A somewhat peculiar feature of the 1978 SAM in this regard is that the single migrant households predominates the higher percentiles of the Black income distribution, which is surprising since they hold low-skilled employment (McGrath, 1987:306). This issue will be investigated in more detail in the next section.

A number of further adjustments that are made to the input-output table need to be mentioned. First, the 93 production sectors identified in the input-output table are aggregated to yield a 24 sector interindustry matrix. Second, the control totals (the totals for a submatrix and row/column total) used in balancing the SAM's rows and columns are obtained from the South African Reserve Bank rather than from the CSS. Third, imports are treated differently in the SAM than in the input-output table. In the input-output table each element of the final demand and transaction matrices consists of imports and domestically produced products. In the SAM, imported components are separately identified in both intermediate and final demand expenditures. These are then summed vertically and shown as a separate imports row, rather than being subtracted from final demand as a column vector. Imports are further disaggregated in the SAM into foreign labour and goods, recognising that industrial production uses the imports of foreign labour as well as intermediate goods from the rest of the world. Payments to foreign labour are calculated from internal South African Reserve Bank documents. Finally, the revaluation of inventories is treated separately in the SAM.

Government income and expenditure are also disaggregated in the SAM. The distribution of government payments to various occupation groups are obtained from the 1980 census (CEAS,1986:30).

The basic format of the 1978 SAM is shown in Appendix C (p.275) with the control totals for each submatrix and row and column total shown. The detailed methodologies used in constructing each submatrix and in balancing the SAM, fall outside the scope of the present study. The reader is referred to CEAS (1986:25-38). To facilitate comparison with the 1988 SAMs of the Development Bank and the CSS, a simplified version of the 1978 SAM is presented in table 12 :

Table 12 : A simplified 1978 South African SAM (R millions)

	Production Activities			Production Factors			Institutions			Capital	External	12
	1	2	3	4	5	6	7	8	9	10	11	
	Primary	Second	Tertiary	Capital	W&SWhite	W&SBlack	HHWhite	HHBlack	Govt	Invest	Exports	Total
Product	1Primary	335	3377	104	0	0	0	312	499	6	106	12133
Activity	2Secondary	1893	12583	2893	0	0	0	3815	3575	1381	7089	36435
	3Tertiary	1119	5903	5640	0	0	0	6047	3973	395	827	25253
Product	4 Capital	5862	4202	7045	0	0	0	0	0	785	-1044	17246
Factors	5W&S White	728	3901	4911	0	0	0	8	0	1966	0	11511
	6W&S Black	1413	2870	2219	0	0	0	554	12	1482	0	8549
Instit	7HH White	0	0	0	3958	11247	0	40	0	857	0	16220
	8HH Black	0	0	0	1033	264	8549	0	319	169	0	10354
	9Govment	89	340	742	3013	0	0	2872	980	582	200	8978
Capital	10Savings	0	0	0	8293	0	0	1590	587	905	0	11375
	11Imports	587	3250	1700	949	0	0	982	409	450	4196	1330
	12Total	12133	36435	25253	17246	11511	8549	16220	10354	8978	11375	13862

In table 12 the entire input-output coefficient structure, representing the interaction between the 24 industries in the SAM in Appendix C have been collapsed into the submatrix defined by rows and columns 1 to 3. Renumeration is represented by accounts 5 and 6, in which Black wages and salaries combines all non-White groups. The submatrix defined by rows 7 to 9 by columns 4 to 6 is the distribution matrix. From table 12 the unequal distribution of income in South Africa can be determined from the distribution matrix, which indicate that White households obtain R 15 205 million from production factors against Black households' R 9 846 million.

From table 12 can be seen that the 1978 South African SAM does not make a distinction between commodities (products) and production activities (industries). In chapter 3 it was mentioned that such a distinction allows one more freedom in defining activities according to criteria other than only the characteristic products. For example, activities producing essentially the same type of products might vary with the regard to levels of technology or employment requirements, as is often the case if a distinction is made between small and

large businesses (Meller & Marfan, 1981). In view of the potential role of small and medium and emerging (SMEE) enterprises in South Africa to alleviate unemployment (Thomas, 1992:464) such a distinction could be useful. Furthermore, if one is to incorporate the informal sector in a SAM, households and small enterprises would have to be distinguished from larger, limited liability companies (Keuning, 1985). The Swaziland SAM is an example of a country SAM that contains the distinction between commodities and activities (Hayden & Round, 1982).

Because it has been noted that regional household income and expenditure backward linkages are more important in many developing countries than inter-industry multiplier effects (MacNicoll & Davies, 1987), the construction of regional SAMs should be encouraged (see Chander *et al.*, 1980). In light of the spatial maldistribution of production and income in South Africa (Kritzinger-van Niekerk *et al.*, 1992:6) regional SAMs can be a potential useful tool for planning regional development in South Africa (CEAS,1986:80).

The compilation of regional SAMs can be approached from two angles. On the one hand it is possible to disaggregate the national SAM into its regional components. On the other hand the regional SAMs can be combined in a multiregional table. The South African regional SAM is of the first kind, while the Malaysian SAM is of the second kind.

The format of the SAM in Appendix C can be compared with that of the regional SAM for 1978 in Appendix D (p. 276). While the regional SAM is also based on the input-output accounts, it does not offer the same level of detail on income flows as does the proper SAM (therefore known as the "income" SAM). Furthermore labour and capital income are lumped together. It should be noted that the economic regions used in this SAM were

redefined in November 1985. Changes were made to region C and an additional region, region J, was created.

A number of shortcomings of the 1978 SAM have been pointed out. These were the dated base year, the classification of households into ethnic groups without consideration of rural and urban households, the omission of the informal sector, and the omission of a distinction between activities and commodities. Many of these shortcomings violate the basic steps suggested in chapter 3 to follow when compiling a SAM, and highlight the need for a comprehensive manual on SAM construction. As far as modelling is concerned, McGrath (1987:309) is of the opinion that "...the cost of such a model for South Africa would be quite exorbitant, and the writer would rather see resources being allocated to improving the database for the economy, before building a skyscraper on hollow foundations".

While most of McGrath's (1987) criticisms against the 1978 SAM has merit, and can also be levied against the 1988 SAMs, it is argued in chapter 5 that the costs of using the SAM for a CGE model need not be as "exorbitant" as he claims. The usefulness of SAMs for modelling has been established, and the applications of the 1978 SAM through first generation CGE models have already reaped benefits for policy analysis in South Africa (see sections 4.4 and 4.5). From the previous chapter one can conclude that the compilation a SAM is not a trivial task, but a challenge. SAMs therefore need to be pushed to their limits to make their compilation worthwhile.

4.3 THE 1988 SOUTH AFRICAN SAMs⁷

In this section the two SAMs for 1988 are contrasted with the 1978 SAM and with one another. The SAM compiled by the Development Bank of Southern Africa is discussed in section 4.3.1 while the SAM compiled by the CSS is discussed in section 4.3.2.

4.3.1 The Development Bank's 1988 SAM

The Development Bank's "preliminary" SAM is prefaced by a declaration that by the time the 1978 SAM was published (1986) it was already dated (Van Seventer et al., 1992:1). Roukens de Lange and van Seventer (1990) and Van Seventer et al. (1992:1) justify the compilation of a new SAM for South Africa on the following grounds. First, negotiations on South Africa's political and economic future necessitates the use of tools for analysing different positions on income distribution and economic growth. Second, the 1978 relationships in the CEAS's SAM are dated. Third, the South African economy underwent a period of structural transformation during the 1980s, starting with the tri-cameral parliament in 1983 and the repealing of different restrictive policies. The period also includes the full implementation as well as the partial lifting of sanctions against South Africa. Finally, as Van Seventer et al. (1992:1) point out, the 1978 SAM contained a number of deficiencies. These deficiencies were mentioned in the previous section with reference to McGrath's (1987) criticism.

The 1988 SAM is based on the 1988 input-output table. The control totals for the basic framework of the Development Bank's SAM are contained in Appendix E (p.277) while an aggregated version of this SAM is presented in table 13. Appendix E can be compared to the 1978 SAM in Appendix C (p.275) while table 13 can be compared to table 12.

⁷ This section is based on Van Seventer et al. (1992), Eckert et al. (1992) and CSS (1993).

Table 13 : A simplified 1988 SAM for South Africa by the Development Bank of Southern Africa

	1	2	3	4	5	6	7	8	9	10	11	
	PRIMARY	SECOND	TERTIAR	CAPITAL	W&S WHITE	W&S BLACK	HH WHITE	HH BLACK	GOVT	INVEST	EXPORTS	TOTAL
1 PRIMARY	1623	13486	90	0	0	0	1817	3461	291	240	32968	53976
2 SECONDARY	8771	89587	8932	0	0	0	33382	36505	9150	36614	23506	246447
3 TERTIARY	2069	21291	9611	-1480	0	0	12422	5453	647	757	1382	52152
4 CAPITAL	24350	44638	14916	0	0	0	0	0	7951	-7084	1652	86423
5 W&S-WHITE	4150	26364	10322	0	0	0	8	7	11228	0	0	52079
6 W&S-BLACK	7489	23419	3296	0	0	0	1600	587	10726	0	0	47117
7 HH WHITE	0	0	0	18846	52077	0	218	0	1551	0	104	72796
8 HH BLACK	0	0	0	5975	0	47117	0	1073	3814	0	259	58238
9 GOVT	780	4155	2923	12792	0	0	16738	6959	3992	3861	-533	51667
10 SAVINGS	0	0	0	42977	0	0	2696	913	-1247	0	0	45339
11 IMPORTS	4744	23507	2065	7313	0	0	3914	3280	3564	10951	2728	62066
12 TOTAL	53976	246447	52155	86423	52077	47117	72795	58238	51667	45339	62066	

At first glance it is clear that the 1988 SAM follows the format of the 1978 SAM in broad terms. A number of changes are made, however, some of which are more obvious from Appendix E than others. First, industries are aggregated into 34 instead of 24 sectors. This choice is based on Roukens de Lange and van Seventer's (1990:162-163) argument that a better selection of industrial sectors than the 24 in the 1978 SAM can be made. The correspondence between the 34 production activities in the 1988 SAM and the 93 in the 1988 input-output table is listed in table 14 :

Table 14 : Correspondence between production sectors of the 1988 SAM and the 1988 input-output table:

TITLE	DESCRIPTION	I-O SECTOR	SIC CODE
1 Agr	Agriculture	1	1110-1302
2 gold	Gold mining	3	2400
3 min	Other mining	2,4, & 5	2100-2302,2700-2900
4 food	Food processing	6 - 16	3111-3122
5 bev	Beverages	17-19	3131-3134
6 tobac	Tobacco	20	3140
7 text	Textiles	21-28	3210
8 cloth	Clothing	29	3220
9 leath	Leather	30-31	3231-3233
10 footw	Footwear	32	3240
11 wood	Wood	33	3310
12 furn	Furniture	34	3320
13 paper	Paper	35-37	3410
14 print	Printing	38	3420
15 chem	Chemicals	39-45	3510-3540
16 rubber	Rubber products	46-47	3550
17 plast	Other plastic products	48	3560
18 n-m-min	Non metal minerals	49-53	3610-3690
19 bas-met	Basic metals	54-55	3710-3720
20 fab-met	Fabricated metals	56-59	3810
21 machin	Machinery	60-65	3820
22 el-mach	Electrical machinery	66-69	3830
23 trp-eq	Transport equipment	70-75	3840-3850
24 oth-manf	Other manufacturing	76-77	3861-3900
25 electr	Electricity, gas & water	78-79	4100-4200
26 constr	Building construction	80	5100
27 civ-eng	Civil engineering	81	5200-5300
28 trade	Wholesale & retail trade	82	6100-6200
29 accom	Accommodation	83	6300
30 transp	Transport	84	7100
31 commun	Communication	85	7200
32 finance	Financial services	86-89	8100-8300
33 com-serv	Community services	90-92	9200-9520,9591-9599
34 n-class	Non classified	93	0100

(Source : Van Seventer *et al.*, 1992 : 21)

A second difference between the 1978 SAM and the 1988 SAM of the Development Bank is that a new procedure is developed to trace payments of salaries and wages to workers in

occupations in an attempt to capture the shift towards fewer unskilled workers in the occupational classification of the industrial sector and also to capture the influence of organised labour on wage levels. In the Development Bank's SAM, single and multiple Black households are separately distinguished. In other population groups, households are undifferentiated. This distinction is aimed at representing the system of oscillating migration which characterises South Africa's labour market, where a number of males lives away from home.

A third difference is that only six income classifications are used for households instead of seven. Data on household income classes are obtained from the Urban Foundation's income distribution model (UF,1991). Household expenditure data are taken from the Bureau for Market Research (BMR,1985) while unpublished data from the Central Statistical Services are used to separate indirect taxes and subsidies on expenditures. Finally, to obtain a SAM without Namibian data the bi-proportionality technique (see Miller & Blair,1985:306) is used to adjust the 1988 input-output totals to the revised national income accounts contained in the June 1991 Reserve Bank Quarterly Bulletin.

4.3.2 The CSS's 1988 South African SAM

The Central Statistical Services (CSS,1993) released their 1988 South African SAM in January 1993. As in the Development Bank's case their SAM is labelled as provisional. This SAM is mainly compiled from CSS data, although data from the Reserve Bank, the 1991 Population Census and various Household Surveys for South Africa and the TBVC-States are used. As in the Development Bank's SAM, Namibian data are excluded.

From Appendix F (p. 278) can be seen that the basic framework of the CSS's SAM is similar to that used by the CEAS (1986) and the Development Bank (Van Seventer *et al.*,

1992). As such it remains susceptible to the criticism levied against the previous SAMs for omitting the informal sector and for not making a distinction between rural and urban households. It remains to be seen if the benefits of comparison with the 1978 SAM outweighs the loss of a more accurate framework for analysing South Africa's particular structure of poverty. Table 15 presents a simplified version of the CSS's 1988 SAM and facilitates comparison with the 1978 SAM and Development Bank's SAM (respectively in tables 12 and 13).

Table 15 : A Simplified 1988 South African SAM by the CSS (R millions)

	1	2	3	4	5	6	7	8	9	10	11	
	PRODUCTION			CAPITAL	W&S	W&S	HH	HH	GOVT	INVEST	EXPORT	TOTAL
	PRIMARY	SECOND	TERTIARY		WHITE	BLACK	WHITE	BLACK				
1 PRIMARY	1790.58	13567.65	99.99	0	0	0	1957.28	3496.22	313.59	438.9	32037.53	53701.74
2 SECONDARY	11192.51	88692.14	7667.89	0	0	0	33788.61	36671.64	9388.98	37519.52	23726.34	248647.8
3 TERTIARY	2750.02	20297.95	9115.28	-1680	0	0	10608.48	7038.91	773.41	657.57	1400.08	50961.7
4 CAPITAL	22732.74	47440.36	13529.81	0	0	0	0	0	7951	-7084	1652	86221.91
5 W&S WHITE	3035.73	24329.64	11947.62	0	0	0	25.27	0	10208.29	0	0	49546.55
6 W&S BLACK	6816.91	26293.19	3597.84	0	0	0	1693.69	160.18	10970.69	0	0	49532.5
7 HH WHITE	0	0	0	18964.29	49546.55	0	255.53	0	1620.23	0	194.56	70581.16
8 HH BLACK	0	0	0	5857.41	0	49532.5	0	1684.4	3742.82	0	168.48	60985.61
9 GOVT	762.38	4074.9	2873.23	12790.1	0	0	16009.53	7293.53	4711.49	3689.77	-540.43	51664.5
10 SAVING	0	0	0	42977.01	0	0	2266.44	1342.57	-1247	0	0	45339.02
11 IMPORTS	4620.87	23951.8	2130.04	7313.1	0	0	3976.33	3298.16	3231	10117.26	2728	61366.56
TOTAL	53701.74	248647.6	50961.7	86221.91	49546.55	49532.5	70581.16	60985.61	51664.5	45339.02	61366.56	
ROW TOT	53701.74	248647.6	50961.7	86221.91	49546.55	49532.5	70581.16	60985.61	51664.5	45339.02	61366.56	

From comparison of appendices E and F and tables 13 and 15, it is clear that the major differences between the two SAMs are subtle. One such difference is that the relative shares of White and Black incomes have shifted in favour of Blacks in the CSS's SAM. Because the CSS's SAM is based on the 1991 Population Census as far as household income and expenditure are concerned, its results may be more accurate than that of the

Development Bank. A second reason for the difference is that the CSS adjusted production factors' receipts of salaries and wages to bring it into line with the national account's definition of remuneration of employees. This is done by excluding farming profits and the profits of one man businesses and partnerships from the occupational groups (CSS,1993:3). Thirdly, the CSS (1993) does not regard the employment of Blacks in the service sector as being only in the domestic service of White households. Black households employing Black workers are also reflected.

A number of smaller differences between the CSS's SAM and the Development Bank's that are not obvious from Appendix F or table 15 are the following :

(i) Only 23 industries are identified in the CSS's SAM, and not 24 as in the 1978 SAM or 34 as in the Development Bank's SAM. According to the CSS (1993:2) this is due to less detail being available in the 1991 census.

(ii) 13 occupational groups are distinguished in the CSS's SAM (row/column 3 in Appendix F) against the 10 in the previous SAMs. These 13 groups are

- Professionals
- Other professionals
- Technical workers
- Managerial workers
- Clerical
- Sales
- Transport
- Services
- Farmers
- Artisans

- Production workers
- Labourers
- Non - classified

(iii) Only six income distribution categories (quantiles) are distinguished against the 7 that were used in the 1978 SAM. These are :

<u>Quantile</u>	<u>Percentage of the population</u>
Q1	0-20
Q2	21-40
Q3	41-60
Q4	61-80
Q51	81-90
Q52	91-100

The population numbers per quantile are obtained from the 1985 population census in order to calculate the household income per capita.

Just as in the Development Bank's SAM, the CSS also disaggregates the capital account into that of government and non-government.

In the next section, the results from the first generation CGE models based on the South African SAMs are reviewed.

4.4 GENERAL EQUILIBRIUM MODELS BASED ON THE SOUTH AFRICAN SOCIAL ACCOUNTING MATRICES

In this section, attention is given to the first generation CGE models based on the South African SAMs. Previously input-output models were the only general equilibrium models used to evaluate policy options in South Africa. Holden and Holden (1975,1978) used the 1956 and 1963 input-output tables to calculate effective tariff rates for South Africa under various assumptions regarding the elasticity of factor substitution. They later used the input-output tables for 1967 and 1975 to investigate the relationship between South Africa's trade regime and the composition of output and found that export industries are generally more labour intensive than other industries (Holden & Holden, 1981:239).

Interpretation of the results of SAM-based models should be seen against the fact that they are more suited for structural issues than stabilisation issues, and that for interpretation of the results it might be useful if one is aware of the structural characteristics of the economy under investigation. In order to show that SAM-based models can make a contribution to the debate on income redistribution and economic restructuring in South Africa, the structural characteristics of the South African economy are discussed in the next subsection⁸. Thereafter two descriptive studies based on the 1978 SAM, by Eckert and Crouch (1986) and Dreyer and Brand (1986) are reviewed. This is followed by a review of the results from the first-generation SAM-based models in South Africa.

⁸ The description in this section also serve as background for the interpretation of the results from a CGE model of the South African economy based on a financial SAM in chapter 9.

4.4.1 Structural distortions in the South African economy

The present government has a history of state intervention aimed at structuring consumption and production along racial lines (Morris, 1991:36). This intervention was based, in part, on a strategy of import substitution industrialisation (ISI) (Morris, 1991; Gelb, 1991). The ISI strategy aimed at making South Africa self-reliant. Accordingly strategical rather than economic considerations guided state intervention, as is witnessed by the establishment of parastatal corporations such as Armscor, Sasol, Atlantis Diesel Engines, Iscor and Mossgas.

During the 1970s, it became clear that the ISI strategy was a failure. Moreover, it had distorted the structure of the economy. Besides the obvious unequal income distribution, these distortions are evident from three other characteristics of the South African economy.

First, South Africa's import propensity remains at approximately 24 percent of GDP. Compared to other countries in a similar stage of development such as Brazil, Mexico and Argentina with import propensities around 10 percent of GDP, this is high. It is not only the level of imports which is problematic, but also the composition of the imports. Kritzinger-van Niekerk *et al.* (1992) mentions that 35,5 percent of South Africa's fixed investment is imported. Black (1985:155) estimates that 80 percent of all new technology in the South African manufacturing sector are imported. According to Black (1991b:160) a reason for South Africa's continued high import propensity is the pattern of demand caused by the unequal distribution of income. Kaplan (1991:176) ascribes the dependency on imported technology to the fact that the ISI strategy encouraged production for the domestic rather than for the export market. He also claims that high levels of economic

concentration in South Africa have made many firms reluctant to undertake technical innovation.

Although the government recognised this problem, and the Kleu Report (RSA, 1983) advocated a more outward-orientated strategy, several factors impeded the implementation of such a strategy, such as the imposition of sanctions and powerful vested interest in domestic tariff protection.

The second distortion caused by the ISI strategy is the failure of South African manufacturing to develop a significant export capacity. South Africa's share of world manufactured exports fell from 0.8 percent in 1955 to 0.3 percent in 1985. Moreover, South Africa's share of developing country manufactured exports fell from 12,6 percent in 1955 to only 1,9 percent in 1985 (Black, 1991a:2). Aspects related to the ISI strategy which led to this decline can be identified as exchange rate policy which favours the mining industry⁹ (Kahn, 1992:4) and the particular form of import substitution which protects upstream industries at the expense of those downstream with larger value added components (Bell, 1975:499-500). Furthermore, the racial inequalities in education have led to a shortage of skills, already felt in the 1970s. The shortage of skills led to lower productivity growth while trade unions began bargaining for larger real wage increases. According to Hofmeyer (1990) and Van der Berg (1989) the real wages of Blacks increased by 240 percent between 1970 and 1985. As a consequence South Africa's international competitiveness was adversely affected, and the capital intensity of production increased. This further heightened the dependency of the manufacturing sector on imported capital goods.

⁹ Since 1973 a flexible exchange rate regime was followed in order to stabilise the gold earnings of mines. This increased manufacturers uncertainty over export earnings.

The third distortion caused by the ISI strategy is the increasing dominance of the government sector in the South African economy. Faced with with a 1,5 percent average growth rate between 1974 and 1990, increasing social unrest and international isolation, government intervention in the economy increased significantly since the 1970s. For example, during the 1980s 341 000 employment opportunities were created in the government sector, against 57 000 in the manufacturing sector (Hugo, 1992:86). In 1990 the total number of employees in the government sector totalled 1,6 million, or 15 percent of the economically active population (Hugo & Stack, 1992:53). Since salaries and wages in the government sector increase by more than any other producer prices in the economy, the increase in the size of the government is an important factor in adding momentum to inflation. Also, 63,7 percent of all net fixed investment between 1970 and 1985 were made in the government sector (Kritzinger- van Niekerk et al., 1992:4).

From the above discussion it is clear that the South African economy needs to be restructured. This restructuring should be aimed eliminating the distortions in the economy and at making growth through redistribution feasible. The remainder of this chapter is devoted to a consideration of the evidence in this regard from first generation CGE models of the South African. Models by Van Seventer, Wang and Mullins, Eckert and Mullins, and Roukens de Lange are considered. These models were preceded by two studies using the SAM in a descriptive manner. These are by Eckert and Crouch (1986) and Dreyer and Brand (1986). Both studies use the 1978 SAM for analysing income redistribution.

4.4.2 Eckert and Crouch

In section 4.3 it was explained that the four households receive their income from salaries and wages paid to them by 10 occupational groups in case of the 1978 SAM

(CEAS,1986) and the Development SAM (Van Seventer, et al., 1992) and 13 occupational groups in case of the CSS's SAM (CSS,1993). It was explained that this income is supplemented with income from transfers and income from property. Eckert and Crouch (1986:288) derives the following table to trace the percentage of each households income coming from each source :

Table 16 : Percentage of household income from different sources

SOURCE OF INCOME	HOUSEHOLD GROUP			
	WHITE	COLOURED	ASIAN	BLACK
Salaries & Wages				
-from industry	57.18	69.60	64.56	63.21
-from government	12.12	17.44	15.28	14.54
-from households	0.05	3.28	0.29	6.94
Subtotal : Salaries	69.35	90.32	80.13	84.70
Property Income	24.40	5.89	17.03	9.64
Transfers				
-from relatives	0.25	0.13	0.17	4.47
-from government	5.28	3.52	2.16	0.99
-from abroad	0.72	0.14	0.51	0.20
Subtotal : Transfers	6.25	3.79	2.84	5.66
TOTAL	100	100	100	100

(Source : Eckert & Crouch, 1986:288)

From table 16 can be seen that White households' income are more evenly received from the different sources than that of the other households. The main source of income for all households is salaries and wages, although White households seem to be less dependent on salaries and wages, with 69,35 percent of their income coming from salaries and wages while more than 80 percent of the other households' income come from salaries and wages. White households furthermore stand out in that a significant amount of their income comes from property, namely 24,40 percent, compared to 9,64 percent for Blacks. It is noticeable from table 16 that Black and Coloured households are more dependent than the other households on income from other households, in the form of payments for

domestic services delivered. Another noticeable feature of Black incomes has already been mentioned in section 4.3, namely the importance of transfers from relatives. Table 16 indicate that Black households receive 4,47 percent of their income in the form of transfers from relatives, while Whites receive only 0,25 percent of their income from that source. In contrast, Whites receive the greatest part of their transfers from the government, in the form of pensions (Eckert & Crouch, 1986:289).

The incomes of the four households from salaries and wages are paid over to them by labour in different occupational groups. It has been mentioned that this is reflected in the distribution matrix in the SAM. The characteristics of the distribution matrix of the 1978 SAM are summarised in table 17 where the percentage of each household's income that derive from a specific occupation group, is listed :

Table 17 : Percentage of household income from occupations

OCCUPATION	HOUSEHOLD WHITE	GROUP COLOURED	ASIAN	BLACK
Professional	14.2	5.0	10.3	2.8
Technical	6.9	4.2	4.1	2.7
Other Prof	1.1	0.2	0.4	0.1
Administrative	13.8	1.1	4.5	0.3
Clerical	20.6	12.2	22.3	7.2
Sales	12.1	5.4	18.1	4.5
Services	5.9	11.8	6.3	18.3
Farm	0.7	6.1	0.8	7.2
Labourer	24.1	52.9	32.5	54.8
Other	0.6	1.3	0.8	2.1

(Source : Eckert & Crouch, 1986:290)

From table 17 the sources of White households' income are more diversified than that of the other households. A significant proportion come from higher paying occupations such as the professional, technical, administrative, clerical and sales occupations. Although labourers constitute the largest source of income for each household, for Coloured and Black households this source exceeds 50 percent, indicating a narrow occupational base. Eckert & Crouch (1986:290) identify as the cause of this characteristic socio-political and historical factors which have limited opportunities for education, training and advancement for Black households.

The fact that Black households receive 18,3 percent of their income from domestic services, have lead Eckert and Crouch (1986:290) to comment that redistributive policies that adversely affects White households may have a negative impact on Black households. This comment should be judged in light of the fact that the 1978 SAM assumes all Black domestic workers to be in the service of White households. The 1988 CSS's SAM corrects

this distortion, although no study has as yet been done with this SAM to determine the extent of the dependency of Black domestic servant's income on White incomes.

While the 1978 SAM identifies household incomes by flow, these figures need to be adjusted for the number of people in each household income class. As was explained in an earlier section, each household is divided into 7 income classes, based on quantiles and percentiles. In 1978 a percentile of the White population contained 436367 persons while a percentile of the Black population contained 2002970 persons. The Coloured population contained 248713 persons and the Asian population 77898 persons. These figures allows table 16 to be written in per capita terms as in table 18:

Table 18 : Sources of per capita income for households in the 1978 South African SAM

Source of Income	Per capita Whites	incomes of : Coloureds	Asians	Blacks
Salaries & Wages				
-from industry	2125,12	536,12	673,12	222,19
-from government	450,54	134,40	159,31	51,11
-from households	1,83	25,27	3,07	24,40
Subtotals	2577,38	695,79	835,50	297,70
Property Income	906,98	45,40	177,58	33,90
Transfers				
-from relatives	9,24	1,00	1,81	15,75
-from government	196,42	27,15	22,47	3,49
-from abroad	26,88	1,11	5,32	0,69
Subtotal	232,54	29,25	29,61	19,89
All incomes	3716,91	770,45	1042,69	351,49

(Source : Eckert & Crouch, 1986:293)

From table 18 can be seen that in 1978 White per capita income was 10,5 times higher than Black per capita incomes. Recently, the CSS (1993) used their 1988 SAM to find that White per capita income had declined to 8,47 times that of Black income.

In sum, tables 16 to 18 indicate that any redistribution strategy in South Africa ought to consider that Black households are particularly disadvantaged with respect to (i) property incomes, (ii) transfers from government, and (iii) transfers from abroad. Black households are also dependent on low paying occupations, especially domestic services through which they may be susceptible to shocks to White incomes. While these facts illustrate part of the legacy of apartheid, it also suggest part of the solution : significant retraining and improvement of educational programmes for Blacks are necessary for Blacks to diversify their employment base to include higher income occupations. The results from first generation CGE models, which are discussed below, emphasises this fact.

4.4.3 Dreyer and Brand

Dreyer and Brand (1986) use the 1978 SAM to investigate the changing sectoral patterns in the South African economy. They compare this with the "stylised facts" about structural change and development as identified by Chenery (1979). Dreyer and Brand indicate (1986:132) that the differences in South Africa's sectoral change from the norm is due to administrative control over Black urbanisation and the limited mobility of Blacks between lower and higher-skill occupation groups. These factors cause the mining sector to remain the dominant sector in South Africa, and industrial development to lag behind that of countries in a similar stage of development. Dreyer and Brand (1986:140-141) postulate that as urbanisation in South Africa accelerates, and income redistribution continues to take place, the demand for basic goods such as food, clothing, housing, public transport and furniture will increase. Under such circumstances, the overall propensity to save in the

economy is likely to decrease. This could lead to an imbalance between savings and investment, and consequently a deficit in the current account of the balance of payments. To test this postulate Dreyer and Brand use the 1978 SAM under a number of assumptions to obtain two scenarios for the pattern of structural change in South Africa from 1978 to 1990. First it is assumed that real per capita incomes for Whites, Coloureds, Asians and Blacks will increase over the period by respectively 0,04, 2,55, 1,74 and 3,56 percent per year. Second, it is assumed that the populations of the four households will respectively increase by 0,70, 1,81, 1,86 and 2,70 percent per year. Scenario 1, of no income redistribution, are compared with the results from scenario 2, which gives the influence of income redistribution measures on the production structure. The results are summarised in tables 19 and 20 :

Table 19 : Percentage share of aggregated production sectors in total production

Production Sector	1978	1990	
		No income redistribution	Positive income redistribution
Primary	16,44	15,01	15,30
Secondary	49,36	49,69	49,68
Tertiary	34,21	35,30	35,02
Total	100	100	100

(Source : Dreyer & Brand, 1986:144)

The results in table 19 show that under income redistribution primary production is set to increase slightly at the cost of production in the tertiary and secondary sectors. More detailed results are contained in table 20 :

Table 20 : Percentage share of major sector classifications in total production

SECTOR	1978	1990	
		No income redistribution	Positive income redistribution
Agriculture	6,10	5,92	6,37
Mining	10,33	9,09	8,93
Manufacturing	39,98	40,36	40,69
Electricity	2,76	2,73	2,64
Construction	6,62	6,60	6,35
Trade	13,07	13,20	13,49
Transport	7,65	8,46	8,53
Financial services	8,98	9,11	8,64
Commuting services	2,23	2,28	2,10
Other	2,27	2,26	2,27
Total	100	100	100

(Source : Dreyer & Brand, 1986:146)

From the results summarised in tables 19 and 20 Dreyer and Brand (1986:145-146) conclude that income redistribution in South Africa could cause changes in the sectoral composition of aggregate demand that would favour agriculture, manufacturing, trade and transport and could disadvantage construction, electrical services and the financial sectors. Income redistribution could thus stimulate GDP growth, giving support for a "growth through redistribution" strategy (A.N.C.,1990). Support for Dreyer and Brand's findings were recently obtained by the CSS (1993) from a study of their 1988 SAM. They find that, as Dreyer and Brand suggests, income redistribution would lower the propensity to save in the economy. Considering that the share of White incomes in total income declined by 9 percent between 1978 and 1988, and that the share of Black incomes increased by 7 percent over the same period, the CSS (1993:9) found the following propensities to save for the different households :

Table 21 : Propensities to save in South Africa according to SAMs

Household	1978	1988
Whites	11,17	3,86
Coloureds	8,23	3,42
Asians	3,25	1,98
Blacks	5,30	2,07

(Source : CSS, 1993:9)

From table 21 can be seen that the propensities to save amongst all the household groups declined significantly between 1978 and 1988. Especially noticeable is the large decline in White households' propensity to save, reflecting in part the decline in White real incomes between 1978 and 1988. The results reinforce Dreyer and Brand's concern over the current account, and considering South Africa's large import propensity, one can expect a significant deficit on the current account to emerge should the South African economy show a positive growth rate in the near future. Should the need arise to borrow from the IMF, South Africans would be well advised to study the consistency of IMF conditionality with an income redistribution strategy.

The value of Dreyer and Brand's (1986) contribution lie in their illustration of the descriptive power of a SAM. Many of the fundamental structural characteristics of the South African economy can be derived from it. Its strenght in providing answers and guidelines to economic restructuring implies that policymakers should be aware of its value in designing and evaluating policy measures. When used as a model, and not just a descriptive database as in Eckert and Crouch (1986) or Dreyer and Brand (1986), its potential value can even be increased. This will become clear in the following sections where the first generation models based on the 1978 SAM are discussed. It will become clear that these models can extend and/or modify the results obtained by Eckert and

Crouch (1986) and Dreyer and Brand (1986), and offer additional insights into ways to approach the structural distortions in the South African economy.

4.4.4 Van Seventer's semi-closed input-output model

Van Seventer (1987) uses the 1978 SAM as a semi-closed input-output model¹⁰ to investigate the effects of income redistribution in South Africa. This model is essentially an input-output model which incorporates income distributions. Examples of similar models are by Paukert *et al.* (1981), Pyatt and Roe (1977) and Behrens (1984). In matrix notation the model is specified as

$$(4.1) \quad AY + X = Y$$

Where

A = coefficient matrix

Y = a column vector of endogenous variables

X = a column vector of exogenous variables

This equation can be re-written in solution form as

$$(4.2) \quad Y = (I-A)^{-1}X$$

A discussion of the submatrices and subvectors consumed within A and Y and X are contained in Van Seventer (1987:136-137). The distribution of income in the 1978 SAM is taken as the base distribution against which simulation results are compared. Three

¹⁰ The semi-closed input-output model differs from the closed input-output model by treating the household sector as a distinct decision making unit and not as another industry as in the closed input-output model.

simulation runs are performed. In one simulation run a less equitable income redistribution is used and in the other two more equitable distributions are used. The figures used for the three simulation runs are summarised in table 22 :

Table 22 : Simulation runs in Van Seventer's (1978) semi-closed input-output model

HOUSEHOLD	1978 SAM	RUN 1	RUN2	RUN3
Whites	62,4	70,0	48,0	40,0
Coloureds	7,4	7,0	11,0	14,0
Asians	3,1	3,0	6,0	6,0
Blacks	27,1	20,0	35,0	40,0

(Source : Van Seventer, 1987:139)

In table 22 the percentage income received by each household as a percentage of the total income is given in respect of 1978.

The results of the simulation runs described in table 22, are contained in Van Seventer (1987:141-143) and are too extensive to replicate here. His main findings are that sectors such as agriculture, food processing, beverages, tobacco, textiles, clothing, leather, wood, paper, trade and transport will benefit the most from a redistribution of income towards the Black population. These sectors benefit at the expense of fabricated metals, electricity, finance, construction and community services. Van Seventer (1987:140) points out, however, that the decline in construction and community services point to the rigidities of his model, since income redistribution is likely to coincide with Black urbanisation which would probably lead to an increase in construction and community services.

In general, Van Seventer's (1987) results concur with those of Dreyer and Brand (1986). Van Seventer's (1987) results also have similarities with that of Eckert and Crouch (1986)

in that Van Seventer (1987:140) identifies a dependency of Black income on White income. This dependency is through government tax revenue, which might be adversely affected when White household income declines. As a consequence, the government will have less income to spend on Black upliftment, and/or would have to shift the main source of tax income away from direct taxes towards indirect taxes such as VAT which would impact regressively on low income earners. One already sees in South Africa a shift away from direct income tax towards indirect taxes.

Van Seventer's (1987:142) model also supports Dreyer and Brand's (1986) finding that income redistribution might worsen the current account. In Van Seventer's model the cause is the higher imports of intermediate goods required to produce the consumer goods desired by the Black population. One can thus conclude that income redistribution strategies in South Africa would have to be accompanied by import substitution and/or export promotion strategies. In light of the discussion in section 4.4.1 which pointed to the failure of import substitution strategies in the past, export promotion seems to be the preferred strategy. The finding by Holden and Holden (1981) that export promoting strategies might create more employment opportunities than an import substitution strategies, should be taken into consideration.

As far as employment and economic growth is concerned, Van Seventer's results indicate that a redistribution of income may have a "non-negative effect on GDP and a definite positive effect on employment" (p. 144). Recent results by the CSS (1993) derived from their 1988 SAM explains this by finding that the GDP multiplier for Black household expenditure is 1,25, compared to 1,16 for Coloureds, 1,15 for Asians and 1,04 for Whites.

4.4.5 Wang and Mullins' semi-closed input-output model

Wang and Mullins' (1989) model is linear, demand driven and assumes that capacity constraints are absent. The model uses a semi-closed input-output structure with the household sector as the source of final demand. The model distinguishes 24 productive sectors. The return on labour is divided into the four main population groups. Personal income and disposable income are also disaggregated into the four population groups with each population group divided into 7 income groups. In total there are 106 endogenous variables in 106 equations that is written in the format:

$$(4.3) \quad Y = \beta^{-1} \times X$$

Where

Y = the endogenous variable vector;

β = the coefficient matrix; and

X = the exogenous variable vector.

A Keynesian disaggregated consumption function is also incorporated into the model by making consumption demand dependent on the structure of income distribution. After the solutions to the model are obtained, the Gini-coefficients are calculated by using the following formula :

$$(4.4) \quad G = \left(\frac{2}{K} \right) \sum_k \lambda_k - \frac{(K+1)}{K}$$

Where

$\lambda_k = DI_k/\sum DI$ is the K-th income group's share of the totale disposable income (DI).

Wang and Mullins perform three experiments by making changes in the exogenous vector, F. These are (i) a change in the export structure; (ii) an increase in indirect taxes, and (iii) an expansion of capital available in various sectors.

The change in export structure is modelled by assuming a 10 percent decrease in primary exports and a ten percent increase in secondary exports. The results indicate that capital requirements decrease, reflecting that South Africa's primary industries are more capital intensive than the secondary industries. Taken together with Holden and Holden's (1981) results, this could imply that an export promotion strategy should be concentrated on secondary industries to provide the maximum employment opportunities.

An increase in indirect taxes is modelled by assuming a 5 percent increase in GST, and a 5 percent decrease in personal income tax. Wang and Mullins (1989) find that the tax burden on the higher income groups decrease, while the burden on the lower income groups increase. This leads to a deterioration in the distribution of income as measured by the Gini coefficient. This result concurs with Van Seventer's (1987) results that a drop in White incomes could be to the detriment of Black households if it forces the government to rely more on indirect taxation.

An exogenous expansion of capital available in different sectors show that on the basis of the 1978 SAM, a capital expansion programme initiated in the secondary industries may

have beneficial effects on income distribution while an expansion of capital in the primary industries (outside of agriculture) may worsen income inequalities.

Wang and Mullins (1989:231) state that their experiments are merely illustrations of their model, and as such may contain little of relevance for policy makers, especially since South Africa's indirect tax regime changed in the meanwhile. A further shortcoming of their model is that after policy simulations the whole matrix needs to be rebalanced by the bi-proportionality method¹¹. Roukens de Lange (1989) points out that such a procedure may adversely affect the comparability between simulations.

4.4.6 Eckert and Mullins' model

Rather than focus on ways to achieve income redistribution, Eckert and Mullins (1989) concentrate on the consequences of income redistribution. This is done through a fixed-price multiplier model based on the work of Moore and Petersen (1955:368), Miernyk (1965) and Pyatt and Round (1979).

Eckert and Mullins (1989) find that a redistribution of income may lead to an increase in GDP. They calculate that the GDP multiplier for Blacks is 1,23 while the multiplier for Whites is 1,02. This can be compared with the recent results of the CSS (1993) from which can be seen that the multipliers did not change significantly between 1988 and 1978. This result may strengthen the relevance of results from the 1978 SAM. Eckert and Mullins also find that aggregate demand may shift towards the primary and secondary sectors, confirming Dreyer and Brand's finding. Eckert and Mullins point out that for redistribution to be feasible over the long term, the restructuring of the economy is

¹¹ This loss of internal consistency is caused when some of the components of final demand are fixed and the endogenous links between all sectors of the economy are not allowed to operate freely.

needed, since the high dependency on intermediate imports may lead to an increase in the demand for imports and to subsequent balance of payments difficulties. Special attention should consequently be given to the supply of investment capital, because this could be crowded out by higher imports of intermediate goods.

4.4.7 Roukens de Lange's SAMSIM model

Although a first generation CGE model, Roukens de Lange's (1989) SAMSIM model it is not a semi-closed input-output model and differs from the other first generation CGE models in that none of the components of final demand is assumed to be exogenous. SAMSIM does not require to be rebalanced after simulations as is the case in the Wang and Mullins model. Based on the 1978 SAM aggregated into a 34 by 34 matrix, Roukens de Lange performs the following experiments :

- (i) the effects of a government funded public works programme;
- (ii) the impact of direct relative to indirect taxation; and
- (iii) the impact of Black relative to White consumption patterns on the economy.

Roukens de Lange's results concur in general with those of Wang and Mullins, but in a few areas discrepancies exist. An aspect of interest is that government financing of a public works programme will have a significant impact on economic growth and redistribution only if it is financed through deficit spending. In this regard Abedian and Standish (1987) make a strong case for a public works programme in South Africa, and point to the successful public works programme of the 1930s to uplift the poor white community and at the same time reactivate the South African economy. Although the

current (1993/1994) South African budget deficit is at approximately 5 percent of GDP at a moderately high level, there exists some scope for a reallocation of funds within the budget. In education increased standards will have to come from more effective use of existing amounts of money, since the percentage allocation to education in the budget is already above average for a country in South Africa's phase of development (Van der Berg, 1992:137). The scope for reallocation of funds within the budget may be increased through political deregulation. In this regard Mandela (1991) recognises that "...enormous savings will be made as a result of the abolition of the multi-headed hydra represented by the various apartheid administrative structures".

4.4.8 Van Seventer's decomposition of multipliers

Using the same aggregated (34 by 34) SAM as Roukens de Lange, Van Seventer's analysis follows that of Pyatt and Round (1985) by decomposing multipliers into their intragroup, intergroup and extragroup effects. Van Seventer (1990:69) states that the decomposition points at the absence of any inherent progressive redistribution mechanisms in the South African economy. This emphasises the need for economic restructuring in South Africa.

A more problematic issue that Van Seventer's results identify is that the degree of separability of the accounts used in the 1978 SAM (and subsequently in the 1988 SAM) is not obvious. Specifically, lower Black occupation groups do not seem to have the same characteristics as the lower Black household group; a R 100 injection in agriculture raises lower Black occupation groups' income by R14, but those of lower Black households by only R3. This finding supports the claim made in section 3.3.2 that the classification of households according to income classes is not an optimal classification. The case for

distinguishing between rural and urban households and formal and informal households in the SAM can this be reiterated in the light of this finding.

Van Seventer recognise the limitations inherent in the South African SAM and qualifies his results by stressing these limitations. Van Seventer concludes his paper with a plea that CGE modelling in South Africa need to move beyond first generation CGE models to second generation CGE models with "more economic content" (Pyatt, 1989:129).

4.4.9 Iyengar and Porter's hybrid model

Since South Africa "evokes a morbid fascination" (Iyengar & Porter, 1990:2) it is to be expected that not all CGE modelling on South Africa would be done by South Africans. The first CGE model to be implemented for South Africa by non-South Africans, is the hybrid model of Iyengar and Porter (1990). This model is labelled a "hybrid" because its origins are not clear : it is not based on any SAM; it is based on the neo-classical assumptions of utility maximisation but, unlike most other neo-classical models, it omits aggregate demand! Consequently, like most hybrids, this model can be considered sterile. The lack of confidence in this model is shared by the authors themselves who admit that "the treatment of human capital is terribly simplistic" (p.14) - and this in a model that focuses on labour income.

Iyengar and Porter's main finding is that the total removal of labour restrictions proliferated by apartheid could raise GDP by 5 to 10 percent. In the author's opinion this is an overly optimistic finding. Over the long term this might realise, but only if education and training is provided to Blacks to allow their productivity to increase and to allow them to obtain higher paid occupations.

4.5 SUMMARY

The purpose of this chapter was twofold. First, the existing SAMs for South Africa were presented and critically discussed. This was necessary to determine the SAMs' strengths and weaknesses so past modelling results could be interpreted in this light and so that future modelling could attempt to rectify the weaknesses.

Four different SAMs for South Africa were presented. The first two were a SAM for 1978 and a regional SAM for 1978 respectively. They were compiled by the Central Economic Advisory Service (CEAS). The third SAM, for 1988, was compiled by the Development Bank of Southern Africa and the fourth, also for 1988, by the Central Statistical Services (CSS). It was shown that these SAMs follow the same basic structure: an input-output table forms the central building block and is supplemented by data obtained mainly from household income and expenditure surveys and population census reports. As far as the two 1988 SAMs are concerned, the one by the CSS is probably more accurate, as it is based on household data from the 1990 population census, while the Development Bank's SAM uses manpower surveys and the distribution matrix of the 1978 SAM. Both these SAMs are designated as being "preliminary", reflecting perhaps the insecurity of their compilers.

A strong point of these SAMs was shown to reside in the distribution matrix, which shows the mapping of factor incomes from different occupation classifications to four household types, classified by race. From descriptive studies based on these SAMs a number of characteristics of the South African economy were derived. From these it was gathered that any redistribution strategy in South Africa should take into consideration that Black households are particularly disadvantaged with respect to (i) property incomes, (ii) transfers from government and (iii) transfers from abroad. Black households are also

dependent on low paying occupations, especially domestic services, through which they may be susceptible to shocks to White incomes.

A weakness of the SAMs is that, although they are all based on the same format and are easily comparable, the sub-optimal classifications of the 1978 SAM were perpetuated. These classifications are sub-optimal because no distinction is made between rural and urban households and between formal and informal activities. Another weakness of the SAMs is that, due to a lack of a SAM culture in South Africa, they tend to be dated by the time their compilation are completed.

The second purpose of this chapter was to consider the results from first generation CGE models based on the South African SAMs. The results were not only interpreted in the light of the structure and characteristics of the underlying SAMs, but also against the background of the structural distortions in the South African economy. In addition to the unequal distribution of income these distortions were identified as (i) a high degree of dependence on imported intermediate and capital goods, (ii) the failure of manufacturing to develop a significant export capacity; and (iii) the increasing dominance of the government sector in the South African economy.

The results from the first generation CGE models emphasise that income redistribution policies would cause a shift in aggregate demand in favour of basic goods such as food, clothing, housing, public transport and furniture. This shift could stimulate GDP growth. The negative effects of income redistribution would seem to entail, first that the overall propensity to save would decrease and worsen the current account. Second, a decrease in White incomes could lead to erosion of the government's direct tax base, necessitating increases in indirect taxes such as VAT, which are regressive. Third, a decrease in White

incomes could lead to a decline in Black income through Black households dependency on the income of domestic service workers. In the CSS's SAM this dependency is less acute than in the previous SAMs.

The negative effects of income redistribution imply that it should have to be accompanied by import substitution and/or export promotion, and that income redistribution should take place through retraining and better education.

Although the results confirm that general equilibrium models are suitable tools for analysing income redistribution issues, these models for South Africa are still all of the first generation type. As such they are demand driven, and it should be no surprise that they all found a redistribution strategy to be expansionary. Recently, however, Moll (1991) has argued that capacity constraints may cause redistribution policies to fail, and warned against the possibility of a populist experiment occurring in South Africa. Before any final conclusions can therefore be made regarding income distribution in South Africa, the results contained in this chapter need to be complemented by the results from a second generation CGE model.

In the next chapter a conceptual framework for the construction of a second generation CGE model based on the 1988 SAMs is suggested, and its implementation through the appropriate computer software discussed. Results from such a second generation CGE model for South Africa are reviewed.

CHAPTER

5

A CONCEPTUAL FRAMEWORK FOR A CGE MODEL BASED ON A SOUTH AFRICAN SAM¹²

5.1 INTRODUCTION

In the previous chapter, the existing South African SAMs were presented and critically discussed. The results from a number of general equilibrium models based on these SAMs were discussed. These models illustrated the potential benefits of SAMs to provide databases for economic models. In the discussion some of the strengths and weaknesses of South Africa's current SAMs and CGE models were identified. The strengths of the South African SAMs were seen to lie in analysing income distribution and structural adjustment. A number of guidelines were derived for income redistribution strategy in South Africa. One of the SAMs' weaknesses is that they do not contain a distinction between the rural/urban and formal/informal sectors. Another weakness is that the financial sector is not included in the SAMs. A weakness of South Africa's SAM-based CGE models is that they are first generation CGE models. It should therefore not be a surprise that most income redistribution strategies would according to these models be expansionary. The results from a second generation CGE model could either challenge, modify or confirm the results on income redistribution and structural adjustment that were obtained from the first generation models. A second generation CGE model may also point out further

¹² An abridged version of this chapter was published in the *Journal for Studies in Economics and Econometric* (See Naudé, 1993a).

shortcomings of the present South African SAMs; the demands of second generation CGE models should, as was indicated in chapter 3, set the agenda for the revision of South Africa's national accounts.

In this chapter, it is illustrated how a conceptual framework known as the transactions value (TV) approach can be used to translate a SAM into a CGE model and how this model can be solved for policy simulations. Some of the misgivings concerning the potential toil and cost (see McGrath, 1987) involved in starting the general equilibrium inquiry in South Africa will hopefully be dispelled. An indication is given for the direction in which the current SAM ought to be improved if it is to remain relevant as a base for CGE modelling in South Africa.

In section 5.2 the transactions value (TV) approach to SAM-based CGE modelling is presented. In section 5.3 a simple second generation CGE model is described and its solution discussed. In section 5.4 some results from a second generation model based on a South Africa SAM for 1988 are presented. The limitations of second generation CGE models are pointed out in section 5.5 and the implications of CGE modelling for the South African national accounts are drawn in section 5.6. Section 5.7 contains a summary.

5.2 THE TRANSACTIONS VALUE (TV) APPROACH TO SAM-BASED MODELLING

In chapter 3 it was illustrated that a SAM is a way of expressing the "only fundamental law" of economics namely that for every expenditure a corresponding income is created (Pyatt, 1988:329). This property can be illustrated by noting that a SAM can be written as a matrix $T = [t_{ij}]$ where t_{ij} = the payment to the i^{th} sector by the j^{th} sector. This implies that revenues are recorded along the rows and expenditures down the columns. The

fundamental law of economics is then reflected in the balancing property of the SAM, i.e. $Ti = y = T' i$, where i is the unit vector. A SAM was derived from basic principles in chapter 3 and is contained in table 7 (see p. 53). From table 7 and diagram 3 (p.62) it were seen that the SAM is a representation of the circular flow in the economy.

Since a SAM represents the circular flow of income in the economy and possesses the characteristic that $Ti = y = T' i$, it follows that any model based on a SAM will satisfy Walras' Law (Robinson & Roland-Holst, 1988:357). Furthermore, CGE models require a consistent and disaggregated database such as a SAM provides (Drud and Kendrick, 1990 : 1).

Using the format of table 7, Drud et al. (1986) have developed the TV approach to CGE modelling. In this approach the SAM framework is used for both empirical and theoretical description of the economy. The empirical description is given by a SAM with numerical values in the cells while the theoretical description is given by algebraic expressions which describe the way prices and transaction values in each cell is determined. The novelty of the TV approach is that while the traditional approach to modelling typically specify how prices and quantities are determined, the TV approach specify how transaction values are determined.

For a SAM $T = [t_{ij}]$ a model in TV form is a set of equations for

- (i) cells $t_{ij} = t_{ij}(\cdot)$
- (ii) demands $y_i = \sum t_{ij}$ (row summation)
- (iii) supplies $y_j = \sum t_{ij}$ (column summation)
- (iv) closure rules.

Some remarks about closure rules are in order. The number of equations needed for closure rules are equal to the degrees of freedom (the difference between the number of unknowns and equations) in the model. From a view of policy analysis, closure rules are important since they indicate the potential wide clientele of SAM-based models and determine the direction of causality in a model. Since CGE models are agnostic on the question of how factor markets behave, the closure rules will reflect the viewpoint of the model builder on this issue. Under a Keynesian paradigm the closure rules usually specify wages to be exogenously fixed, and specify unused capacity in production. From this follows that injections into the system will only have beneficial effects. Under a Classical paradigm, wages are specified to adjust to ensure full employment, and full capacity is assumed to be used in production. In this case injections into the economy may have negative effects (Robinson & Roland-Holst, 1988 : 370).

5.3 A SIMPLE CGE MODEL AS CONCEPTUAL FRAMEWORK

In this section a simple model is taken and the underlying SAM derived by exploiting the proposition that for every model a corresponding SAM exist. The model used is based on that of Drud *et al.* (1986) and Bourguignon, *et al.* (1992). The reason for starting with a model and then building a SAM from it is that a SAM can be obtained that is tailor-made to study some specific policy issue. Thus a country will need to build different SAM's according to the purpose at hand. In contrast, having a SAM and attempting to figure out a corresponding underlying model for each policy issue, may not only lead to a sub-optimal model being used, but might also be more time consuming. More importantly however, such an approach will in effect be an exercise in adjusting a model to the data, and not in expanding a country's database to fit the demands of the model.

5.3.1 Description of the model

The theoretical framework of the model is the modern version of Walras' model of the competitive economy (see chapter 2, section 2.4). In Walras' setting, only relative prices matter; producers are profit maximisers facing non-increasing returns to scale; consumers are insatiable utility maximisers, and production factors are paid according to their marginal revenue productivity. The model's solution provides a set of prices which clears all markets simultaneously.

It is assumed that the only available factors of production are labour and capital. Labour is assumed to be homogeneous and is paid the same wage in all production activities. Capital, on the other hand, is assumed to be sector specific once installed.

Production takes place in two sectors, a and b, where two commodities, 1 and 2 are produced. There are two kinds of domestic institutions, namely households and the government. Under a small country assumption (i.e. the prices of tradable goods are given exogenously) trade takes place with the rest of the world.

The demand for labour functions of the two production sectors is written as is conventional in economics, namely

$$(5.1) \quad w.L_a = f_{1a}(w, p_1)x_1$$

and

$$(5.2) \quad w.L_b = f_{1b}(w, p_2)x_2$$

Where

p_i = price of activity i

w = the wage rate

x_j ($j = a, b$) = the value added in activity j .

Assuming capital to be sector-specific one installed, the demand for capital by sector can be written as:

$$(5.3) \quad r_a K_a = f_{ka}(r_a, p_1)x_1$$

and

$$(5.4) \quad r_b K_b = f_{kb}(r_b, p_2)x_2$$

Where

r_a, r_b = the nominal rate of return of an unit of capital of type a and b respectively.

$r_a K_a$ = the value of capital demanded by activity a .

Net output is defined as the value added produced by using labour and capital of type a . The net output is then combined with intermediate inputs to produce gross output, x_1 . If it is assumed that this is done in a fixed-coefficient (Leontief) technology, then the supply functions can be written as follows (the input-output coefficients denoted by β) :

(a) Net output :

$$(5.5) \quad \text{Sector a:} \quad x_1 = p_1 \cdot \beta_{10} (x_1/p_1)$$

$$(5.6) \quad \text{Sector b :} \quad x_2 = p_2 \cdot \beta_{20} (x_2/p_2)$$

(b) Intermediate inputs :

$$(5.7) \quad \text{A:} \quad p_1 \cdot \beta_{11} (x_1/p_1)$$

$$(5.8) \quad p_2 \cdot \beta_{21} (x_1/p_1)$$

$$(5.9) \quad B: \quad p_1 \cdot \beta_{12}(x_2/p_2)$$

$$(5.10) \quad p_2 \cdot \beta_{22}(x_2/p_2)$$

Total gross output supplied then equals :

$$(5.11) \quad x_1 = (5.5) + (5.7) + (5.8) \quad \text{in sector a;}$$

and

$$(5.12) \quad x_2 = (5.6) + (5.9) + (5.10) \quad \text{in sector b.}$$

The split between net and gross output would be redundant if a SAM was thought of exclusively as an accounting framework. The split expresses the economic assumptions given by the production technology namely that it is possible to substitute labour for capital, and vice versa, while net output and commodity inputs are combined in fixed proportions without any substitution possibilities (Naudé, 1993a:58).

Gross output is destined for the domestic market and the export market. Exports are a function of export prices, P_e , world prices of the commodity in a foreign currency, P_e^* , and the exchange rate, e .

$$(5.13) \quad P_e \cdot E = k(P_e, P_e^*, e)$$

On the domestic markets for goods 1 and 2, as well as on exports, a tax rate is levied (t_1 , t_2 and t_e) so that the market prices are determined as follows :

$$p_1 + t_1 = P_1 \quad \text{.....domestic market price of good 1.}$$

$$p_2 + t_2 = P_2 \quad \text{.....domestic market price of good 2.}$$

$$p_1 + t_e = P_e \quad \text{.....Market price of exports.}$$

The revenue accruing to the government is given by

$$(5.14) \quad (t_1/1+t_1).X_1$$

$$(5.15) \quad (t_2/1+t_2).X_2$$

$$(5.16) \quad (t_e/1+t_e).P_e.E$$

Where

X_1, X_2 = the market value of good 1 and 2 sold on the domestic market respectively.

$P_e.E$ = the market value of exports of good 1.

As is implied from the above, good 1 is assumed to be a tradable good, while good 2 is assumed to be non-tradable.

Domestic demand for good 1 is met by domestically produced goods (Q_1) and imports (M). Imports can be written as the following function :

$$(5.17) \quad P_m.M = w(P_m, P_1)X_1$$

If it is assumed that domestic goods and imports are not perfectly homogeneous, then prices will differ between sources, i.e. $P_1 \neq P_m$. Imports are subject to import duties, t_m , and the revenue accruing to government is given by

$$(5.18) \quad (t_m/1+t_m)P_m.M$$

Where

$P_m.M$ = the market value of imports.

Assuming no direct taxes, all factor income accrues to households. Households allocate their total income (Y_h) in three steps. First total income is allocated between total consumption, C , and savings, S_h . The marginal rate of consumption, c , is assumed fixed and thus savings are determined residually :

$$(5.19a) \quad S_h = (1-c) \cdot Y_h$$

with total consumption C given by

$$(5.19b) \quad C = c \cdot Y_h$$

Second, total consumption is allocated according to a Stone-Geary utility function. In other words, discretionary consumption, CD , can only take place after a minimum level of committed consumption has taken place. The latter is given by

$$(5.20) \quad P_1 \cdot C_1$$

and

$$(5.21) \quad P_2 \cdot C_2$$

Thus discretionary consumption is given by

$$(5.22) \quad CD = C - P_1 \cdot C_1 - P_2 \cdot C_2$$

Third, discretionary consumption is allocated between the goods in a convex combination

$$(5.23) \quad P_1 \cdot C_1 = \alpha CD$$

$$(5.24) \quad P_2 \cdot C_2 = (1-\alpha) \cdot CD$$

Where α = the normalised marginal utility of consumption of good 1.

The government is assumed to receive all its income from commodity taxes, thus

$$(5.25) \quad Y_g = (t_1/1+t_1).X_1 + (t_e/1+t_e).P_e.E + (t_m/1+t_m).P_m.M \\ + (t_2/1+t_2).X_2$$

Government expenditure is assumed to consist of purchases of fixed quantities, namely :

$$(5.26) \quad P_1.G_1$$

and

$$(5.27) \quad P_2.G_2$$

Thus government savings are determined residually as follows:

$$(5.28) \quad S_g = Y_g - P_1.G_1 - P_2.G_2$$

Total savings consist of savings by households, the government and the rest of the world.

Savings by the rest of the world equals the deficit on the current account:

$$(5.29) \quad S_{row} = (1/1+t_m)P_m.M - P_e.E$$

Savings are allocated in fixed nominal shares,

$$(5.30) \quad \mu S$$

and

$$(5.31) \quad (1-\mu)S$$

between investments in the two sectors. In activity a investment in goods 1 and 2 are given respectively by

$$(5.32) \quad P_1.I_{1a}$$

and

$$(5.33) \quad P_2.I_{2a}$$

And in activity b investment in goods 1 and 2 are given respectively by

$$(5.34) \quad P_1 \cdot I_{1b}$$

and

$$(5.35) \quad P_2 \cdot I_{2b}$$

Where

I_a = one unit of investment in a.

The complete model is written in SAM format in Appendix G (p. 279-280). In accordance with the TV approach, the algebraic expressions derived above specifies how the value in each cell is obtained. The entries in each cell correspond to the equations in the text.

5.3.2 Solving the model

The early work on general equilibrium models was done with analytical mathematical models (Kendrick, 1990:66). For example, fixed point theorems were used by Debreu (1959) to prove the existence of solutions (see chapter 2). However, during the past two decades computer technology has advanced to the stage where increasing complex CGE models can now be solved. In this regard Drud *et al.* (1986) and Drud and Kendrick (1990) have developed a software package known as HERCULES, which is based on the TV approach. This software package uses the GAMS system (see Brooke *et al.*, 1988) to provide a user-friendly interface for inputs and outputs but has separate software for the analysis and solution of the general equilibrium model. The user only has to select the institutions and the functional forms of the production and consumption functions. HERCULES has a menu of some 20 admissible functional forms from which items can be selected. The system imposes consistency checks on the selections made and then requests values for all non-distributive parameters, such as elasticities. Thus the need for

conventional macroeconometric analysis remains. HERCULES then uses a base year SAM to calibrate the model. Any perturbations are solved in respect of this base year SAM and the output is a new SAM. The advantages of this approach are that it offers computational ease, a solution to the model is guaranteed to exist and a natural starting point for experiments is provided. HERCULES thus makes it possible for a comparative novice to develop significant general equilibrium models within a relatively short period of time (Kendrick, 1990:66).

5.4 RESULTS FROM A CGE MODEL BASED ON THE 1988 SOUTH AFRICAN SAM¹³

The first use of a South African SAM for second generation CGE modelling is contained in Brixen and Naudé (1993). This model uses the TV approach described in section 5.3. The model used is based upon the Development Bank's 1988 South African SAM. This SAM was aggregated into a more manageable SAM consisting of 11 sectors of production, 6 production factors and seven institutions. The aggregation was guided by the aim of including the structural characteristics of the South African economy, as discussed in the chapter 4, as well as emphasising the distribution of income. The 11 sectors of production that are distinguished in the aggregated SAM are the following :

- i) Agriculture
- ii) Gold and other mining
- iii) Food, beverage and tobacco
- iv) Printing and publishing, chemicals, rubber and plastics
- v) Non-metallic minerals and products, basic metal and fabricated metal products

¹³ This section is based on a paper presented at the *6th International Symposium on Economic Modelling* on 4 June 1993 at the University of Piraeus, Athens (See Brixen & Naudé, 1993).

- vi) Manufacturing (textiles, clothing, leather, footwear, wood, furniture, paper, machines, electrical machines, transport equipment and other manufacturing)
- vii) Electricity, transport and communication
- viii) Construction
- ix) Trade
- x) Accommodation, financial services , community services and non-classified activities
- xi) Government (contains the demand for domestically produced goods as shown in the government expenditure column of the original 1988 SAM, as well as the labour and capital demands and demands for imported commodities).

It should be noted that there is one commodity for each of the domestic activities listed above. In addition there are three commodities which are only imported for (i) intermediate use, (ii) final use in private consumption and (iii) gross fixed capital formation. The production factors distinguished in the underlying aggregated SAM are the following :

- i) Professional, technical and other professional workers.
- ii) Administrative and clerical workers.
- iii) Sales and services workers.

iv) Farm workers, labourers and not classified workers.

v) Foreign labourers who are recorded as a separate type of labour whose income is transferred abroad.

In the model, capital is assumed to be sector specific which implies that there is one heterogeneous type of capital used in each of the 11 domestic production activities. However, for simplicity, only one type of capital is listed above. The institutions that are distinguished in the SAM are the following :

i) Four types of households, distinguished by race. Each household are associated an income and a consumption account .

ii) The government is described by six accounts, namely indirect taxes, income, consumption, government transfers, government saving and government gross capital formation.

iii) The transactions involving the rest of the world are collected in the account for the rest of the world.

iv) For modelling purposes, a further institution has been included which does not feature explicitly in the SAM. This is the corporate sector, which receive all its income from the gross operating surplus account.

The final accounts of the SAM are the account containing the savings of the households and the corporate sector, the investment account that shows private sector gross capital

formation, and the account which transfer resources from institutions with a savings surplus to institutions with a deficit, including the rest of the world.

Three closure rules can be used in this model. Internally the labour market can be closed by either fixing the labour supply or wages and the savings and investment need to be equated either by letting investment be determined by saving or by fixing investment and letting saving adjust. In this model it is assumed that private investments adjust to the available resources. This implies that total domestic saving, i.e. private and government saving plus the surplus on the capital account of the balance of payments, is first used for the exogenous government investment while the remaining amount is spend on private sector capital formation. The external closure can be either obtained by fixing the exchange rate or by fixing the current account deficit.

In the light of the distortions in the structure of the South African economy which were discussed in chapter 4, the model set out above was used in comparative static fashion to simulate the impact of the following economic policies, external shocks and structural adjustments:

- (i) A 10 percent increase in real government consumption.
- (ii) A 10 percent increase in export demand.
- (iii) A 10 percent increase in the world price for exports and imports.
- (iv) A 50 percent reduction in the tariff rate on commodities imported for private consumption and investment.

As was mentioned the model's closure rules determine the causality in the model, and thus the results one will obtain. In order to not present results biased by the model builder's preferred closure rule, each of the four experiments listed above are repeated under four combinations of the closure rules. These combinations are as follows:

(i) Fixed labour supply and flexible wages together with a flexible exchange rate and fixed current account surplus.

(ii) Fixed wages with employment determined by labour demand with a flexible exchange rate and a fixed current account surplus.

(iii) Fixed labour supply and flexible wages with fixed exchange rate and flexible current account surplus.

(iv) Fixed wages and employment determined by labour demand with a fixed exchange rate and flexible current account surplus.

The experiment results are discussed below, and can be compared to those obtained from the first generation CGE models.

5.4.1 Experiment 1 : A 10 percent increase in real government consumption

The most pronounced macroeconomic effect of this experiment is the crowding out of private investments by between 10.1 and 21.3 percent. This crowding out follows in part from the increase in government consumption which leads to an increase in the public sector borrowing requirement, leaving fewer resources for private investments.

As a consequence of the fall in private investments, imports of capital goods fall by up to 15 percent. When the exchange rate is fixed this leads to an improvement in the trade balance. When the exchange rate is flexible this leads to a nominal (and real) exchange rate appreciation in order to maintain the fixed current account deficit. This appreciation of the exchange rate causes exports of all commodities to fall.

The second important effect of an expansion of government consumption occurs through the labour markets. When the labour supply is fixed the wages rates for professionals, administrative and sales personnel increase, while they fall for workers. This change in relative wage rates is due to the fact that government production is relatively intensive in the non-worker labour types. These wage increases tend to reinforce the crowding out of private investments because they worsen the public sector deficit. Under the two fixed wage closures, the demand for the non-worker labour types increases as well.

Black and Coloured households do not benefit as much as the White and Asian households from an increase in government consumption, since the latter two types own relatively larger shares of the professional labour force. Consequently, these two households have the largest income increases under all four closures. On aggregate, the rise in household income exceeds the change in prices and real private consumption goes consequently up by between 0.8 and 2.1 percent.

It should be mentioned that the Black households could benefit indirectly if the increased government consumption was directed towards the underprivileged groups, for example through better education and health facilities, i.e. features that might affect household utility but are not included in the model.

Another effect worth mentioning is that three production sectors, namely metal, manufacturing and construction experience a decline in output. This follows directly from the decline in private investments. The largest decline is in construction output, of between

6.4 and 13.9 percent. Because this sector is worker intensive the decline in its output may tend to reinforce the shift in relative wages discussed above.

4.2 Experiment 2 : A 10 percent increase in export demand

The results reveal that the chosen exchange rate closure is crucial and that the sign of changes in the macroeconomic variables depends upon whether the exchange rate is assumed fixed or flexible. The labour market closure seems in comparison to have only modest influence on the results.

Under a flexible exchange rate the initial push to export demand causes an appreciation of the nominal exchange rate in order to maintain the fixed current account surplus. Given that the current account is fixed as a nominal surplus in domestic currency, this appreciation of the exchange rate leads to the rather peculiar result that in the new equilibrium aggregate real exports have actually fallen by 3.1 percent under closure rule 1, while imports have increased by 1.3 percent. The fall in exports leaves room for an expansion of domestic demands, and both private consumption and private investment increases in the fixed exchange rate experiments.

The incomes of the different household types increase in almost the same proportion, namely around 2 percent when the labour supply is fixed and 2.5 percent when the wage rate is fixed.

The two sectors that benefits the most in this experiment are manufacturing and construction. This is due to the increased commodity demand for private investments. Mining, however, is adversely affected. The reason for this is the fact that a very large share of mining's output is exported. Hence, the mining sector is particularly susceptible to the exchange rate appreciation.

Under a fixed exchange rate the increase in export demand is allowed to improve the trade balance. This crowds out private investment almost one for one. The change in private consumption and GDP is negligible. The fall in private investment however, lowers the imports of capital goods, which reinforces the current account improvement, and causes a fall in the production of construction and manufacturing. Mining, in contrast, improves its production as the increase in the export demand is not adversely affected by a real exchange rate appreciation as under the first two closures. Finally, factor prices and household incomes are only marginally affected.

5.4.3 Experiment 3 : A 10 percent increase in export and import prices

This experiment is almost equivalent to a devaluation under a fixed exchange rate because imports and exports make up most of the transactions that South Africa have with the rest of the world. Therefore, it is not surprising that the effects only marginal when the exchange rate is flexible.

Under a fixed exchange rate the exogenous increase in the world price of imports and exports leads to a dramatic improvement in the external accounts, and the qualitative effects are similar to the ones obtained by a 10 percent increase in export demand as described in the previous section. The improvement in the terms of trade improves the trade balance with the consequence of falling private investment through lower domestic saving. In the case where the exchange rate is fixed this decline is strong enough to counter the increased export demand. Hence, real GDP and private consumption decline along with the factor prices of domestic labour and the income of the households.

Again, the mining sector responds differently than the other domestic production sectors. Specifically, the mining sector's output increases due to an improved competitiveness, while the output in all sectors decline despite large increases in the exports. The expansion of the mining sector is, however, limited by an increasing output price. With fixed wage

rates, all other private sectors face falling total demand, which reflects a major shift in demand composition as exports grow by between 20 and 27 percent. Domestic private demand thus falls dramatically. The sectors that are worst off are capital good producing, such as construction whose output is down by more than 25 percent, and to a lesser extent metal and manufacturing industries.

With the structure of the South Africa as embodied in the 1988 SAM, an increase in world prices of exports and imports under a fixed exchange rate regime may not improve income inequalities. As the GDP deflator drops by 2 percent, all households experience a fall in real income with the fall in aggregate real private consumption as the result. The fall in Asian and Black household income is the largest of the households, between 3 and 5 percent. The reason for this is apparent in the fact that households income from farm workers and administrative workers decrease the most, by 2.4 to 6 percent respectively.

Although the importance of the savings/investments closure has already been mentioned, it is nowhere as clear as in this experiment. A devaluation (here a uniform increase in world market prices) would normally be expected to have expansionary effects, especially in a situation where the export is fairly responsive to changes in the real exchange rate, and where there are some substitution possibilities between importables and domestically produced goods, as it is the case in the present model. However, the trade balance improvement that follows from the terms of trade change leads to a fall in the demand for domestic capital goods that more than counters the increased export demand and the increased demand arising from import substitution. This initiate a spiral of falling incomes, further falls in domestic demand and so on, which cause a fall in GDP. One might explain this phenomenon from a national portfolio choice point of view, where South Africa has the choice to accumulate either private capital stock or foreign assets. In the model presented here, no explicit behaviour is modelled for this choice as private investments

adjust passively to available resources, and another investment behaviour specification would most likely give different results.

5.4.4 Experiment 4 : A 50 percent reduction in import tariffs

There are two immediate effects of the reduction in import tariffs on private consumption and capital goods. First, imports of consumption and capital goods in quantities increase due to the fall in the market price measured in domestic currency and, secondly, government revenue decreases with an increased government deficit as a consequence. The general equilibrium effects again depends crucially on the external closure rule. This choice of closure even affects the direction of change in many of the macroeconomic variables. The selection of the labour market closure on the other hand does not influence the direction of change, but matters as far as the absolute size of changes are concerned. This latter feature is more pronounced in this experiment than in any of the others.

Under a flexible exchange rate, the initial large increase in imports of consumption and capital goods cause an exchange rate depreciation to counter the deterioration in the trade balance. The nominal exchange rate depreciates by 8 and 17 percent under closure 1 and 2, respectively. This partly offsets the increased imports and stimulates exports which rises by 4.4 and 8.8 percent under the two closure rules. Also, the increased government borrowing requirement following from the loss of import tariff revenue tends to reduce imports through the crowding out of private investments.

The choice of labour market closure determines how the increased export demand affects the South African economy. When the labour supply is fixed the domestic price level is pushed up, so that only a relatively small real depreciation of the exchange rate takes place. When the wage rate is fixed the increased export demand leads to an increase in GDP of 2.6 percent combined with a more modest increase in the domestic price level. It should be noted that in this case, there is a quite large depreciation of the real exchange

rate. The increase in domestic production results in higher household income and consequently higher private sector saving. This almost counters the increased government deficit, leaving private investments almost unchanged in equilibrium. In terms of sectoral output levels, the mining sector has the largest increase, while construction does worst.

When the exchange rate is fixed, the trade balance and the current account deteriorate quite dramatically as the imports of private consumption goods increases. Real private investments benefit from two factors in these experiments. First, as private investment is determined by available savings, a nominal variable, the lower price of imported capital goods allows larger real investment. Second, the trade balance deterioration feeds back into a higher level of investments. This change in private investment furthermore leads to a real exchange rate appreciation through demand pressure on the domestic price level, and exports consequently declines.

Private consumption increases by between 3.8 and 10.5 percent under the four closures, but it should be noted that a part of this increase is the direct result of the lower market price of imported consumption commodities caused by the reduction in the tariff rate. The income distribution is apparently relatively unaffected under all four closures, and nominal incomes of all four household types increase in approximately the same proportion.

The results from the four experiments were consistent on a number of issues. First, the type of closure rule under which the experiments are performed are crucial for the results. In the South African case, the vital closure concerns the exchange rate regime. Very different effects were obtained under the two different exchange rate regimes. In many cases there were a reversal in the direction of change. More specifically, a flexible exchange rate regime was seen to give the most beneficial results throughout.

Second, the special role played by the mining sector in the South African economy was distinguished. Moreover, the role of the mining sector is of such a nature, that in many experiments the mining sector behaved in the opposite direction than the other domestic sectors. This indicates that the South African economy is likely to experience a Dutch Disease in the event that gold prices increase substantially and the exchange rate is allowed to appreciate.

Third, it was noticeable that the South African economy is particularly vulnerable to external shocks, perhaps due to the specific structure of the South African economy such as the dependence on foreign capital goods, coupled with the tendency of the government to expand expenditure when the gold price rises but not cutting back on programmes when the gold prices falls (Kahn, 1992:5). The latter two conclusions may make it desirable for South Africa to diversify its exports.

Fourth, other aspects of traditional structural adjustment programmes, such as liberalising trade, should be considered in South African. The experiment which had the most favourable effect on real growth and income distribution was a reduction of 50 percent in the import tariffs. However, this result is contingent on a flexible exchange rate being followed.

Fifth, the saving-investment closure, whereby investment is savings driven, as in a typical neo-classical model, played an important role in the results that were obtained. In general, this closure, together with the functional forms used in the model, that were based on microeconomic optimising behaviour, reflects the strong neo-classical bias of the present model. Taylor (1990) criticises the neo-classical approach and is of the opinion that "Structuralist" models are more appropriate in a developing country. Policy analysis for South Africa through a structuralist model is left for future research.

Finally, although some of the simulated policies did have some effects in redressing the unequal distribution of income, these effects were marginal. Rather, it would seem as if the effects in the model are of a "trickle down" kind. Also, the incomes of the four household types moved parallel in experiments 2 to 4 under all four closures. This points to the fact that a an overhaul of the structure of the economy is necessary, and that demand management strategies may not have the sought after effects upon income and wealth distribution. The form this restructuring may take are taken up again in chapter 9 (section 9.3) where the results from a model based on a financial SAM are discussed.

5.5 LIMITATIONS OF SAM-BASED MODELS USING HERCULES

The results of policy simulations that can be obtained from a SAM-based CGE in using HERCULES, should be interpreted in the light of the limitations of this approach, and also in the light of the criticisms against second generation CGE modelling in general.

Pyatt (1988) and Kendrick (1990) state that the principal limitation of this approach is the fact that it is not dynamic, but based on comparative statics. Bell and Srinivasan (1984) add to this by stating that the strength of such models lies in describing the economic interdependence and price structure of an economy, but that they are less useful in describing short-run adjustment or the evolution of long-term structure and technology. This implies that one cannot estimate the time it takes for policies to have effect. This is a serious limitation in the current South African context, as a post-apartheid government's credibility and acceptability may depend on how speedily that government can address pressing economic issues such as housing, education, and on how effective income redistribution measures are over the short-term.

Another limitation is that all prices are equal to one in the base period. Thus it is not possible to compare prices in the base period.

A limitation specific to the model used above, and to the South African SAM, is that the financial sector is omitted. This limitation is discussed in section 5.

Finally, because the functional forms that HERCULES employs are based on the assumptions of utility and profit maximisation subject to certain constraints, it has a distinct neo-classical nature. For "Structuralists" like Taylor (1990) this is not acceptable. Accordingly many modellers prefer using GAMS directly in modelling, as it provides a greater flexibility in the specification of the model.

To conclude, it is clear that although SAM-based models have some limitations, these limitations do not rule out the possibility that these models might be used to gain considerable insight into an economy and to provide guidelines for policy. It seems necessary however, to supplement these models with more conventional macroeconomic models in order to capture some of the dynamics at work in the South African economy.

5.6 IMPLICATIONS OF CGE MODELLING FOR THE SOUTH AFRICAN NATIONAL ACCOUNTS

In section 3.1 of chapter 3, it was mentioned that people and their living standards are increasingly assuming their rightful place at the centre of social accounting. This is witnessed by the decision of the United Nations to revise their 1968 SNA in order to allow more flexibility. More specifically, it is argued that the SNA should be flexible enough to allow each country to develop its own CGE models in response to relevant and urgent

domestic issues (Bartelmus *et al.*, 1991:111; Harrison, 1990:335). Pyatt (1991) argues in this context that because CGE models have replaced input-output tables as the central conceptualisation of the SNA, the basic requirements for a relevant CGE model should determine the national accounting framework in each country. Shoven and Whalley (1984:1048) point out that most countries national accounting procedures are orientated towards calculating macro-aggregates rather than sub-aggregate microeconomic detail. The growing interest amongst economists in South Africa in CGE modelling to analyse crucial development issues will increase the demands on the South African national accounts and statistics, and specifically on microeconomic data.

The 1978 SAM were updated by the Development Bank of Southern Africa (Van Seventer *et al.*, 1992; Eckert *et al.*, 1992) and the Central Statistical Services (CSS,1993). These revisions stop short, however, of meeting the data requirements of a SAM-based CGE model suitable to analyse the crucial development issues facing South Africa, as these updated SAMs do not incorporate the financial sector. A CGE model based on this new SAM will therefore be inadequate for analysis of the impacts of monetary and exchange rate policies on wealth and income distribution and the financing of the government deficit.

How can this limitation be addressed? From a survey of the literature on how the monetary side can be incorporated into CGE models, Pereira and Shoven (1988) found that no standard practices exist in the way the financial side of the economy are modelled. This means that, before South Africa's SAMs can be improved to make modelling more relevant, an agreement amongst economists is needed as to the ideal classifications of the SAM's financial sector. The actual classifications employed in a SAM are crucial to its potential usefulness. No set of classifications can be ideal for all purposes and, unless there are abundant resources to produce a set of SAMs with different classifications, a

compromise has to be made to select the set most likely to be required for major policy purposes (Greenfield, 1985:132).

Once such a set of classifications has been agreed upon, concrete suggestions for the revision and improvement of South Africa's national accounts data can be made. It should be added that in accordance with the approach outlined in section 5.3, the appropriate classifications of the financial SAM could be derived from an underlying model. It may also be mentioned that the simple model referred to in this chapter corresponds to the real side of the model by Bourguignon *et al.* (1992), which is one of the few models to include the financial side of the economy in some detail. It would therefore be possible to extend the model of section 5.3 to include the equations for the financial sector and then to derive the underlying SAM. In this way one possible set of classifications for a financial SAM may be obtained which may direct the revision of the South African national accounts.

Apart from forcing a revision of the South African national accounts to serve the needs of people and their living standards, compiling a financial SAM will, due to the balancing property of the SAM, impose some consistency checks on the financial data in the national accounts. For example, the accuracy of the estimates of total realised saving, which is currently determined residually, might be checked in a SAM-based model where savings and investment behaviour are explicitly modelled.

5.7 SUMMARY

In the previous chapter, the results from a number of SAM-based models for South Africa were used to derive a number of guidelines for income redistribution in South Africa. The models reviewed were all of the first generation type, which emphasises constant, linear relationships between variables, and which are demand driven. It was therefore not a

surprise that most income redistribution strategies would according to these models lead to GDP growth. In order to modify, reject or confirm these results this chapter illustrated how a second generation CGE model can be based on a South African SAM. It was shown that the transactions value (TV) approach offers a way of implementing a SAM-based CGE model without much toil and cost. The transactions value approach uses the SAM for both empirical and theoretical description of the economy. The empirical description is given by a SAM with numerical values in the cells while the theoretical description is given by algebraic expressions which describes the way prices and transaction values in each cell are determined, and how macro closure is obtained. The novelty of the TV approach is that while the tradition approach to modelling typically specifies how prices and quantities are determined, the TV approach specifies how transaction values are determined.

The TV approach makes use of a software package known as HERCULES to solve the model. This software uses the GAMS system to provide a user-friendly interface for input-output but has separate software for the analysis and solution of the general equilibrium model. The user only has to select the institutions and the functional forms of the behavioural equations. HERCULES has a menu of some 20 admissible functional forms from which items can be selected. The system imposes consistency checks on the selections made and then requests values for all non-distributive parameters, such as elasticities. HERCULES then uses a base year SAM to calibrate the model. Any perturbations are solved in respect of this base year SAM and the output is a new SAM. The advantages of this approach are that it offers computational ease, a solution to the model is guaranteed to exist and a natural starting point for experiments is provided. The limitations of this approach are that it is not dynamic, but static, and are less useful in describing short-run adjustment. The functional forms that HERCULES employs are based on the assumptions of utility and profit maximisation subject to certain constraints,

which gives HERCULES a neo-classical character. For structuralists like Taylor (1990) this is not acceptable. The implementation of a second generation structuralist CGE model for South Africa is left as a topic for future research.

The results of four experiments from a second generation CGE model based on the Development Bank's 1988 SAM, and using HERCULES and the TV approach, were reported. These experiments were (i) a ten percent increase in real government consumption, (ii) a ten percent increase in export demand, (iii) a ten percent increase in export and import prices and (iv) a 50 percent reduction in import tariffs.

The results of the experiments were consistent on a number of issues. First, the type of closure rule under which the experiments are performed is crucial for the results. In the South African case, the vital closure concerns the exchange rate regime. A flexible exchange rate gave the most beneficial results.

Second, the special role played by the mining sector in the South African economy was distinguished. Moreover, the role of the mining sector is of such a nature that in many experiments the mining sector moved in a direction opposite to that of the other domestic sectors. This indicates that the South African economy may experience a Dutch Disease in the event that the gold price increases substantially, and the exchange rate consequently appreciates.

Third, it was noticeable that the South African economy is particularly vulnerable to external shocks, no doubt due to the specific structure of the South African economy as discussed in chapter 4.

Fourth, liberalising trade should be considered in South Africa. The experiment which had the most favourable effect on real growth and income redistribution was a reduction of 50 percent in import tariffs.

Finally, although some of the simulated policies did have some effect in redressing the unequal distribution of income, these effects were marginal. Rather, it would seem as if the effects in the model are of a "trickle down" kind. This implies that a restructuring of the economy may be necessary for demand management strategies to have beneficial effects on income distribution. The form that this restructuring can take is addressed in chapter 9 where a CGE model for South Africa is based on a financial SAM. This is necessary because the existing South African SAMs do not incorporate the financial sector. Without a SAM that contains the financial sector, CGE models will be inadequate for the analysis of the impact of monetary and exchange rate policies and the financing of the government deficit on income distribution.

The conceptual framework illustrated in this chapter may be applied to address this shortcoming. As a first step policy makers and economists in South Africa would have to agree on the appropriate model of the financial sector for South Africa. This model may be determined by the role of money and finance in the economy. Second, this model has to be translated into a SAM, with the classifications of the SAM being determined by the agreed upon model, as well as the structure of South Africa's national financial accounts. Third, the national accounts data of South Africa would have to be revised and improved to supply the data to fill the cells of the SAM. CGE modelling will then be able to commence.

In the next chapter, the role of money and finance in an economy, with special reference to that role in a developing country, is discussed.

6.1 INTRODUCTION

In the previous chapter it was argued that a weakness of SAM-based CGE models is that the financial sector is usually omitted. This is the case in South Africa, since the existing South African SAMs omit the financial sector, and the first generation CGE models for South Africa do not take the effect of monetary variables into account. The first step in taking the effect of monetary variables into account would be to construct a financial SAM. This SAM can then be used as a database for different CGE models. In this section the foundations are laid for the compilation of the financial SAMs in chapter 8. Financial SAMs are also further justified by identifying relevant policy issues that might be analysed through them. This will be done through a discussion of the role of the money and the financial sector in developing countries. Throughout the emphasis will be on the South African situation.

The literature on the role of money and finance in developing countries derives from the discussion on money and finance in the developed countries. As such the main focus of the discussion is on (i) the effect of money and finance on economic development and growth (neutrality debate); and (ii) the direction of causality between money and economic development ? (exgoneity debate).

In section 6.2 the role of money in finance in developed countries will be briefly described. In section 6.3 dual economy models of money in developing countries are discussed. In section 6.4 the supply leading and demand following characteristics of money and finance are identified, while the different stages of banking development are delineated in section 6.5. Section 6.6 portrays the relationship between financial development and income distribution. The financial repression paradigm is discussed in section 6.7. In section 6.8 the potential economic instability that can be caused by a financial sector is considered. Finally, the relationship between financial development and regional development is discussed in section 6.9. The chapter concludes with a summary.

6.2 MONEY AND FINANCE IN DEVELOPED COUNTRIES

In developed countries, the main theories pertaining to the role of money and finance in the economy have been the quantity theory of money and the neo-classical-Keynesian synthesis. These theories are discussed in most standard economic textbooks. These theories generally consider money to be neutral and exogenous. The monetarist advocacy of a "k-percent" growth rule for the growth in money supply derives directly from the quantity theory (Friedman, 1962). The first discussion of money in a general equilibrium framework was provided by Tobin (1958). Tobin extended Keynes' liquidity preference theory into what is known as the portfolio balance approach. The portfolio balance approach was given microeconomic foundations by Arrow (1970). The portfolio balance approach is implicit in the derivation and use of the national flow of funds accounts discussed chapter 7 and the financial SAMs compiled in chapter 8.

Recent developments cast doubt on the view that money and finance are neutral and exogenous. For instance, Grandmont (1985) has found money and finance to be non-neutral in a general equilibrium setting. Extensions by Foley (1992) have shown that a

general equilibrium with money is not Pareto optimum, because pricing decisions by any one firm affects the real value of liquidity throughout the economy. On the other hand, the post-Keynesian theorists have attempted to revive the "Keynesian revolution" and undo the corruption of Keynes' ideas by the neo-classical-Keynesian synthesis (Weintraub, 1978). According to the post-Keynesian theory, the money supply is credit driven, and therefore not exogenous, but endogenous, as it is determined by market forces (Moore, 1988:145). The specific causality between economic activity and money supply runs from wage increases to credit to money (Wills, 1982).

A discussion of the various aspects of post-Keynesian monetary theory is contained in Arestis (1988b). Some of the policy implications of the post-Keynesian theory for South Africa are the following :

First, the policy implications of the post-Keynesian theory for South Africa contradicts the monetarist "k percent" rule advocated for the growth in the money base by Barr and Kantor (1990). The post-Keynesians advocate a policy of accommodation by the Central Bank. Isaac (1991) finds that when the money supply is endogenous and inflation determined by the intensity of the struggle over income shares, a "k percent" rule may lead to endogenously unstable business cycles. In contrast, under an accommodative rule, monetary policy may stabilise the economy. Isaac (1991) and Burdekin and Burkett (1988) also show that a "k-percent" rule may lead to a shift in income away from workers. This should serve as a cautionary note to those advocating a fixed money supply rule in South Africa.

Second, conventional economic theory disaggregate expenditures by type into consumption, investment, exports and imports, but treats income as an aggregate. The post-Keynesian theory extends this disaggregation to the the income side and highlight in

particular the factor distribution of income (Jackson, 1992:267). The proper disaggregation of income is of considerable importance in the compilation of any SAM, specifically in South Africa where income distributional issues are important.

Third, it should be recognised that macroeconomics is not inherently a matter of aggregation, as many economic theories attempt, but rather a way of depicting the economy as a whole. The contribution of the post-Keynesians has been to show that, while society is composed of individuals, it has its own structure contingent on time and place. Individuals can influence society, but social structure also influences the individual. Therefore, "any truly macroeconomic model has to be institutional - a fact that is barely acknowledged by mainstream economics, yet one that is fundamental" (Jackson, 1992:278). Any macroeconomic model for South Africa would by implication need to take into consideration the nature and history of the financial institutions, their size and importance (Porteous, 1991).

Finally, the focus of the post-Keynesian view on the relevant historical forces and institutions in shaping the financial sectors in countries has a further implication for policy analysis in South Africa. Since South Africa is not a developed country, one should be wary of straightforwardly applying the theories formulated for developed economies (Corden, 1987). The rest of this chapter is devoted to a discussion of the most important theories dealing with money and finance in a developing country.

6.3 DUAL ECONOMY MODELS

Many developing economies are characterised by a dualistic structure which consist of a large traditional sector (confined mainly to agriculture and services), and a modern sector concentrated in manufacturing industry (Hill, 1992:7).

Much of the theoretical literature on economic development embodies the idea that development of a modern sector occurs only after the emergence of a surplus in the traditional sector. This surplus enables resources to be transferred from the latter to the former (see Lewis, 1954; Jorgenson, 1961 and Fei & Ranis, 1961). The agricultural surplus satisfies the demand for basic consumption goods that arises as employment is created in the modern industrial sector (Kalecki, 1971). Nicholls (1963) considers this surplus a necessary condition for development in a closed economy.

Sideri (1984) and Hill (1992) show that the role of money and finance in dual-economy models have been neglected. Hill (1992:7) identify two important aspects :

(i) It is unlikely that the agricultural surplus will be marketed unless the economy is monetised (Ghosh, 1986). The reason for this is that search and information costs of barter would be high given the long distances between the points of production and agricultural and industrial outputs. Also, the surplus might be used as a form of saving rather than being marketed as in a monetary economy (Bardhan, 1970).

(ii) The initial capital endowment in the industrial sector and subsequent net capital formation must somehow be financed. Lewis (1954) discusses this aspect, and points out that capitalists can create capital as a result of an expansion of bank credit. In this way capital formation can take place without a prior fall in production of consumption goods. If, however, capital formation is paid for by new money, prices can rise temporarily because nominal national income rises while the output of consumer goods remains constant.

The balanced growth rule devised by Fei and Ranis (1961) requires that once surplus labour is exhausted, investment in the agricultural sector should be high enough to allow labour to be transferred out of agriculture and into industry. High investment in agriculture is needed to increase agricultural surplus so as to prevent the terms of trade turning against industry. However, if the investment in agriculture is self-financed, it may cause a fall in the demand for industrial products. Thus, for economic growth an expansion of bank credit in agriculture is just as necessary as it is in industry.

Lewis's (1954) characterisation of bank credit reflects the standard money multiplier process (see Moore, 1988:127-129). For this process to be applicable in developing countries, it is necessary that either (i) the redeposit ratios are high, or that (ii) individual banks can buy in reserves if redeposit ratios is too low to validate new lending. This last condition will only be possible if there exist a lender of last resort or the banking system is integrated so that they can tap an interbank funds market. In the early stages of financial development, such an integration is absent, so that the money multiplier process is severely truncated and economic growth is likely to be lower (Hill, 1992:9). The implications are clear : the development and integration of a network of banks to serve industry as well agriculture, are necessary for economic growth in developing countries.

Adera (1987) surveys the experience of financial development and economic growth in African countries and concludes that policy makers have failed to follow an active policy of developing the domestic monetary and financial sectors. Adera (1987) points out that financial markets in many developing countries are dualistic, and that only urban banks are integrated. An implication for policy makers is that different policies with respect to urban and rural banks may be necessary.

6.4 IS FINANCIAL DEVELOPMENT SUPPLY-LEADING OR DEMAND-FOLLOWING ?

Supply-leading development occurs when the creation and evolution of financial institutions precedes the demand for their services and economic growth. Supply -leading development has two functions, to (i) transfer resources from traditional sectors to modern sectors, and (ii) promote and stimulate an entrepreneurial response in these modern sectors. Thus supply-leading financial development inaugurate self-sustaining development by opening up new possibilities for investors and savers.

According to Patrick (1966:17) supply-leading financial development will occur during the early stages of development. As financial and economic development proceed, however, the supply-leading character of financial development is diminished and eventually replaced by demand-following financial development. The latter occurs when the creation and evolution of financial institutions and their asset and liability instruments are a response to the demand for financial services by investors and savers in the real economy. The importance of the financial sector does not, however, diminish during this phase. The more rapid the growth rate of real national income, the greater will be the demand by enterprises for external funds and therefore financial intermediation, since under most circumstances firms will be less able to finance expansion from internally generated depreciation allowances and retained profits.

For the same reason, with a given aggregate growth rate, the greater the variance in the growth rates among different sectors or industries, the greater will be the need for

financial intermediation to transfer savings to fast-growing industries from slow-growing industries and from individuals (Patrick, 1966 : 17).

Policy makers in many developing countries during the 1960s and 1970s often assumed that supply-leading financial development would be dominant during the early stages of development. Governments assisted in the establishment of financial institutions either directly (by setting up government-owned banks) or indirectly (by subsidising private banks through the rediscounting of commercial loans).

Empirical verification of Patrick's hypothesis are based on Granger causality analyses. Examples are by Gupta (1984) and Jung (1986). Hill (1992) compare the different results and find some support for the hypothesis.

6.5 STAGES OF BANKING DEVELOPMENT

In section 6.5.1 Goldsmith's (1969) characterisation of the financial development process is discussed. The stages of banking theory of Chick (1983) and Chick and Dow (1988) are discussed in section 6.5.2.

6.5.1 Goldsmith's seven stages of financial development

According to Goldsmith (1969) the development of financial institutions follow seven stages. The first stage is characterised by the absence of financial institutions. Only commodity money is in circulation, although occasionally credit transactions takes place.

The second stage is characterised by the introduction of metallic money and bills of exchange. Small-scale financial institutions are founded, for example the goldsmith's in 15th century Italy.

During the third stage a central bank is founded. Kindleberger (1986) points to the fact that England had a central bank before France did as one of the major reasons for England's economic dominance during the 17th and 18th centuries. The third and fourth stages present according to Goldsmith (1969:35) two alternative paths of development. During the fourth stage deposit banks are created, although no paper money exists yet.

During the fifth stage a diverse number of small scale financial operators are established. During the sixth stage other types of financial institutions, such as mortgage banks are established. The seventh stage is characterised by the maturity of financial institutions and instruments, as is found in the developed countries today.

The above pattern identified by Goldsmith is not one of a tight coupling between economic growth and financial development. At most he found parallels in many countries. He noted (p.47) that in some countries financial institutions are ahead of economic development because of the strong influence of the more advanced countries. In the light of South Africa's history as a British colony, its relatively advanced financial sector - as well as similarities with the British financial system - seems to support Goldsmith's observations.

6.5.2 Chick and Dow's stages of banking development

Chick (1983) and Chick and Dow (1988) identify six stages of banking development. During the first stage banks are pure intermediaries, with money being deposited at banks

only as a low risk way to save. Redeposit ratios (which determines the money multiplier) are low and claims on banks are not used in transactions. During this stage savings are necessarily prior to investment and growth is low. Growth is constrained by savings.

During stage two bank notes and claims on deposits are being used as payment. All bank liabilities are seen as money, and redeposit ratios rise. Savings are not anymore a constraint on investment and growth. Instead the constraint is posed by reserve requirements banks have to meet. Thus, finance is separated from savings, and the credit creating ability of banks allow investment to go ahead without the need for prior savings. Because banks are not yet well integrated at this stage individual banks must be aware of leakages to other banks. The latter causes the actual credit expansion to be smaller than the theoretical limit determined by the money multiplier.

During stages three and four the network of banks are forged into a coherent system. The third stage is characterised by an interbank funds market. Investment finance becomes cheaper. During stage four the central bank is established. The effect of a lender of last resort on banks' willingness to lend is greatest when the central bank has a stable interest rate policy and does not exact a penalty rate. The volume of bank loans becomes fully demand determined, with the supply of deposits simply following. Because banks behave just as any other portfolio-managing company they will stop the money-creating process when the ratio of reserves to liabilities reaches a certain point (Heise, 1992:291). Banks use a variety of rules to ration credit : they require collateral, they limit the size of loans to individual borrowers based on borrower equity, market share, leverage of prospective income flows, established relations and past repayment records.

During stage five banks acquire the skills and technologies that allow them to actively manage liabilities. Banks meet all their demands for loans and fund them by actively

bidding for deposits with higher interest rates. This leads to higher concentration in both the financial and business sectors. Much bank lending are directed towards speculative activity. During this stage, innovations in financial markets reduce the credit rationing process of the previous stage. The development of huge pools of managed money, for example insurance funds, pension funds and money market funds increase the availability of nonbank finance. Credit can be made available to nearly everyone who is willing to pay the price. Wonjilower (1980) argues that this significantly increases the fragility of the financial system.

Compared with Patrick's hypothesis, one could identify stages one and two as supply-leading financial development; after stage 2, financial development becomes demand-following.

Two lessons from the historical views on banking and finance in economic development that were set out in this section have been summarised by Dymski (1992:312) :

- (i) The scope and purposes of the organisations that interact in financial markets delimit those market outcomes; and
- (ii) The structure and purposes of financial institutions are themselves historically contingent.

What do these lessons imply for the possible future development of the South African financial structure? First, if one recognises that the present financial system is dominated and managed almost exclusively by Whites, and that this is done to a great extent for the developed "White" segment of the population, it is no surprise that many Blacks feel alienated from the financial sector. Political change in South Africa will, in line with (ii)

above imply an unavoidable shift in the purposes and structure of the local financial institutions¹⁴. Porteous (1991) discusses in this context the possible nationalisation of the South African financial system and offers some alternatives. Furthermore, the increased fragility of the financial sector during its later stages of development provides justification for social control over credit (Wray, 1992:307).

6.6 FINANCIAL DEVELOPMENT AND INCOME DISTRIBUTION

Greenwood and Jovanovic (1990) have proposed a theory of financial development in a historical context (which has many common elements with the stages of banking theory and Patrick's hypothesis) with the emphasis on income distribution.

According to Greenwood and Jovanovic (1990) financial intermediation promotes growth because it allows a higher rate of return to be earned on capital, and growth in turn provides the means to implement costly financial structures.

The dynamics of the development process described above resembles the Kuznets (1955) hypothesis¹⁵. During the early stages of development, an economy's financial markets are virtually non-existent and develops slowly (Stage 1 according to Chick and Dow). Financial superstructure begins to form as the economy approaches the intermediate stage of the growth cycle. This corresponds to stages 2 and 3 of Chick and Dow. Here the economy's growth and savings rates both increase, and the distribution of income across the rich and poor widens. At maturity (Stages 4 & 5) the economy has developed an extensive structure for financial intermediation. In the final stage of development the

¹⁴ This conclusion can also be based upon the Coase (1937) theorem which argues that if the needs of trade demand it, an appropriate financial vehicle will appear.

¹⁵ Kuznets proposed that during the course of an economy's lifetime, income inequality rises during the initial stages of development, tapers off during the middle stages and finally declines during the mature stages.

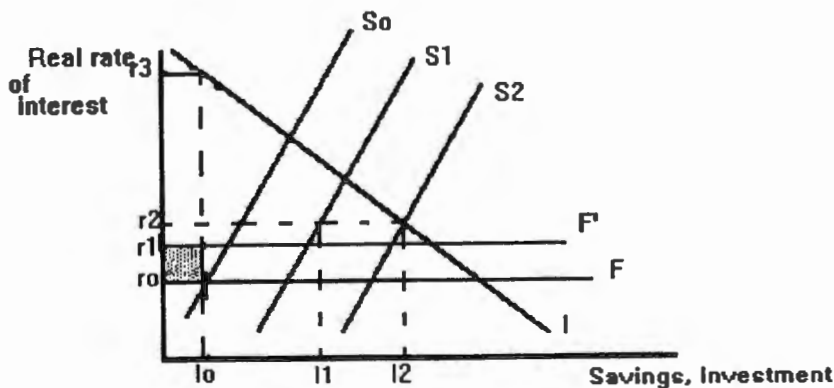
distribution of income across agents stabilises, the savings rate falls and the economy's growth rate converges. This theory is supported by econometric evidence found by Jung (1986) for 56 countries which indicate that Granger causality between financial development and economic growth run in both ways.

6.7 THE FINANCIAL REPRESSION PARADIGM

Fry (1988:13) describes the financial repression paradigm as "the main intellectual base for financial sector analysis and policy advice over the past 15 years". MacKinnon (1973), Shaw (1973) and Fry (1988) argue that distortions of financial prices, such as interest rates and foreign exchange rates, reduce the real rate of growth and the real size of the financial system relative to nonfinancial magnitudes. Fry (1982) refers to the destabilising effect of nominal interest rate ceilings, which is caused by portfolio shifts from financial to tangible assets during rapid inflation.

The financial repression paradigm can be illustrated through figure 1 :

Figure 1 : The financial repression paradigm



(Source : Fry, 1988:16)

In figure 1, financial institutions intermediate between savers and investors. At a economic growth rate g_0 , savings is given as S_0 , which is a positive function of the real rate of interest. Line F represent financial repression, and in figure 1 this occurs through the imposition of a ceiling on interest rates. This ceiling fixes the interest rate below its equilibrium value. Actual investment is limited to I_0 , the amount of saving forthcoming at the real rate of interest, r_0 .

If this ceiling applied only to deposit rates of interest but not to loan rates, the investor/borrower would face an interest rate of r_3 . The spread $r_3 - r_0$ would be spent by the banking system on non-price competition. To the extent that banks do have to apply loan rate ceilings, loanable funds are allocated according to some non-price rationing scheme such as transactions costs or perceived risk of default. Loan rate ceilings discourage risk taking on the part of financial institutions, which may ration out a number of high-yielding investments. According to Fry (1988:18) there is therefore a tendency for the investments that are financed in financially repressed economies to yield returns barely above the ceiling rate of interest, r_0 .

The consequence of the above is that the economy are distorted in three ways (Fry,1988:18-19) :

(i) Low interest rates creates a bias in favor of current consumption and against future consumption. Savings are consequently reduced to below socially optimum levels.

(ii) Potential lenders may engage in low-yielding direct investment (disintermediation) instead of lending through depositing money in a bank.

(iii) Bank borrowers able to obtain all the funds they want at low loans rates will choose relatively capital-intensive projects.

MacKinnon (1973) also argues that financial repression fosters dualism in developing countries. This causes greater income inequality and lessens the efficiency of investment.

Cho (1986:191) shows that financial repression may worsen the distribution of income. First, most of the economic rent goes to large borrowers rather than small savers/lenders when deposit and loan rates are held below equilibrium levels. Second, capital-intensive production methods reduce the demand for labour; consequently the wages of unskilled workers may fall.

A reason for the imposition of interest rate ceilings is to stifle competition to public sector fund raising from the private sector. Under government pressure, banks in many developing countries have to lend to state enterprises and priority sectors at below market rates. The World Bank (1989:1) notes that this caused many directed loans not to be repaid and that savers were discouraged from holding domestic financial assets. Institutions were also discouraged from lending for a longer term or to riskier borrowers. In some countries, public borrowing from commercial banks displaced lending to the private sector; in others, public borrowing financed by money creation led to rapid inflation. In many countries only a market for short-term debt developed (World Bank, 1989:3).

What are the policy prescription for a country with a financially repressed economy ? Using figure 1 one can observe that an increase in the real interest rate raises saving and investment. Raising the interest rate ceiling discourage entrepreneurs from undertaking low-yielding investments since they are no longer profitable. Higher interest rates thus increases the quality of investment The rate of economic growth rises and in the process the savings function shifts to S_1 . A policy prescription for a financially repressed economy is thus to raise institutional nominal interest rates or to reduce the rate of inflation. MacKinnon (1982:48; 1984:477) stresses that a prerequisite for successful financial liberalisation is control over public finances : government deficits are invariably financed by taxing the domestic financial system in one way or the other. The implication is that fiscal policy, if handled too expansionary, may frustrate the potential benefits that the financial sector may have on economic development. Furthermore, the development of non-bank financial intermediaries such as development banks, insurance companies and pension funds, need to be encouraged, as they are potentially important sources of long-term finance, which is typically what a financially repressed economy needs.

A large number of empirical tests of the financial repression paradigm are reported (see Jao, 1976; Jung, 1986 an Lanyi and Saracoglu, 1983). The majority of these tests seems to support to the view that positive real interest rates contribute to economic growth.

The policy implications that financial liberalisation is necessary, and that the government need to interfere as little as possible in the financial market, rest on the assumption that the financial system is inherently stable. This ignores the possibility that the financial sector may be destabilising.

6.8 THE FINANCIAL SECTOR AND ECONOMIC INSTABILITY

In this section, the liquidity preference theory is applied to the interactions between real and financial variables over the long-run business cycle. Minsky (1982) asserted that over the long run there is a tendency to instability in the United States' financial sector. Minsky's "instability" hypothesis has been formalised by Taylor and O'Connell (1985).

The essence of the long-run link between economic development and the financial sector is that during a period of widespread uncertainty, financial tensions arise from an increased demand for liquidity by private agents. Schackle (1961) identifies systemic uncertainty as the most important in this context. Systemic uncertainty refers to the fact that one does not know what the economic system will look like and therefore one cannot predict which physical assets will oscillate in value. Hence at a time when the future structure of the economy is in question, the riskiness of any real disposition of wealth increases. This type of uncertainty also involves an element of serial risk, that is, there exist a possible gain in knowledge by delaying investment.

According to Hicks (1974) systemic uncertainty, together with an evolving emergence of information puts a premium on flexibility. In such a case portfolio theory points at liquid assets as appropriate safeguards. A switch away from productive to monetary assets will have institutional correlates : not only will portfolios alter, but a change in patterns of transaction activity such as an increase in financial consulting and services will occur.

The switch from physical to monetary assets is subject to a monetary constraint. The most elementary way to overcome this constraint is to sell products or production factors in order to finance the necessary purchases of monetary assets. In a credit economy, Grahl (1988:198) argues, these monetary constraints will be linked to the process of settling debts when systemic uncertainty is rife. This will intensify the system-wide constraints and

will lead to a contraction of investment and savings. Grahl (1988:198) points out that this process can persist for a long time because of feedback effects through which the financial tensions reinforce the initial problem of systemic uncertainty : heightened default risks, tighter administrated credit ceilings will intensify the focus of economic agents on short-term survival rather than long-run construction.

Anti-inflationary policies may minimise the destabilising influence of increased liquidity preference. This is because a decrease in the general price level will increase the real value of existing financial assets. This may not, however, solve the underlying economic difficulties; all that may happen is that the pressure of borrowers on lenders will be reduced because the borrowers have come to concur with the pessimistic expectations of the lenders (Kindelberger, 1981).

An application of this theory to the South African situation is called for. A complete discription of the present crisis in the South African economy from a financial perspective falls, however, outside the scope of this study. What should be mentioned though, is that from the national financial accounts and the financial SAMs compiled in chapter 8, a number of significant features of the South African economy can be derived which corresponds with this theory. First, there has been an increased switch in portfolios from physical to monetary assets. The South African economy's current poor performance cannot be ascribed to insufficient savings : it is rather due to insufficient investment. Second, the shift in assets have been towards assets of a short term nature. Third, non-bank financial intermediaries such as insurance companies have grown significantly. Explanations for this growth may be found in the tax benefits of contractual savings (Uys, 1991) or in the fact that the rising cost of loans (as witnessed in the sharp increase in interest rates during the late 1980s) forced households and firms to use other forms of borrowing; furthermore, if banks use non-price rationing mechanisms to allocate finance,

households may invest more of their portfolios in pension and insurance funds to qualify for finance.

A policy implication of the above for South Africa is that a stable political dispensation has to be established as soon as possible. Furthermore, the supply of funds from insurance and pension funds needs to be regulated. Before specifying in greater detail how this might be accomplished, it is necessary to discuss the relationship between financial development and regional development, since it was seen from the discussion in chapter 4 that a weakness of the present South African SAMs is that a sound regional dimension is lacking.

6.9 FINANCIAL DEVELOPMENT AND REGIONAL DEVELOPMENT

A wealth of literature analyses regional development in real terms. Generally, this has been to the detriment of financial factors. Chick and Dow (1988:219) ascribes this to the fact that regional development was first seen as a special case of international economics, following Ohlin (1933). Thus differences between regions were ascribed to differences in total factor productivity. Furthermore, the regional development literature traditionally treated capital as a composite factor, and did not distinguish between physical and financial capital.

Recently the literature on regional development began to include financial factors, especially banking systems. This literature emphasises the role of financial factors in regional development.

Chick and Dow (1988) link the theory of financial development and regional development with their stages of banking theory (see section 6.5.2). This places their analysis within a post-Keynesian framework, since they view monetary systems as constantly evolving.

During the early stages of banking development Chick and Dow (1988) identify the regional distribution of savings as important. During this stages firstly savings, then reserves and then credit are directed to the regions where the expected returns on investment is high. Regional constraints on investment eventually determines growth in a region.

As financial institutions develop and become more concentrated, credit allocation decisions gravitate to the financial centre. This often coincides with a concentration in the manufacturing sector. Branch banking, interbank lending and the availability of a lender of last resort soon remove the reserve constraints on regional credit creation.

As the financial sector becomes more developed, a tendency will arise for periphery deposits to be lost to the centre. This will be acute during periods of uncertainty when liquidity preference is high. In general the periphery experiences larger fluctuations in receipts for its products and tighter binding financial constraints. For this reason there tends to be a marked liquidity preference in the periphery in times of recession. The regional pattern of liquidity preference therefore becomes an important factor in regional credit allocation as banks develop.

During the final stage of banking development, when banks are actively seeking loans, deposit rates rises. Loan rates follow to protect bank margins. Consequently the higher borrowing costs may discourage investment projects. Only producers who possess sufficient market power to pass down the higher borrowing costs through higher prices are favoured. Thus, periphery industries are usually small while larger industries are located in the centre.

A conclusion from the above is that the conventional wisdom of unification of the capital markets in a country can be questioned. According to Chick and Dow (1988:246) : "a move towards unification, which improves micro-efficiency, may be macro-inefficient". A policy of financial segmentation in conjunction with policies to encourage entrepreneurship and to discourage fluctuations in regional product prices may therefore be appropriate in developing countries¹⁶.

An implication for South Africa is that due to transitional uncertainty, liquidity preference may be exacerbating the inequality between regions. Any attempt to stimulate regional development in South Africa will therefore have to look at ways of increasing access to credit in rural and lesser developed regions. A regional reserve and liquidity asset requirement may be imposed on banks and other financial institutions to force these institutions to reinvest a proportion of the deposits from a specific region in that region. This idea needs to be further investigated.

Other measures, aimed at breaking down the alienation felt by a large number of Black people (especially in the rural areas) towards the financial sector, need to be urgently considered. Although a discussion of informal credit falls outside the scope of this study, the role played by informal credit associations in this regard, such as stokvels, needs to be investigated in the future.

6. 10 SUMMARY

¹⁶ Naylor (1975) argues that the more balanced regional development in the United States as compared to Canada can partly be explained by the more segmented regulatory framework in the U.S.

In this chapter, the importance incorporating the financial sector in the South African SAMs was emphasised, and the theoretical foundations for the analyses in chapters 7 and 8 were laid. For these purposes the role of money and finance in a developing country such as South Africa, were discussed.

The classical economists dicotomised the economy into a real and financial sector. This allowed them to reduce money to a neutral "oil" needed only to ensure that transactions proceed smoothly. Within the modern neo-classical theory, Patinkin argued that money is non-neutral, by invoking the real balance effect. Attempts to incorporate money into the Walrasian general equilibrium system supported the view that money is non-neutral. A monetary economy can be seen as suffering from a positive externality, because the real value of any firm's liquidity holdings is affected by the pricing decisions made by other firms.

The classical economists used the quantity theory of money in conjunction with the dichotomy of the economy to argue that the money supply is exogenous. The modern monetarist tradition, with their perscription of a "k-percent" rule for growth in the money supply, derives directly from the classical quantity theory.

Although Keynes held money to be exogenously determined, he paved the way for Tobin and Arrow to point to the endogeneity of money. Tobin and Arrow refined and extended Keynes' concept of liquidity preference. Only recently, however, the endogeneity of money became generally recognised. The post-Keynesians argued that during the time of the classical economists money consisted mainly of metallic money and could be considered exogenous. The subsequent expansion of banking and the provision of a myriad of money substitutes, together with the establishment of central banks to act as lenders of last resort have caused the stock of money to be determined by money demand. Money should thus

only be studied in a historical and institutional context. Such a focus, coupled with the portfolio approach of Tobin, can be useful for analysis of the South African economy through financial SAMs.

From the discussion of the role of money and finance in developing countries the foremost conclusion is that economic growth and development and financial structure is inextricably linked. The general idea is that financial structure allow investments to be undertaken more efficiently. A financial structure provides a vehicle for mobilising savings as well as a mechanism for gathering information on borrower default risk. Thus financial intermediaries may encourage a switch in savings from unproductive to productive assets. The financial intermediaries can calculate the average demand for early withdrawal due to idiosyncratic events and adjust their investment portfolios to accommodate this better than the individual can. For example, the creation of capital markets in developing countries can help these countries to face fluctuations in export earnings by accumulating reserves during periods of upswing and by drawing them down and/or by increasing foreign borrowing during periods of downswing.

Not only may a financial structure allow investment to be undertaken more efficiently, it may also contribute towards the quality of investments undertaken. In this context the importance of financial liberalisation measures, such as the establishment of positive real interest rates, were pointed out. Artificially low interest rates may discourage economic growth by "repressing" the financial system and thereby lowering the quality of investment.

The role of the financial sector in economic development depend on the stage of development an economy finds itself in. During the early stages of development, money and finance can be supply-leading, i.e. stimulate and cause real economic growth and

development. During these early stages growth and development are stimulated mainly through financial services which makes it cheaper and less risky to trade goods and services than to borrow and lend. Without money the economy would be confined to barter, which inhibits specialisation. The financial sector thus provides a medium of exchange, avoiding the double coincidence of wants needed in a barter economy. In this respect financial intermediaries play an important role in overcoming friction by reducing search and information costs.

During the latter stages of economic growth, as the financial sector becomes more sophisticated and powerful (but also more concentrated), the financial sector fulfills an important role by facilitating economic growth and development. During these stages regulation of the financial sector becomes important, because the financial sector could be destabilising. Financial intermediaries services the liquidity needs of agents. The better developed the financial system, the more alternative liquid assets are offered. During periods characterised by systemic risk, as is the case at present in South Africa, economic agents may be reluctant to save substantial parts of their wealth in illiquid assets. This effect may be amplified by the financial system into a destabilising crisis.

Some policy recommendations that follows from the above is that the encouragement of the financial sector in South Africa might have supply leading effects, due to the duality of the economy and the fact that a large proportion of the population, especially in the rural areas and informal sector, have a disproportionately small access to financial services. However, given the developed nature of the South African financial system, and the large degree of concentration, it might also be destabilising. The financial system thus need to be encouraged on the one hand, by bringing more people closer to financial services, but on the other hand needs to be regulated to prevent liquidity preference to cause destabilising speculation. The financial sector can be encouraged by adjusting the banking

sector to the needs of informal credit associations and to reduce the alienation felt by many Blacks towards the financial system.

Regulation of the financial system, although necessary, should not lead to financial repression. This means that positive real interest rates should be maintained. Lowering the inflation rate is important, since it will allow lower nominal interest rates and also because it may counteract the liquidity preference effect which diverts real capital formation. To obtain a lower inflation rate would require strict control over the government deficit, so that the government does not succumb to the temptation of employing the inflation tax. Regulation of the financial sector should also support regional development. For this a regional liquidity reserve was suggested, which would consist of banks buying bonds from regional authorities in proportion to their deposits coming from that region. This suggestion needs to be further researched.

The above policy recommendations are preliminary at this stage. In chapters 7 and 8 a methodology is presented which could allow these recommendations to be empirically evaluated.

**THE NATIONAL FINANCIAL ACCOUNTS
AS BUILDING BLOCK FOR FINANCIAL
SOCIAL ACCOUNTING MATRICES**

7.1 INTRODUCTION

In the previous chapter the role of money and finance in an economy, and specifically in a developing economy, was discussed. From the discussion it was clear that economic analyses which omit the role of the financial sector will be incomplete. This conclusion has led an increasing number of developing countries to attempt to quantify the influence of financial policies (Roe, 1985:70). The basic tool used for this quantification is the flow of funds (or national financial) accounts¹⁷. In this chapter an overview of the national flow of funds accounts in South Africa is given, and it is argued that these accounts can be used as a building block for financial SAMs.

In section 7.2 the origins of the national flow of funds accounts is traced, and some of the contributions of the accounts to economic theory are highlighted. In section 7.3 the national flow of funds accounts are defined while the theoretical foundations of these accounts are set out in section 7.4. In section 7.5 the South African national flow of funds accounts are described. The possible applications of the national flow of funds accounts

¹⁷ Uys(1991:6) is of the opinion that the term "national financial accounts" is preferable to "flow-of -funds accounts". Since the flow of funds accounts are only flows, and give no indication of initial and final balances of financial assets and liabilities, the description "national financial accounts" may be somewhat of a misnomer. As a compromise the term "national flow of funds accounts" is henceforth used when referring to these accounts.

are described in section 7.6. In section 7.7 an alternative statistical format for the national financial accounts is suggested, and it is argued that this format can facilitate the incorporation of the national flow of funds accounts into a SAM. Section 7.8 is a summary.

7.2 ORIGINS OF NATIONAL FLOW OF FUNDS ACCOUNTS AND CONTRIBUTIONS TO ECONOMIC THEORY

The national flow of funds accounts was part of the broader system of national accounts envisaged by Hicks (1942). Shortly hereafter, Mitchell (1944) produced an unpublished paper on the national flow of funds accounts, which led to Copeland's (1947,1952) compilation of a set of national flow of funds accounts for the United States. This new accounting system was hailed as expanding the potential frontier of economic model-building (Riefler, 1952). The flow of funds accounts were expected to be as popular with the next generation of economists' as the GNP accounts were with the current one. However, the contribution of national flow of funds accounts to economic modelling have been limited (Cohen,1972:17). One of the reasons for this limited use of the national flow of funds might have been the lack of an organising theory that incorporates finance and development (Cohen,1972). In a survey on national flow of funds accounts Bain (1973:1087) remarks that "...the reader may have been struck by the lack of any common theoretical core running through this survey".

Although Copeland's accounts did not contribute towards economic modelling, it did exert some influence on monetary theory. Cohen (1972:14) points out that Copeland's belief that banks act as financial intermediaries in the same way as other financial institutions, has received attention through the writings of Gurley and Shaw (1955,1960) and Tobin (1963). Furthermore, Copeland pointed out that the discretion for economic upswings lies

with those economic sectors where the real uses of funds are increasing faster than the real sources of funds. The banking sector merely provides the funds that these sectors demand. For Copeland the causal direction is therefore the reverse of the quantity theory : the volume of moneyflows determine the quantity of money rather than the other way around. Although expansionary monetary policy may lead to increased liquidity in the banking and non-banking sectors it would be insufficient to overcome a recession. Banks cannot convert sectors where the sources of funds are changing by a greater amount than the uses into a sector where the uses increases faster than the sources.

A further contribution of the national flow of funds accounts to economic theory is one that has been overlooked for some time (Cohen, 1972:15). This contribution is the focus of the accounts on transactors and their interactions in the financial markets. This is in contrast with the historical debate in monetary theory which focus on the relationship between the money supply and GDP. This debate ignores the effects of economic activity on borrowers's demand for funds and on the money supply.

7.3 DEFINITION AND PURPOSE OF THE NATIONAL FLOW OF FUNDS ACCOUNTS

Bain (1973:1055) defines the national flow of funds accounts as "one component of the national accounts system, which shows the financial transactions between broad sectors of the economy, thus linking the savings and investment aggregates". The basic idea behind the national flow of funds accounts is that the financial system of a country is part of its inherited technology in the same way as its factories. In chapter 6 this financial technology was seen to serve amongst others two essential functions, namely to (i) facilitate the movement of funds from surplus to deficit sectors and to (ii) provide incentives to stimulate future consumption as opposed to present consumption.

The purpose of the national flow of funds accounts is to quantify the role of a country's financial technology. Uys (1991:6) states in this regard that "...the financial flows generated by the surplus units seeking appropriate investment outlets, including those provided by the opportunity of financing the activities of the deficit units with their insufficient savings, are reflected in the system of national financial accounts".

Bain (1973:1065) claims that the main function of the national flow of funds accounts is the provision of data on transactions in financial markets in as neutral a form as possible. One should, however, recognise that the practical relevance of a set of economic statistics is often judged by its role in helping to determine appropriate economic policy and in the subsequent execution of that policy (Stone,1986:12). The operation of these two functions is normally (implicitly or explicitly) dependent on an underlying model of the behavior of the economy, and the practical relevance of a set of data can therefore be judged according to its consistency with that model. The next section is devoted to a description of the theoretical foundations of the national flow of funds accounts.

7.4 THE NATIONAL FLOW OF FUNDS ACCOUNTS : STATISTICS IN SEARCH OF A THEORY ?

It is largely through the efforts of economists' like Leontief and Stone that the value of economic statistics have come to be taken for granted (Roe,1973:409). Until recently, however, this was not the case in economics. Roe (1973) refers to the doubtful attitude towards statistics during the 1960s. In this context Meiselman (1967:461) commented as follows on the U.S. national flow of funds accounts : "Yet despite this vast and continuing outpouring of data from the Federal Reserve's flow of funds statistical salt-mill, to the reviewers best knowledge not a single important substantive contribution to the fields of

money, finance and investment behaviour has resulted from the availability of data or from the special accounting format used to assemble and classify figures”.

Meiselman's comment is representative of a view that the national flow of funds accounts is a case of statistics in search of a theory (Roe, 1973). Although a number of papers have pointed out the contribution that the national flow of funds accounts have made, Roe (1973) defends the national flow of funds accounts by clarifying its theoretical foundations.

The national flow of funds accounts are implicitly based on Tobin's (1952) portfolio approach to money and the financial sector. This borne out by Uys's (1991:5) description of the national flow of funds accounts, namely that "...both borrowers and lenders have optimal conditions. The various borrowers require different forms of financing to satisfy their particular needs at the lowest real cost, while lenders seek the financial asset rendering the highest real yield and appropriate to their particular income and capital needs”.

Although a portfolio approach underlies many orthodox economic theories, the degree of disaggregation is often minimal. In most cases the term "portfolio" merely seems to imply a two-way disaggregation into money on the one hand and all other items on the other. Hypotheses about the portfolio behaviour of this sectors are then only needed to yield statements about the demand to hold money.

The recent literature on the "reinterpretation" of Keynes illustrates that Keynesian economics can furnish an approach towards understanding the portfolio behaviour implicit in the national flow of funds accounts (e.g. Leijonhuvfud, 1968; Clower, 1965) . In this context Hicks (1967) argues that the bonds/money distinction in Keynes's (1936) *General*

Theory can be seen as a shorthand for a distinction between assets having variable capital values on the one hand (such as securities) and assets having constant capital values on the other (such as money when inflation is absent).

Once this distinction between money and other different assets are accepted, the concept of liquidity is important. It should, however, be emphasised that there is nothing absolute about the liquidity of an asset. Liquidity is a relative concept, since an asset which can be sold with absolute ease when few people are willing to sell might prove impossible to sell during a period when all holders are trying to sell simultaneously. This imply that the interactions and interdependencies in the financial markets can place institutions under threat of insolvency, not through their own mistakes or because of a lack of long-term viability, but because of investment mistakes that are made by other institutions. Thus bystanders can suffer because they sell to, buy from and hold the same type of asset as those who make an investment mistake.

Roe (1973:410) show that portfolio instabilities which occur because of investment mistakes may have a "financial multiplier" effect analogous to the income multiplier from orthodox Keynesian theory. If the implications of portfolio adjustment as described above are accepted, then the need for disaggregated financial statistics should be clear : the national flow of funds accounts may be needed to improve the knowledge of how, and to what extent, portfolio instabilities might occur.

7.5 DESCRIPTION OF THE NATIONAL FLOW OF FUNDS ACCOUNTS

Elementary descriptions of the national flow of funds accounts are available (see Uys, 1991 and Bain, 1973). The most recent South African national flow of funds accounts are contained in Appendix H (p. 281-282). These accounts are briefly described in this section.

The South African national flow of funds are presented in a "*sources -uses*" format (Roe,1985). The financial flows are presented in the form of a rectangular matrix with the sources and uses of funds of each sector shown as columns and the transaction items (claims) appearing as rows. Changes in a sector's holding of financial assets are shown in the column for uses of funds (decreases shown as negative uses). Similarly, changes in liabilities are shown in the column for sources of funds (decreases are shown as negative sources).

According to Uys (1991:14-22) the sectoral classifications employed in this national flow of funds accounts are the following :

1) A foreign sector consisting of all persons, organisations and assets resident or situated in countries other than South Africa. With regard to the domestic sector, this sector is a residual sector, required to balance the accounts of the domestic sector.

2) A general government sector consisting of the the central government and the provincial administrations and local authorities. The central government and provincial administrations include :

**** Government departments**

**** Departmental enterprises such as Government Motor Transport, the Government Printer, the South African Development Trust and social security funds.**

**** Governments of independent and self-governing states within the borders of South Africa.**

The local authorities include :

- ** Municipalities;
- ** Town councils
- ** Local health committees;
- ** Divisional councils, ect.

3) Financial intermediaries. Within this broad sector six subsectors are identified on the basis of differences in function and in the nature of liabilities. These six subsectors are :

3.1) Monetary authorities, consisting of the South African Reserve Bank, the Department of Finance as well as the Corporation for Public Deposits.

3.2) Other banking institutions than the monetary authorities include :

- ** Commercial banks
- ** Discount houses
- ** Merchant banks
- ** General Banks
- ** Short-term business of the Land and Agricultural Bank

3.3) Other deposit receiving institutions are classified as a separate sub-sector in the national flow-of funds accounts, mainly on account of similarities in the liabilities which consists mainly of saving-type deposits. these are included under the following headings :

- ** Permanent building societies
- ** The Post Office Savings Bank
- ** The Public Investment Commissioners

**** Insurers and Pension funds**

3.4) Other financial institutions include a variety of functionally different institutions, and can be regarded as a residual of institutions not included in the previous sectors. They consists of :

**** Unit trusts**

**** Participation Bond Schemes**

**** Finance companies**

**** Long-term business of the Land and Agricultural Bank**

**** National Savings Certificates**

**** Local Authorities Loans Fund**

**** National Housing Fund**

**** Development Bank of Southern Africa**

4) The Non-Financial Corporate Sector :

This sector includes business enterprises that are directly or indirectly engaged in the production and distribution of goods and services other than financial intermediation. They are separated in the national flow of funds accounts into private sector and public sector enterprises.

4.1) Private sector enterprises include :

**** Companies**

**** Co-operatives**

**** Incorporated professional service firms**

**** Mining and finance houses and holding companies.**

4.2) Public sector enterprises include :

**** Department of Posts and Telecommunications**

**** South African Transport Services**

**** South African Mint**

**** National Supplies Procurement fund**

**** Community Development Fund**

**** Non-financial public corporations such as the IDC, the Rand Water Board, Atomic Energy Corporation.**

**** Agricultural Control Boards.**

4.5) Households are the final consumers in the economy and the owners of all assets. In the national flow-of funds accounts this sector consist of :

**** Individuals and families**

**** Private charitable, religious and non-profit organisations**

**** Unincorporated business enterprises and farmers**

Twenty-four different assets/liabilities are distinguished in the national flow of funds. Before mentioning these, it should be noted that the link between the amounts of financial assets/liabilities held, are given by the financial balances. The financial balances can be defined as the difference between savings from own funds and fixed investment.

For the economy as a whole the financial balances will cancel out, since the following national accounting identity must hold :

$$(S_p - I_p) + (S_g - I_g) + S_f = 0$$

Where S_p = private savings

S_g = government savings

S_f = net foreign savings

I_p = private investment

I_g = government investment

The financing balances give an indication of the surplus and deficit sectors in the economy. The type of asset/liability in which financial balances can be invested are classified in the national flow of funds accounts according to the type of instrument and the circumstances in which the transaction took place. In the South African national flow of funds accounts, these transactions are shown along the rows. The transactions are organised in decreasing order of liquidity. Short-term assets/liabilities are shown at the top of the rows, while long-term assets/liabilities are shown towards the bottom. This allows one to obtain through inspection an assessment of the degree of liquidity and solvency of the different sectors.

The different transactions (assets/liabilities) that are distinguished in the national flow of funds are the following (for a detailed description, see Uys, 1991) :

- Gold and foreign reserves
- Cash and demand deposits
- Other short-and medium term deposits with banks

- Long-term deposits with banks
- Deposits with other deposit-receiving institutions
- Deposits with other financial institutions
- Deposits with other institutions
- Treasury bills
- Other bills
- Loans and advances by banking institutions
- Trade credit and short-term loans
- Short-term government stock
- Long-term government stock
- Non-marketable bonds of the central government
- Securities of the local authorities
- Securities of public enterprises
- Other loan stock and preference shares
- Ordinary shares
- Foreign branch balances
- Long-term loans
- Mortgage loans
- Members interest in life assurance and pension funds
- Amounts receivable and payable

A major residual item is denoted "other assets/liabilities". This includes transactions in existing fixed assets as well as all transactions which cannot be allocated to the other items because of a lack of data. In case of the foreign sector this item also includes the IMF's allocation of Special Drawing Rights (SDRs) to South Africa as well as valuation adjustments and errors and omissions in the balance of payments.

7.6 USES OF THE NATIONAL FLOW OF FUNDS ACCOUNTS

Although pioneering work on national flow of funds accounts began almost fifty years ago, far more effort is still devoted data collection than to analyses (Roe, 1985:73). The type of analyses that can be carried out with these accounts are discussed in this section. This is done in order to illustrate the versatility of these accounts, and to indicate the range of applications to which a SAM that incorporates the national flow of funds accounts can contribute to.

7.6.1 Historical descriptions

The national flow of funds accounts can be used as a framework for historical descriptions of the evolution of an economy's financial system (Roe, 1985; Uys, 1991). It may be useful to know something about the changing relative importance of different financial instruments, and about the manner in which a given structure of real investments was financed.

Furthermore, the national flow of funds can also be used for comparative analysis of financial development in different countries. In this context reference was already made in chapter 6 to Goldsmith's (1969) study.

Criticisms against this use of the national financial accounts is first that most analyses lack a consistent theory concerning the manner in which the financial events have interacted with the production, consumption and income creation in the real economy. Second, it provides relatively little policy guidance for those who are interested in intervening in the evolution of the financial system.

7.6.2 Surplus-deficit analysis

Surplus-deficit analysis makes use of the financing balances. An excess of investment (I) over saving, i.e. $I_i - S_i > 0$ indicates that a sector (i) is a deficit sector and is exerting an expansionary effect on the economy. A reverse situation, i.e. $S_i - I_i > 0$ identifies a sector as a surplus sector, one which is exercising a dampening effect on the economy (Cohen, 1972:2). Alternatively, a deficit sector can be defined as one where liabilities (L) exceed assets (A), i.e. $L_i - A_i > 0$, and a surplus sector as one experiencing a net money outflow from financial transactions, i.e. $A_i - L_i > 0$. Combining these two points of view indicates the underlying assumptions of surplus-deficit analysis about real-financial linkages. A deficit sector is one which converts nonfinancial sources into net financial saving, i.e. $S_i - I_i = A_i - L_i$.

A weakness of surplus-deficit analysis is that the equality of surpluses and deficits for the economy as a whole makes it impossible to say which sector(s) is exerting an expansionary or deflationary effect. This weakness can be overcome by using changes in surpluses and deficits and by assuming that a sector has more discretion over its uses of funds than its sources. In this way Copeland (1947:34) developed a three-part classification of bulls, bears and sheep.

Bulls are active sectors whose real uses of funds are increasing faster than their real sources of funds, i.e.

$$\Delta I > \Delta S, \Delta I > 0$$

Bears are active sectors whose real uses of funds are decreasing faster than their real sources of funds, i.e.

$$|\Delta I| > |\Delta S|, \Delta I < 0$$

Sheep are sectors whose sources are changing by a greater amount than their uses, i.e.

$$\frac{\Delta I}{\Delta S} < 1$$

Within surplus deficit-analysis one can distinguish liquidity analysis. The latter does not concentrate on the size or change in the financial balance, but on the financing of this balance. According to Holtrop (1957:306) "the essence of monetary disturbances is to be found in the possibility of exerting effective purchasing power in excess of, or in deficiency of, current contribution to production. This can be done only by financing expenditure out of the creation of new money or by drawing on available liquid reserves, or reversely, by hoarding money or taking it out of circulation."

The idea is that sectors which are reducing their liquidity (increasing short term borrowing or running down holdings of liquid assets) are providing an inflationary stimulus to the economy, whereas the reverse holds for those sectors which are increasing their net liquidity (Bain, 1973:1069).

Because the financial transactions in the South African national flow of funds accounts are arranged in descending order of liquidity, it is easy to arrange the table so as to give an

indication of how sectors are financing their surplus/deficits through short and long term claims.

7.6.3 Financial planning

The national flow of funds accounts are often used for calculation of the sectoral financing implications of medium-term development plans in developing countries. This have traditionally been carried out on an *ad hoc* basis with particular attention to the financing of government deficits (Roe, 1985:74). An example is the planning at the Reserve Bank of India (Bhatt, 1971). This planning relies on "financial input-output analysis" (Stone, 1966). This consists of a simple Keynesian model in which investment plays the role of an exogenous disturbance. Bhatt (1971) applied such a model at the Reserve Bank of India to the investment targets of the Fourth Indian plan in order to compute target sector savings figures, as well as the implied increase in the amounts outstanding of each major financial claim. By comparing their actual savings vector with the target savings vector from the plan, they were able to identify trends that were necessary to ensure the attainment of these targets.

7.6.4 Monetary approaches to the balance of payments

The national flow of funds accounts can be used to empirically formulate monetary models of the balance of payments for developing countries. This use draws only partially on the national flow of funds accounts.

The original monetary model of the balance of payments was developed by Polak (1957). This model and its subsequent elaborations provide the basis of the IMF's financial programming model. It was mentioned in chapter 4 that in view of South Africa's high

import propensity, economic growth may lead to a balance of payments crisis, and that this might necessitate the use of IMF assistance. The IMF's conditions for this assistance might not be consistent with income redistribution policies. A study of the IMF's conditions would have to take its financial programming model into account. In this use and knowledge of South Africa's national financial accounts may be useful. A discussion of the IMF's financial programming model is contained in Tarp (1991).

It should be stressed that monetary models of the balance of payments do not involve a full specification of the intersectoral financial flow of funds and do not enforce all the financial accounting identities implicit in the national flow of funds accounts. They therefore commit some of the sins of implicit specification discussed in Brainard and Tobin (1968). A further criticism against these models is that the strong link that they assume exists between aggregate demand and imports is dubious when the import demand of many "open" developing countries is in fact dictated by direct government control.

7.6.5 Money market analysis

One of the most widespread uses of the national flow of funds have been to forecast money market conditions (Uys, 1991; Cohen, 1972). On the basis of forecasts of demand and supply in financial markets, financial flows and market clearing interest rates have been predicted.

Another use of the national flow of funds accounts in this context can be to measure the extent of disintermediation taking place in the money market. Disintermediation can be defined as the by-passing of financial intermediaries and the resorting to direct borrowing and lending between surplus and deficit units (Uys,1991:31). Usually disintermediation

occurs when the spread between borrowing and lending rates becomes large enough to make lending and borrowing favourable at rates inbetween.

In practice, disintermediation often takes place in the form of a non-bank lender which withdraws money from an existing deposit with a deposit receiving institution and uses these funds to purchase a debt instrument or to make a loan to a borrower who used to borrow from a financial intermediary. As data on this are available from the national flow of funds accounts, one can obtain an idea through which institutions and instruments the disintermediation is taking place. This can be used to construct a more stable and accurate money supply indicator for the purposes of monetary policy.

7.7 THE NATIONAL FLOW OF FUNDS IN A SAM FRAMEWORK

In this section a novel application of the national flow of funds accounts is suggested. This is to construct financial SAMs which can be used as bases for CGE models.

The statistical format employed by the South African Reserve Bank is known as a "*sources-usages*" format, in which sector and claim detail are shown in columnar form. An alternative format is the "*sector-claim*" format (Roe, 1985:71). This format is shown in table 23.

Table 23 : The national flow of funds accounts in sector-claim format

	SAVINGS	INSTITUTIONS	FINANCIAL CLAIMS	TOTAL LIABILITIES
INVESTMENT		Z_j		
INSTITUTIONS	S_j		L_{jk}	$l_j = S_j + L_{jk} i_k$
FINANCIAL ASSETS		A_{jk}		a_k
TOTAL ASSETS		$a_j = Z_j + A_{jk} i_k$	l_k	

(Source : Roe, 1985 : 71)

In table 23 the subscript j denotes a financial institution and k a financial claim. For example, S_j represents the savings of the j -institutions identified in the accounts, while A_{jk} represents the amounts of the k -financial assets bought by the j -institutions. The sector-claim format in table 23 is the most general format of the flow of funds accounts and corresponds with that suggested in the United Nations SNA (UNSO, 1968).

In a sector-claim format the national flow of funds accounts provide a set of accounting identities that can (i) contribute to the identification and elimination of inconsistencies between different data sources, and (ii) provide two elements that will link it back to the real economy, namely a savings vector and an investment vector. These are :

$$(7.1) \quad S_j = a_j - L_{jk} \times i_k$$

(Where i_k is the unit vector)

Equation (7.1) states that sectoral saving is identical to the total of assets acquired by the sector less the liabilities issued. Further

$$(7.2) \quad Z_j = I_j - A_{jk} \times i_k$$

Equation (7.2) states that sectoral real investment is identical to the total sources of each sector less the financial assets acquired.

By comparing table 23 with the national flow of funds accounts in Appendix H (page 344-345), it can be seen that the sources-uses table published by the Reserve Bank rearranges the A and L matrices of table 23 so that a sale of an asset, or an acquisition of a liability, is shown in the sources column, while any purchase of an asset or repayment of a liability is shown in the uses column. A disadvantage of the Reserve Bank's format against the sector-claim format is that some of the interesting aggregates obtainable from a_k and I_j are lost. Further, table 23 is a square matrix which conforms to the principles of SAMs explained in chapter 3. This property enables one to replace the capital account in a SAM with the national flow of funds accounts in sector-claim format. This is done in chapter 8.

7.8 SUMMARY

In chapter 6 the importance of money and finance in an economy, and especially in that of a developing country such as South Africa, was pointed out. With reference to the first and second generation CGE models of chapters 4 and 5, it was stated that any economic analyses which do not take the role of the financial sector into consideration, are bound to be incomplete. This realisation has led an increasing number of countries to attempt to

quantitatively analyse the influence of financial policies. The basic building block in this quantification is the national financial (or national flow of funds) accounts. The purpose of this chapter was to give an overview of the national flow of funds accounts and to argue that these accounts can be extended to serve as a building block for social accounting matrices.

The national flow of funds accounts can be defined as one component of the national accounts system which shows the financial transactions between broad sectors of the economy, thus linking the savings and investment aggregates. The purpose of the accounts is to reflect the financial flows generated by surplus units seeking appropriate investment outlets, including those provided by the opportunity of financing the activities of the deficit units.

The national flow of funds accounts were first envisaged by Hicks in 1942. In 1947 Copeland compiled a set of national flow of funds accounts for the United States. The basic idea underpinning Copeland's accounts ties in with the theoretical view of the financial system as consisting of different institutions that make decisions regarding their portfolios of assets and liabilities. This implies that the national flow of funds accounts can be used to investigate the reappraisal of portfolio's due to incorrect investment decisions in a world of uncertainty. This portfolio instability can have a financial multiplier effect analogous to the income multiplier.

Although the national flow of funds can improve the understanding of the financial interactions in the market, and of portfolio instabilities, far more effort is still devoted to data collection than to economic analyses. The different types of analyses that these accounts can be used for illustrates their versatility, and are (i) historical descriptions, (ii)

surplus-deficit analysis, (iii) financial planning, (iv) monetary approaches to the balance of payments and (v) money market analyses.

It was pointed out that the statistical format of the South African national flow of funds accounts is known as the sources-usage format. An alternative format, the sector-claim format, was presented. It was argued that in this format the national flow of funds accounts can be incorporated into a SAM, because it contains savings and investment vectors which provide a link with the real sector, and because it is square. In chapter 8 the South African national flow of funds accounts are incorporated into four different financial SAMs.

CHAPTER

8

FINANCIAL SOCIAL ACCOUNTING MATRICES FOR SOUTH AFRICA

8.1 INTRODUCTION

In the previous chapter the national flow of funds accounts were discussed. It was shown that the national flow of funds accounts can be rearranged into a square matrix that is compatible SAM principles.

In this chapter, the South African national flow of funds accounts for 1988 and 1990 are used to compile four different financial SAMs. The year 1988 is chosen for compatibility with the 1988 SAMs of the Development Bank and the CSS, and 1990 is chosen to present a more recent SAM for South Africa. Due to a lack of data on households the real part of the 1990 SAMs cannot attain the same level of disaggregation as the 1988 SAMs.

In section 8.2 two financial SAMs for 1988 are compiled. These SAMs contain only the flows of financial variables. In section 8.3 two financial SAMs for 1990 are compiled. These SAMs contain the initial and final stocks of financial assets and liabilities, in addition to the flows. Section 8.4 contains a summary.

8.2 FINANCIAL SAMs CONTAINING ONLY FINANCIAL FLOWS

The existing SAMs for South Africa can be linked with the national flow of funds accounts through the savings and investment vectors of the economy. These vectors are contained in the capital account row/columns of the SAMs. A financial SAM can therefore be seen as a SAM with an elaboration of the capital account. In section 8.2.1 a simple financial SAM for South Africa is constructed. This SAM contains only the flows of financial assets and liabilities. In section 8.2.2 this SAM is made more sophisticated by focussing upon institutions. A classification is also employed which will allow income distribution issues to be investigated.

8.2.1 A simple financial SAM

The financial SAM compiled in this section is based on a framework suggested by Robinson (1991). This framework is illustrated in table 24 :

Table 24 : A framework for a simple financial SAM

	Current Accounts	Firms	HH	Govt	Row	Capital invest	Equity	Money	Dom.dep	For. dep
Cur Accounts	SAM									
<u>Capital Acc:</u>										
Firms	Sf					- ΔEQ	ΔEQ		ΔBDf	ΔBFf
HH	Sh									
Govt	Sg							ΔCU	ΔBDg	ΔBFg
Row	Bot									
<u>Δ liabilities</u>										
Capital		Δk	$-\Delta EQh$	$-\Delta EQg$						
Equity			ΔEQh	ΔEQg						
Money		$-\Delta CUf$	ΔCUh							
Dom.dep			ΔTDh							
For.dep			ΔFh	ΔFF	ΔNFD					
Total	SAM+sav									

(Source : Robinson, 1991:234)

In table 24 the following symbols are used :

Δ = change in
g = government
h = households
f = firms

SAM = real SAM
Invest = real investment
S = savings
BOT = balance of trade
k = Capital stock
EQ = Equity
CU = currency

TD = Domestic deposits
F = foreign exchange
FF = foreign currency
NFD = net foreign deposits
BD = domestic borrowing
BF = foreign borrowing

The savings entries in the first column of table 24 (Sf,Sg,Sh,BOT) represents the injections of savings into the loanable funds market. These injections can be considered sensitive to changes in the interest rate. For balance, aggregate savings have to equal aggregate investment.

Using the framework in table 24 to obtain a financial SAM for South Africa from the national flow of funds accounts is relatively straightforward. The capital accounts of institutions such as firms, households, government and the foreign sector can be obtained

from the national flow of funds accounts (row 4, Appendix H, p.281). Assets types can be obtained from the national flow of funds accounts. These asset types have been aggregated into six types, namely reserves, deposits, bills, loans, pension funds and shares. These types correspond as follows to the national flow of funds classification :

Table 25 : Definition of asset/liability types according to flow of fund classification

<u>TYPE OF ASSET/LIABILITY</u>	<u>ROW NUMBER IN FLOW-OF-FUNDS</u>
Reserves	9
Deposits	10, 11, 12,14,15
Bills	16,20,21,22,23,24,27,21,32,33
Loans	18,19,28,29
Insurance and Pension funds	30
Shares	25,26

The institutions in the financial SAM consist of :

-Firms, consisting of public and private corporations, insurance and pension funds and the public investment commissioners;

-Banks, consisting of the monetary authorities, other banks, other deposit-taking institutions and other financial institutions.

-Government, consisting of the central government, provincial administrators and local authorities.

-Households, including farmers and unincorporated enterprises.

-Foreign sector.

Data on the financial sector are obtained from the national flow of funds accounts, while all the other data are obtained from the national income and production accounts published by the Reserve Bank (in the Quarterly Bulletin, March 1992).

The first step in the compilation of the financial SAM is the aggregation of the national flow of funds accounts into the classifications described above; thereafter the accounts are written in a sector-claim format as in table 26 :

Table 26 : The 1988 South African national flow of funds accounts in sector-claim format (R millions)

	1 Save	2 For	3 Bank	4 Govt	5 Firm	6 HH	7 Loans	8 Depos	9 Rsrve	10 Bills	11 Share	12 Pifs	13 Total
Inves		0	1491	5721	34371	9179							
For	-5787						422	0	879	-504	838	0	-4125
Bank	3124						4679	17308	0	7215	1406	0	33732
Govt	1937						639	0	0	6124	320	71	9091
Firm	40199						18185	7908	0	569	6787	34680	108328
HH	11289						19960	0	0	9950	0	0	41199
Loan		-2141	23077	2069	20128	752							43885
Dep		1329	318	-2786	24530	1825							25216
Rserv		0	878	1	0	0							879
Bill		889	7250	4081	16493	-5359							23354
Share		-4229	718	5	12806	51							9351
Pifs		0	0	0	0	34751							34751
Total	50762	-4152	33732	9091	108328	41199	43885	25216	879	23354	9351	34751	

From column 1, row 5, of table 27 can be seen that households (HH) saves Rm 11289 from their own resources. They supplement this by taking out loans (Rm 19960) and by issuing debt instruments (Rm 9950). Their savings are used in column 6 for fixed invested (Rm 9179), loans (Rm 752), deposits (Rm1825), and shares (Rm 51). Most savings are put in insurance and pension funds, namely Rm 34751. In total, households' use of funds are greater than their sources. This forces them to reduce their assets, such as bills, by Rm 5359. A similar analysis can be undertaken for each of the sectors.

For incorporation into the Development Bank's SAM, table 26 is simplified by netting out assets and liabilities. This was done by subtracting the column entries from the corresponding row entries. The subsequent sub-matrix of financial flows (net assets) that is incorporated into the Development Bank's SAM is shown in table 27:

Table 27 : Submatrix of financial flows in a simple financial SAM for South Africa 1988 (R millions)

	14	15	16	17	18	19	SUB	CAPITAL	ACC	
	LOANS	DEPOS	BILLS	SHARES	PIF _s	RESRVE	TOTAL	INVEST	SAV	TOT
9 FIRMS	-1943	-16622	-15924	-6019	34680	0	-5828	-34371	40199	0
10 HH	19208	-1825	15309	-51	-34751	0	-2110	-9179	11289	0
11 GOVT	-1430	2786	2043	315	71	-1	3784	-5721	1937	0
12 FOREIGN	2563	-1329	-1393	5067	0	879	5787	0	-5787	0
13 BANK	-18398	16990	-35	688	0	-878	-1633	-1491	3124	0

In table 27 the rows and columns have been numbered to indicate their place in the simple financial SAM. This financial SAM is contained in table 28. To illustrate the link between the real and the financial sectors the savings and investment vectors have been included. In the financial SAM in table 28, columns 4 - 8 pay their savings over to their capital accounts in rows 9-13. In practice, however, discrepancies exist between the savings/investment figures in the national production accounts and the savings/investment figures in the national flow of funds accounts. A reason for these discrepancies may be due to the fact that savings and investment are determined residually in the national production accounts, while a different method may be used for obtaining these balances in the national flow of funds accounts.

In the simple financial SAM in table 28 these discrepancies are adjusted as follows :

(i) The investment demand of the government and non-government from the national flow of funds accounts are used as a benchmark. Gross investment from the national production

8.2.2 An institution by institution financial SAM ¹⁸

In this section a simple institution by institution financial SAM for South Africa is compiled. This SAM is described as an institution by institution SAM because of the way in which financial transactions are allocated between institutions.

To obtain this SAM, the national flow of funds accounts are arranged into a sector-claim format where the items are aggregated into the following types of financial assets and liabilities :

Table 29 : Description of correspondence between asset/liability types in the institution by institution financial SAM and the national financial accounts

TYPE	DESCRIPTION	Flow of funds Rows
ΔK	investment	4
ΔW	change in wealth (savings)	1-3
bank-loans	loans issued by banks	18,28-29
deposits	deposits held by banks	10-15
net-gbonds	government bonds	16-17,20-24,31
stocks	securities issued by firms	25-26
trade credits	aggregated with stocks	19
balancing	subsidised loans to hh	32
for-exch	gold and other forex	9&27
pension & insurance funds (pifs)	insurance and pensions	30

The financial transaction items are allocated to either one of the following institutions :

¹⁸ This section is based on Van Seventer and Gibson (1992).

Table 30 : Types of institutions identified in institution by institution financial SAM and their correspondence with the national flow of funds accounts

TYPE	DESCRIPTION	Flow of funds Column
Firms	public & private enterprises	9-10
Households	households	11
Pifs	insurance & pension funds	5
Government	general government	7-8
Banks	financial intermediaries	2-4&6
Row	foreign sector	1

Financial transactions are allocated to institutions as follows :

Table 31 : Allocation of financial transactions to institution in the institution by institution financial SAM

INSTITUTION	TRANSACTION ITEM
Banks	deposits, bank loans
Firms	trade credits, stocks
Households	balancing
Government	net-gbonds
Pifs	pifs
Row	for-exch

In table 31 trade credits are assumed to be issued by firms and used by everyone else. In the financial SAM they are aggregated together with stocks under the firms' heading. The relevant amounts are contained in table 32 and were derived from the national flow of funds accounts.

Table 32 illustrate that increases in firms' assets are due to increases in gross domestic investment, deposits, trade credits to households and banks and home loan to households. Assets are financed by gross savings (mainly allowance for depreciation), bank loans and stocks sold to pension and insurance funds. A significant amount of stock were sold to firms by the rest of the world. From the T-balance of the rest of the world can be seen that they use this proceeds to finance the surplus on the current account.

Table 32 : T-account of the firms

ASSETS		LIABILITIES	
ΔK	30 007	ΔW	39140
deposits	11 061	bank-loans	9726
net-gbonds	-8 225	stocks	1635
trade credits	11 181	households	51
households	6 337	pifs	7876
pifs	-1 250	government	-315)
government	-108	banks	-910)
banks	5 546	row	-5067)
row	656		
balancing	6 446		
for-exch	11		
TOTAL	50501	TOTAL	50501

From tables 33 and 36 can be seen that the trade credits issued in table 32 are issued to households and banks. Similarly, from table 34 can be seen that new stocks in table 32 are taken up mainly by pension and insurance funds. The transaction item "balancing" is described by Uys (1991:27) as "...transactions in existing fixed assets and ...all transactions that cannot be allocated to the other items because of a lack of data". For the present purposes it is assumed that this item consists largely of subsidised home loans from employers to households. The main contributors are firms (R6,5b), pension and insurance funds (R3,2b) and the government (R5,7b).

From the households' T-account (table 33) can be seen that their main assets lie with the pension and insurance funds (R35b). This is financed by savings, bank loans, trade credits and subsidised loans. Table 33 imply that contractual savings of households with the pension and insurance funds are largely financed through loans. From table 34 can be seen that the pension and insurance funds use these contractual savings to purchase assets such as deposits, government bonds and stocks.

Table 33 : T-account of households

ASSETS		LIABILITIES	
ΔK	9179	ΔW	11289
deposits	1825	bank-loans	12871
net-gbonds	-409	trade credits	6337
stocks	51	balancing	14900
pifs	34751	firms	6446
		pifs	3177
		government	5705
		banks	-980
		row	552
TOTAL	45397	TOTAL	45397

Net government bonds (Net-gbonds) include government bonds and amounts payable. The reason for including the latter is based on the assumption that amounts payable consist of outstanding tax liabilities. According to the national flow of funds accounts, the amounts involved are not significant.

Table 34 : T-account of pension and insurance funds

ASSETS		LIABILITIES	
ΔK	4364	ΔW	1059
deposits	13082	bank-loans	762
net-gbonds	6735	trade credit	-1250
stocks	7876	pifs	34680
balancing	3177	households	34751
for-exch	17	government	-71
TOTAL	32251	TOTAL	35251

From the government's T-account (table 35) can be seen that firms sell government bonds on a large scale. These are bought by pension and insurance funds and the public

investment commissioner, whose business consists of receiving longer term funds from the public sector and investing these funds on their behalf in public sector securities.

TABLE 35 : T-account of the government

ASSETS		LIABILITIES	
ΔK	5721	ΔW	1937
deposits	-2786	bank-loans	-1322
stocks	-315	trade-credits	-108
balancing	5705	net-gbonds	7748
for-exch	1	firms	-8225
pifs	-71	households	-409
		pifs	6735
		banks	8778
		row	869
TOTAL	8255	TOTAL	8255

On the liability side of the T-account in table 35 can be seen that government bonds are mainly bought by pension and insurance funds and banks. The proceedings are used to finance government investment and to subsidise home loans. Because the latter amount is relatively large an investigation into its precise composition seems advisable.

From the banking sector's T-account (table 36) can be seen that firms and pension and insurance funds make large deposits and that households and pension and insurance funds take up most bank loans.

Table 36 : T-account of the banking sector

ASSETS		LIABILITIES	
ΔK	1491	ΔW	3124
bank-loans	23 944	deposits	24531
firms	9726	firms	11081
households	12871	households	1825
pifs	762	pifs	13082
government	-1322	government	-2786
row	1907	row	1329
net-gbonds	8778	trade credits	5546
stocks	-910		
balancing	-980		
for-exch	878		
TOTAL	33201	TOTAL	33201

The T-account of the rest of the world (table 37) indicates that most of the capital outflow from South Africa are financed by the sale of stocks :

Table 37 : T-account of the rest of the world

ASSETS		LIABILITIES	
ΔK	0	ΔW	-5787
deposits	1329	bank-loans	1907
net-gbonds	869	trade-credit	656
balancing	552	for-exch	907
stocks	-5067	firms	11
		households	0
		pifs	17
		government	1
		banks	878
TOTAL	-2317	TOTAL	-2317

The next step is to integrate the above T-accounts in a matrix framework similar to the sector claim format. Such a framework is shown in table 38. Changes in assets are shown along rows and changes in liabilities down columns.

Table 38 : Financial aggregates for the institution by institution financial SAM for South Africa, R 1988 (R millions)

	1 FIRMS	2 HH	3 BALANCE	4 TOT-HH	5 PIFs	6 GOVT	7 BANKS	8 ROW	9 ΔK	TOTAL
1 FIRMS	0	9	6446	6446		-8225	11081	11	30007	39320
2 TRADE CREDITS	0	6337	0	6337	-1250	-108	5546	656	0	11181
3 TOT-FIRMS	0	6337	6446	12783	-1250	-8333	16627	667	30007	50501
4 HH	51				34751	-409	1825	0	9179	45397
5 PIFs	7876		3177	3177	0	6735	13082	17	4364	35251
6 GOVT	-315		5705	5705	-71	0	-2786	1	5721	8255
7 BANKS	8816	12871	-980	11891	762	7456	0	2785	1491	33201
8 ROW	-5067		552	552	0	869	1329	0	0	-2317
9 ΔW	39140	11289	0	11289	1059	1937	3124	-5787	0	50762
TOTAL	50501	30497	14900	45397	35251	8255	33201	-2317	50762	

From cell (3,4) in table 38 can be seen that firms provide Rm 12783 of trade credits to households. Firms sell government bonds (1,6), take up deposits (1,7) and invest in the real sector, ΔK (1,9). This is financed by selling stocks to the pension and insurance funds (1,5) and taking up loans from banks (1,7) and from internally generated savings, ΔW (1,9). It is clear that firms' savings in South Africa are larger than their investment (i.e. they are a financing surplus sector - see chapter 7, section 7.6.2).

According to table 38 households' assets lie mainly with pension and insurance funds (4,5). A substantial amount is also invested in new residential buildings, ΔK (4,9). These amounts are partly financed by personal savings (9,2). Personal savings are financed by credit from firms (4,1) and banks (7,2).

Pension and insurance funds use the households' funds (4,5) to invest in stocks (5,1), government bonds (3,6) and deposits (3,7). Compared to other domestic institutions the government's financial interaction is limited. Finance is raised from pension and insurance funds (5,6) and banks (5,7) and are used to repay bonds to firms (3,6) and to subsidise households' home loans (6,3) and to undertake fixed investment (6,9).

The rest of the world shows a capital outflow (9,8) which is largely financed by firms through sales of stocks (8,1).

The next step is to integrate this matrix with a SAM. For this purpose the matrix in table 38 is transposed and the capital account of the 1988 SAM of the Development Bank replaced. The resulting financial SAM is contained in table 39. Households have been broken down into skilled and unskilled so that this SAM can be used to evaluate the impact of the financial sector on income distribution.

Table 39 : An institution by institution financial SAM for South Africa, 1988 (R millions)

	REAL		SIDE				FINANCIAL						14	
	1	2	3	4	5	6	7	8	9	10	11	12		13
	pr-costs	cur-firms	skill-low	skill-hi	cur-govt	cur-row	res	cap-firms	cap-hh	cap-plfs	cap-govt	cap-row	cap-bank	
1 pr-costs	198915		96075	47710	16868	69487	-8021	23876	9179	4364	7830		1366	467849
2 cur-firms	101787				9949	1808		-5525						108019
3 skill-low	79229	7777			25085	241								112331
4 skill-hi	27768	28156			12894	158								66777
5 cur-govt	27352	18708	7596	16443	5696	459								76254
6 cur-row	32599	8181	7586	3446	5018			8003			1534			66367
7 residual		-8021												-8021
8 cap-firms		35437							51	7878	-315	-5067	8816	46848
9 cap-hh		9037	1075	1177				12783		3177	5705	552	11891	45397
10 cap-plfs		1059						-1250	34751		-71		762	35251
11 cap-govt		4636			944			-8333	-409	6735		869	7456	11989
12 cap-row						-5787		667		17	1		2785	-2317
13 cap-bank		2999						16627	1825	13082	-2786	1329	~	33076
14 TOTAL	467850	108019	112331	68777	76254	66366	-8021	46848	45397	35251	11898	-2317	33076	

8.3 FINANCIAL SAMs WITH FINANCIAL STOCKS AND FLOWS

There are two reasons for expanding the financial SAMs of the previous section to include financial stocks. The first is to be able to empirically determine the implications of portfolio theory for South Africa. The second is to allow a CGE model to be sequentially solved for a number of periods. For this it is necessary that the financial flows of one period be added to the initial stocks of financial assets and liabilities in order to arrive at final stocks for a particular period. The final stocks are subsequently used as beginning stocks for the next period.

In this section two financial SAMs with stocks are compiled. The first is compiled according to a format suggested by Rosensweig and Taylor (1990). The second is an institution by institution financial SAM, and is based on Gibson and van Seventer (1992).

8.3.1 A financial SAM with stocks

A financial SAM with stocks is contained in table 40. Although this SAM follows Rosensweig and Taylor's (1990) format, their format has been adapted in two ways. First, the formation of physical capital is treated differently in order to show the financing balances explicitly. By showing these balances, the overall balance of the financial SAM does not change (the column total of the financing balances adds to zero). It is useful, however, since changes in financing balances can give an indication of which sectors in the economy are exerting an expansionary effect and which are exerting a contractionary effect (see chapter 7, section 7.6.2). Second, capital flight is included as part of the rest of

the world's portfolio. Capital flight is defined as the sum of private short-term capital outflows and errors and omissions in the balance of payments statistics. By including capital flight the political instability (which leads domestically to increased liquidity preference as discussed in chapter 6, section 6.8) in South Africa can be reflected.

The financial SAM in table 40 is for 1990. The data sources for the real part of the SAM are listed in Appendix I (p.283). Data on the financial flows is obtained from the Reserve Bank's Quarterly Bulletin (March 1992). Note that more detail pertaining to the portfolio's of the different sectors are included in this SAM than in the previous financial SAMs in section 8.2. This is because asset and liability items include capital, gold, money (cash and deposits), securities, loans, shares, pension and insurance interest and a category labelled "other". This latter corresponds to the category "balancing" described in section 8.2.2.

In order to obtain an estimate of initial balances of these different assets and liabilities held by the institutions, and due to data availability, the national flow of funds accounts for South Africa were integrated from 1980 until 1989¹⁹. The reason for using this method is (i) because of the lack of available data on the particular stocks desired and (ii) in order to present a flexible method whereby financial SAMs with different classifications can be derived from the national flow of funds accounts. The use of the national flow of funds accounts for obtaining both flows and stocks will ensure consistency over periods. Furthermore this imply that a better use of the national flow of funds accounts is made.

Changes in assets and liabilities of institutions over the period 1980 to 1990 are contained in Appendix J (p.285).

¹⁹ The total capital stock is estimated via the capital/output ratio, which in most countries is around 3:1. According to statistics from the Development Bank, the rate of capacity utilisation in South Africa is 85 %. This imply a potential output of Rm 243289 during 1989. In turn this imply a total capital stock of Rm 729896 at the end of 1989.

Subsequently the flows for 1990, and the financial stocks at the end of 1989, are integrated into a "financial portfolio matrix" for South Africa for 1990. This financial portfolio matrix is shown in Appendix K (p.290). The end of the period stocks are written with a negative sign to indicate that they were obtained as the sum of the initial stock and the flow during the year.

To combining the real SAM for 1990 with the financial portfolio matrix the real sector are adjusted through the bi-proportionality method (see Bacharach, 1970). The real sector has to adjust because the financial sector contains negative entries. Negative entries cannot be changed and re-estimated with this method. As far the financial sector is concerned, the rest of the world is seen as a residual sector needed to balance the entire economy.

A word about the data on the capital flight is in order. By its very nature, capital flight involves unrecorded and illegal transactions. Thus it is clear that capital flight cannot be measured directly, even if all persons agree on its definition. Therefore, a variety of definitions, measurement concepts and computational techniques exist for measuring capital flight, all of which produce different results and implications.

For the present purposes the "balance of payments" measure are used to obtain an indication of capital flight in South Africa over the period 1980-1990. Data were obtained from the IMF's International Financial Statistics. This is contained in Appendix L (p.293). From Appendix L can be seen that capital flight is episodic rather than continuous : heavy outflows tend to concentrate in certain years, suggesting that these outflows are associated with certain (political and economical) events. It is clear that during 1976/77 (Soweto riots) and 1985/86 (Vaal Triangle riots) capital flight from South Africa increased significantly.

Table 40 : A financial SAM for South Africa with stocks, 1990 (R millions)

									9	10	firms' portfolio						banks' portfolio						
	1	2	3	4	5	6	7	8			11	12	13	14	15	16	17	18	19	20	21	22	23
	prod act	gov	w&ls	curr firm	curr hh	curr govt	curr row	residual	invest	fin bal	money	secure	loans	shares	pensions	other	gold	money	secure	loans	shares	pensions	other
1 ini cap									722896														
2 ini gold																	2620						
3 ini money											72433						-138128						
4 ini secu												38982						14557					
5 ini loans													41780							117945			
6 ini shares														-1420								-408	
7 ini pensions															-126327								0
8 ini others																2036							10457
9 prod act	198915				143785	16888	69487	-8021	48615														
10 invest									58152														
11 gov	101787					11054	1808		-5525														
12 w&ls	105997				2783	30408																	
13 curr firms		43703																					
14 curr hh			137385	35933		7371	388																
15 curr govt	27352	3178		15530	24038	5898	458																
16 curr row	32588	9025	2803	281	8229	3813			9537														
17 residual					-8021																		
18 cap firms		37318							-31488	5828	16622	6298	2442	-8018	-34822	9651							
19 cap banks		2998							-1386	1633							-878	-16880	1015	18388	588	0	-3888
20 cap hh		8287			2252				-8408	2110													
21 cap govt		4636				944			-3384	-3784													
22 cap row							5787			5787													
23 cap flight									2412														
24 fin cap									783638														
25 fin gold																	-1742						
26 fin money											-89055							153118					
27 fin secu												-46280							-16572				
28 fin loans													-44302							-138343			
29 fin shares														7438									-379
30 fin pension															161148								0
31 fin others																-11687							6591
32 TOTAL	467850	109124	140198	43703	181098	78254	66368	-8021	1587272	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	household portfolio							government portfolio							foreign portfolio							TOTAL
	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	
	money	secure	loans	shares	pensions	other	gold	money	secure	loans	shares	pensions	other	cap fl	gold	money	secure	loans	shares	pensions	other	
1 int cap														14112								74408
2 int gold							-84								-2538							0
3 int money	42574						19120								1989							0
4 int secu		2418						-58824								1887						0
5 int loans			-140944						1537									-20998				0
6 int shares				1214						1624									-1000			0
7 int pensions					127499							-1172								0		0
8 int others						-7341						-5565									413	0
9 prod act																						467649
10 invest																						56152
11 gov																						109124
12 wls																						140198
13 curr firms																						43703
14 curr hh																						181098
15 curr gov																						78254
16 curr row																						66367
17 residual																						-9021
18 cap firms																						0
19 cap banks																						0
20 cap hh	1825	-408	-19908	-51	34751	-18018																0
21 cap gov							-1	-2788	-7748	1430	316	71	12503									0
22 cap row															879	1328	844	-3082	5087	0	730	0
23 cap flight														2412								0
24 fin cap														-16524								767112
25 fin gold							85								1857							0
26 fin money	-44399							-16334								-3328						0
27 fin secu		-3008							68672									-2711				0
28 fin loans			159452							-2987								24080				0
29 fin shares				-1163							-1938									-4068		0
30 fin pension					-182250							1101								0		0
31 fin others						28359						-5938									-1143	0
32 TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The description of the real part of the SAM in table 40 is straightforward. Notice that rows 9-14 and columns 1-6 balance. This reflects the circular flow of income in the economy. The column for financing balances shows that firms, banks and households are the "savers" in the economy. The government and the rest of the world are dissaving. The fact that firms are a surplus sector in South Africa, is in contrast to the situation in other countries. The reason for this abnormality is ascribed by Uys (1991) to the inclusion of large mining houses in the firm sector. These mining houses handles large amounts of retained earnings and cash from gold sales and use it for intercompany financing.

The purpose of the remaining accounts in the financial SAM is to show how the differences between investments and savings in each sector are financed. Firms, with a financing surplus, increase their assets of money (deposits), other (subsidised home loans) and by extending loans. Note that their liabilities of pension and insurance funds increase by Rm 34680. Firms reduce their holdings of shares by Rm 6019.

Banks, with a slight financing surplus of Rm 1633 (see row 16, column 7), increase their gold and foreign reserves, and purchase securities. They extend loans by the amount of Rm 18398 while their liabilities in the form of deposits increase by Rm 16980.

Households, with a financing surplus of Rm 2110, increase their deposits, but borrow Rm 19208 to invest in pension and insurance funds Rm 34751 and to buy shares Rm 51. They need to decrease their assets of other items by Rm 14900.

The government's investment exceeds their savings by Rm 3784 whereby investment exceeds their savings from own sources. In addition they need finance for subsidised loans

(Rm 5775) and other loans (Rm 1430). This finance is obtained by decreasing money holdings by Rm 2786 and by selling Rm 7748 of securities.

The rest of the world needs to finance its trade surplus with South Africa to the amount of Rm 5787. This is done by reducing gold and foreign reserves, obtaining loans and by selling shares. They increase their deposits in South Africa by Rm 1319.

8.3.2 An institution by institution financial SAM with stocks

An institution by institution financial SAM for South Africa that includes stocks is presented in table 41. In table 41 the real sector is contained on the left hand side in columns 1-5. Beginning stocks for the financial sector are shown in rows 1-8 of table 41. Flows are shown in rows 9-15. The sum of beginning stocks and flows give final stocks. These are contained in rows 16-22.

The major link between the real and financial sides of the economy is given by the gross domestic investment. It is assumed in this analysis that only firms, households and the government undertake investment. Whilst investment is essentially a real sector variable, it can only be found in the SAM amongst the financial variables in columns 6a, 7a and 8a for firms, household and the government respectively. The link is completely specified in the submatrix covered by the coordinates (15a,2) and (15e,5).

The financial SAM in table 41 is in 1990 current prices and does not reflect capital gains of the various institutions, although this could in principle be accommodated. It should also be noted that the financial SAM covers only the formal economy in order to be consistent with the Reserve Bank Quarterly Bulletin.

Because the real side of financial SAM in table 41 is for 1990, and the classifications differs somewhat from that of the 1988 real SAM which is more familiar, the classifications and data sources for the real part of the financial SAM are first discussed, after which the financial part are discussed.

8.3.2.1 The real side of the SAM

The real side of the SAM in table 41 is based on the national accounts published in the Reserve Bank's Quarterly Bulletin (March 1992). The structure of the real part is similar to the control total framework proposed by Eckert *et al.* (1992).

In the SAM in table 41 row 9 shows the sales of gross value of production as intermediates in cell (9,1), final goods and services to households (9,3a) and (9,3b), to government (9,4), to the rest of the world (9,5) and as investment goods to firms (9,6a), households (9,7a) and the government (9,8a). Production costs in column 1 consist of intermediate input (9,1), firms' operating surplus (10,1), wages and salaries to low and highly skilled labour (11a,1) and (12a,1), indirect taxes (13b,1) and imported intermediate goods (14a,1).

The operating surplus (10,1) plus interest payments received from holding government bonds (10,4) is equal to firms' income, which are distributed to low and highly skilled households in cells (11b,2) and (12b,2), direct taxes (13a,2), property income to the government (13c,2) and to pay interest on private foreign debt (14b, 2). The rest are retained as net savings (15a, 2) and allowance for depreciation (15a,2).

Households generate their income in rows 11 and 12. Earned income in the form of wages and salaries are obtained from the private sector (11a,1) and (12a,1) and from the

government in (11a,4) and (12a,4). Unearned income takes the form of distributed profits (11b,2) and (12b,2), net transfers from the government (11c,4) and (12c,4), interest payments on government debt (11d,4) and (12d,4) and transfers from the rest of the world (11c,4) and (12c,4). Household income is used for consumption expenditure (9,3a) and (9,3b), direct taxes (13b,3a), (13b,3b), imported final goods (14a, 3a) and (14a,3b), net savings (15b, 3a) and (15b, 3b) as well as allowance for depreciation (15b, 3a) and (15b, 3b).

Government revenue is shown in row 13 and consists of indirect taxes (13b, 1), direct taxes by firms (13a,2) and households (13b,3a) and (13b,3b), property income and allowance for depreciation (13c, 2) and transfers received from the rest of the world (13d, 5). Government expenditure in column 4 consists of current expenditure on goods and services which is locally supplied (9,4) and imported (14a, 4), interest payments to firms (10,4), households (11d,4) and (12d,4) and to the rest of the world (14b, 4). Furthermore, wages and salaries are paid to households (11a, 4) and (12a, 4) and transfers are granted to households (11c, 4) and (12c, 4). Finally, the government appears to incur a surplus which which consist of savings (15c,4) and allowance for depreciation (15c,4).

In row 5 exports of goods and services (9,5), transfers to households (11c,5) and (12c,5) and a surplus on the current account (15c, 5) allow for imports in row 14 that consists of intermediates (14a, 1) and final goods by households (14a,3a) and (14a, 3b), government (14a, 4) and imported capital goods by firms (14a,6a) and government (14a, 8a).

Gross domestic investment by firms consist of a locally supplied component (9,6a) and imported component (14a,6a). Similarly, government investment can be found in (9,8a) and (14a, 8a). Household investment demand consists only of a locally supplied component (9,7a) for reasons that are explained below. Gross domestic investment are

financed by net savings, allowance for depreciation and changes in financial assets and liabilities. Net savings are undertaken by firms (15a,2), households (15b, 3a) and (15b, 3b), government (15c,4) and the foreign sector (15c,5). Allowances for depreciation are made by firms (15a,2), households (15b, 3a) and (15b, 3b) and the government (15c, 4).

Because the real sector of the 1990 financial SAM is aggregated, the update from 1988 can be obtained almost directly from the Reserve Bank's Quarterly Bulletin. In those cases where the Quarterly Bulletin do not provide the required detail, proportions from the published SAM are used. In table 41 intermediate interactions (9,1), intermediate imports (14a,1), the breakdown of household expenditure (columns 3a and 3b), the breakdown of gross domestic investment into a domestically supplied and imported component (9,6a), (9,7a), (9,8a) and (14a,6a), (14a,7a), (14a,8a) respectively, are obtained as proportions of the published SAM.

Households and labour are disaggregated into high and low skill levels. Low skill labour is defined as clerical, sales, labour, service, farming and not otherwise classified occupation groups according to the definitions provided by Eckert *et al.* (1992). Low skill households are defined in terms of income levels according to the published SAM. For the present purposes it is assumed that the bottom 80 percent of households are low skill. High skill households are defined as the top 20 percent of the income earning households. High skilled labour is defined as professional, administrative and technical occupation groups.

Unlike in the 1988 SAM a perfect correspondence between households and labour is assumed. A corollary of this assumption is that an adjustment have to be made either in the expenditure of the households (columns 3a and 3b) or in the wage incomes of the newly defined labour categories (11a,1) and (12a,1). The former are used in the SAM in table 44. The adjustment is made by applying the bi-proportionality technique, based on initial

proportions from the 1988 SAM. Consequently the ratios of consumption expenditure, direct taxes, final consumer imports and savings of high to low skill households are not similar to those in the 1988 SAM.

As will be shown in section 8.3.2.2, the financial SAM indicates that both firms and households hold government bonds. Consequently, both institutions receive interest payments on government bonds. Furthermore, because the government also borrow from abroad, part of their interest payments flow to the rest of the world. In respect of the latter an interest rate of 8,4 percent is assumed. Foreign interest rate payments by the government are shown in (14b,4).

In the 1988 SAM total government interest payments are allocated to the gross operating surplus account. The latter subsequently distributed government interest payments to the various institutions in the economy along with other forms of unearned income. In the financial SAM in table 41 the difference between total government interest payments and foreign interest payments are allocated to firms and households according to the distribution of profits in the 1988 SAM. Interest payments to firms, low and highly skilled households are shown in (10,4), (11d,4) and (12d,4) respectively.

Finally, total foreign interest payments are obtained from the Reserve Bank's Quarterly Bulletin (March, 1992 : S-60). Subtracting government foreign interest payments results in private sector foreign interest payments which are shown in (14b,2).

The 1988 SAM is expressed in basic prices, i.e. transactions are recorded net of trade and transport margins and factor costs. The SAM in table 41 is expressed in market prices. Indirect taxes on final consumption (including exports and investment demand) are thus

assumed to be collected as part of the production costs and are subsequently transferred to the government in (13b,1).

In the SAM in table 41 it is assumed that gross domestic investment is undertaken by firms, government and households. Firms are assumed to be the only institution to engage in inventory changes and adjustments for inventory valuation. Households are assumed to invest only in residential buildings. Moreover, residential buildings can only be used as an investment good by households. Furthermore, it is assumed that no direct imports on residential buildings are required.

Investments in residential buildings are obtained from the Reserve Bank's Quarterly Bulletin (March, 1992 : S-87). The full amount is allocated to (9,7a). Government gross domestic investment is obtained from the Reserve Bank's Quarterly Bulletin (March, 1992 : S-93). This investment consist of locally supplied and imported components. The distribution amongst these two components are derived from the 1988 SAM and are allocated to (9,7a) and (14a,7a) respectively. A correction is made for government investment in residential buildings. The difference between total gross domestic investment and gross domestic investment by households and government is allocated to firms and distributed among locally produced and imported components in (9,6a) and (14a,6a).

Net savings of the government are obtained from the Reserve Bank's Quarterly Bulletin (March, 1992 : S-96). This excludes allowance for depreciation by the public authorities. On the other hand, gross domestic investment by the public authorities (column 8a of table 44) incorporates allowance for depreciation. In order to examine changes in holdings of financial assets and liabilities it is thus necessary to take government allowance for depreciation into account as part of gross savings. Cell (15c, 4) is for this purpose broken down into net savings (15c,4) and allowance for depreciation (15c,4). This procedure

deviates from the 1988 SAM in which allowance for depreciation is found in the equivalent to cell (15c,2) of the table 41. This procedure is rejected because it suggests that firms make an allowance for government depreciation. In order to restore the balance of the firms' account (row 10, column 2), government property income is increased by their amount of allowance for depreciation. This adjustment is based on the assumption that government allowance for depreciation is financed out of government property income.

A similar procedure is applied to households. The amounts allocated to household allowance for depreciation are discussed in the next section. In order to maintain a balance between household income and expenditure, the distributed profits (or property income) are raised by the same amounts in (11b,2) and (12b,2).

To avoid cluttering the financial SAM in table 41 with relatively less important behavioral relationships, and to maintain consistency with the Quarterly Bulletin, the real sector in the SAM is simplified as far as transfers payments are concerned. Two-way transfers between the rest of the world on the one hand and households and government on the other are netted out. The same applies for two-way transfers between government and households. Transfers of firms to the rest of the world are included in the imports of goods and services in (14a,1). Transfers from firms to government are added to direct taxes in (13a,2). Transfers from firms to households are added to profits in (11b,2) and (12b,2).

**Table 41 : An institution by institution financial SAM for South Africa with stocks,
1990 (R millions)**

	1	2a	2b	3	4	5a	5b	5c	5d	5e	6
	firms	hh-low	hh-high	govt	row	cap-firms	cap-hh	cap-gov	cap-row	cap-bank	TOTAL
1 in-stocks											
a firms							56.3		48	49.3	153.6
b hh										96.2	96.2
c govt						56.4	22.6		22	16	117
d row						37.7	15			-1.8	50.9
e banks						52.3	92.1	15.3			159.7
f capital						477	193.7	341.9			1012.6
2 firms	196.9	95.9	47.8	18.2	69.5	34.3	3.4	3.2			469
3a hh-low											112.2
1 w&s	79.4			19.8							99.2
2 profits	7.1										7.1
3 transf				5.1	0.2						5.2
4 interest				0.7							0.7
3b hh-high											68.6
1 w&s	27.9			10.4							38.3
2 profits	25.7										25.7
3 transf				2.1	0.1						2.2
4 interest				2.4							2.4
4 govt											62.5
a dir-tax	15.5	7.5	16.3								39.4
b ind-tax	27.4										27.4
c profits	3.2										3.2
d interest	-7.7										-7.7
e transfer					0.3						0.3
5 row											64.3
a w&s	36.1	7.6	3.5	4.7			8.2		1.6		61.6
b interest	2.4			0.2							2.6
6 savings											143.6
a firms	53.2						-4.3		-5.1	8.4	52.3
net saving	10.2										10.2
deprec	43.1										43.1
b hh		1.1	1.2							12	14.3
c govt				0.9		-7.6	0.7		0.9	7.1	1.9
d row					-5.8	0.8	-0.5				-5.5
e banks						16.6	14.9	-2.8	-1.3		27.4
7 end stock											
a firms							52		42.9	57.7	152.7
b hh										96.2	96.2
c govt						48.8	23.3		22.9	23.1	118
d row						38.5	14.5			-1.8	51.2
e banks						68.9	107	12.5	-1.3		187.1
f capital						476.4	197.1	346.7			1020.2
8 TOTAL	522.3	112.2	68.6	62.5	64.3	632.6	393.9	359.2	64.5	175.1	

8.3.2.2 The financial side of the SAM

The beginning stocks of the institution by institution financial SAM with stocks (see table 41) are derived from the Reserve Bank Quarterly Bulletin (March 1992) in the following way. Loans and deposits for the government and non-government sector are part of the Reserve Bank's monetary analysis (page S-22 of the Quarterly Bulletin) and consist of :

Government loans:	Rm 15 987
Non-government loans:	Rm 145 516
Government deposits:	Rm 15 315
Non-government deposits:	Rm 144 378
Reserves:	Rm -1 811

A breakdown of non-government loans into household and firms uses the extension to all monetary institutions (page S-20). The following loans are granted to households :

Hire purchase credit :	Rm 15 600
Mortgage advances :	Rm 51 894
50% of other loans and advances:	Rm 28 687

The total of the above is Rm 96 181. The remainder of non-governmental loans, Rm 49 335 are granted to firms.

The analysis of deposits by type of depositor (page S-10) offers a factor which can be employed to break non-governmental deposits down into households and firms. This factor is obtained by noting first that government deposits consist of :

Deposits:	Rm 3 156
Local government & RSCs deposits:	Rm 2 631
Inter-DI deposits:	Rm 15 734
Other deposits:	Rm 22 301

Second, households deposits amounts to Rm 79 418, while pension and insurance funds' deposits amount to Rm 10 754. Firms' deposits amount to Rm 51 182.

By dividing firms' deposits by the sum of firms' deposits and households' deposits, a ratio of 0.3919 is obtained. This factor is subsequently applied to total non-government deposits for the year 1989 so that firms' deposits are equal to Rm 52 277 and households deposits equal to Rm 92 101. The total deposits are Rm 144 378.

Households holding of shares are derived by summing the relevant amounts in the Reserve Bank's Quarterly Bulletin (March, 1992:S-29-S-34). Capital flight by firms is obtained from the analysis of South Africa's foreign assets (page S-66). Capital flight of households are assumed to be Rm 15 000. Total investment of the banking and non-bank private sector is available in the Quarterly Bulletin for the period 1982-1988. This is extrapolated to the year 1989 using linear regression ($R^2 = 0.9234$ and $t\text{-ratio} = 7.76$). The real sector in the SAM indicate that interest payments by the government to firms and households are Rm 7 738 and Rm 3 095 respectively. Assuming an interest rate on government bonds of 13.7 percent, the total stock of government bonds can be approximated at Rm 79 000. Firms' holdings of government bonds are thus Rm 7 738 and household holdings of government bonds are Rm 3 095. Household shares (issued by firms) are estimated to be worth Rm 56 300.

Firms' capital stock and the government's capital stock (in 1985 constant prices) are given on page S-90 of the Quarterly Bulletin. Household capital stock is assumed to be equal to 25 percent of the sum of firms' and the government's capital stock. Deflators are obtained

from gross domestic investment by type of organisation on pages S-89 and S-90 of the Quarterly Bulletin. Government foreign borrowing is estimated as a residual at Rm 22 000 and firm foreign borrowing at Rm 42 000.

It is obvious that a number of heroic assumptions are made to compile the beginning stocks of the SAM in table 41. By adding the financial flows to the beginning stocks the final stocks can be determined. Both wealth and capital stock for each of the institutions are adjusted for depreciation and capital gains. The former are available from the real side of the SAM. The latter can be obtained by using the relevant gross domestic fixed investment deflators.

8.4 SUMMARY

The purpose of this chapter was to present financial SAMs for South Africa, and to discuss the methodology whereby these SAMs were constructed.

The central building block of these SAMs is the national flow of funds accounts which were discussed in chapter 7. To serve as a basis for financial SAMs, the national flow of funds accounts were rearranged into a sector-claim format. In chapter 7 it was shown that this format differs from the Reserve Bank's format in that it is a matrix where assets are acquired down the columns, and liabilities along the rows. The savings and investment vectors of this matrix were used to provide a link with the real sector of the existing SAMs.

The national flow of funds accounts were linked up with a SAM of the real sector in four ways. The first resulted in a financial SAM for 1988 that contained only financial flows. A second financial SAM was obtained by rearranging the national flow of funds accounts

into an institution by institution matrix and by distinguishing between low-skilled and high-skilled households. The final two financial SAMs both contain initial and end stocks of financial assets in addition to the financial flows. These two SAMs are for 1990, and therefore requires a real SAM for 1990. Only the control totals of these SAMs were compiled, and the compilation of a properly disaggregated real SAM for 1990 is left as a topic for future research.

The compilation of the two SAMs with initial and end stocks was problematic, since no consistent data source for initial and end stocks exist. In the one SAM, the initial stocks were obtained from an integration over the flows contained in the national flow of funds accounts since 1970. The advantage of this method is that financial SAMs of different dimensions can readily be obtained.

The other SAM with financial stocks was cast in an institution by institution framework. To obtain values for the financial stocks a number of strong assumptions were made concerning data from the Reserve Bank's Quarterly Bulletin. For example, investment stocks of the banking and non-banking sectors were extrapolated by means of regression analysis from 1988 to 1989; capital flight of households was assumed to amount to Rm 15 000, and household capital stock was assumed to be equal to 25 percent of the sum of firms' and the government's capital stock.

In the next chapter a simple CGE model for South Africa will be based on the 1988 SAM compiled in section 8.2.1. From the results of policy simulations one would be able to derive certain lessons for income redistribution and restructuring in South Africa, and it will become clear that financial SAMs and CGE models can make useful contributions to economic policy analysis in South Africa.

CHAPTER

9

A SIMPLE CGE MODEL BASED ON A SOUTH AFRICAN FINANCIAL SAM²⁰

9.1 INTRODUCTION

Four different financial SAMs for South Africa were compiled in the previous chapter. In this chapter an application of a financial SAMs is illustrated through a simple CGE model for the South African economy. Against the background of the structural distortions in the South African economy, discussed in chapter 4, section 4.4.1, the effects of income redistribution policies and adverse external circumstances are simulated through this simple CGE model. The results are compared with that from CGE models for South Africa which omit the financial sector.

The CGE model in this chapter has its roots in the Gap models pioneered by Chenery and Bruno (1962) and Chenery and Strout (1966). These models were subsequently expanded by Balassa (1982) and Bacha (1990). Although Gap models are frequently criticised as being *ad hoc*, they underpin the World Bank as well as the IMF's approaches to economic modelling (Tarp, 1991). Due to the frequency of these institutions' involvement in developing countries, Gap models have in the past been applied to more countries than any other CGE models (Van Wijnbergen, 1986). With the greater involvement of the IMF

²⁰ An abridged version of this chapter was presented at the biannual conference of the *Economic Trends Research Group* at the University of Cape Town on 5 June 1992 (see Naudé, 1992b).

and the World Bank in South Africa (see Lachman & Bercuson, 1992) an evaluation of Gap models might be necessary.

Gap models are relatively easy to implement, and are not neo-classical as the models that were discussed in chapters 4 and 5. The guiding principle in the choice of a model should be the question posed by Taylor (1975:104) namely "do they provide enough illumination to justify their own construction?" This chapter is based on the assumption that a Gap model provides enough illumination to illustrate the usefulness of financial SAMs. The construction of a more complicated model, similar to the Brixen and Naudé (1993) model, is left as a topic for future research.

In section 9.2 a Gap model for South Africa is presented. The results of policy simulations are reported in section 9.3. Section 9.4 contains a summary.

9.2 A GAP MODEL FOR SOUTH AFRICA

In this section the effects of income redistribution policies (through an increase in government expenditure) are investigated by means of a Gap model based on a financial SAM. Because the CGE model in chapter 5 pointed to South Africa's vulnerability to external shocks, the impact of an adverse external shock is simulated, in order to determine the extent to which the financial markets are able to cushion or transmit such a shock.

The simple financial SAM derived in section 8.2 of chapter 8 (see table 28) is used a basis for the Gap model. The financial SAM of table 28 has been simplified to fit a Gap model, and has been normalised by potential output (Rb 271). This normalised financial SAM is

contained in table 42. From table 42 can be seen that the financial sector now consists of four institutions, namely the private sector, the government, the foreign sector and the banking sector. It can also be seen that five asset/liability types are identified, namely deposits, loans, government paper, foreign debt and foreign reserves.

Table 42 : A simple financial SAM for South Africa, 1988 (normalised by potential output, Rb 271)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	HH	GOVT	ROW	HH	GOVT		FINANCIAL VARIABLES							
	OUTPUT	OUTLAYS	OUTLAYS	OUTLAYS	INVEST	INVEST	CHANGES IN	HH	GOVT	SECURE	HH	GOVT	RESERVS	TOTAL
							DEPOSITS	LOANS	LOANS		FOR DEBT	FOR DEBT		
1 OUTPUT		0.4485	0.0517	0.214	0.1033	0.0221								0.8376
2 HH INCOME	0.7048		0.0812											0.786
3 HH TRANSFERS			0.0443											0.0443
4 GOVT INCOME	0.0295	0.1476												0.1771
5 IMPORTS	0.1033	0.0406												0.1771
6 FOR TRANSFERS		0.0221	0.0074											0.0295
7 HH FOF		0.1734			-0.1292		-0.0923	0.107		-0.0369	-0.0221			0
8 GOVT FOF			-0.0037			-0.0295			-0.0007	0.0369		-0.0018		0
9 ROW FOF				-0.0111							0.0221	0.0018	-0.0148	0
10 BANK FOF							0.0923	-0.107	0.0007				0.0148	0
11 TOTAL	0.8376	0.8303	0.1771	0.203	0	0	0	0	0	0	0	0	0	

The model can now be specified. The model is not original, but is based on the Gap-model suggested by Taylor (1991a, 1991b, 1992). In what follows most variables are normalised by the level of potential output, Q (Rb 271). The model allows the economy to operate below full capacity, Q (see Sobhan, 1990:14). Thus actual output, X, can be written as follows :

$$(9.1) \quad X = \mu Q$$

Where μ = the capacity utilisation rate.

According to standard national accounting principles, product market equilibrium is obtained by equating savings and investment. Savings consist of a private component s_p , a government component, s_g , and a foreign component, s_f . Investment demand is undertaken by the government i_g and the private sector, i_p . Thus

$$(9.2) \quad s_p + s_g + s_f = i_p + i_g$$

In terms of table 42 the sum of cells (7,2), (8,3) and (9,4) is equal to the sum of cells (7,5) and (8,6). The rate of growth of potential output, g , is assumed to consist of an exogenous g_0 plus normalised investment i times the incremental output-capital ratio, κ :

$$(9.3) \quad g = g_0 + \kappa i$$

In other words, potential output is determined as a function of capital stock. The parameter κ is estimated to be equal to 0.31 in South Africa, in order to be consistent with the assumption made about the initial capital stock in chapter 8, section 8.3.1.

In terms of table 45 i is given by the sum of cells (7,5) and (8,6). Government investment is assumed to have a "crowding in" effect on private investment (Bacha, 1990; Shapiro & Taylor, 1990; Taylor, 1990). This crowding in effect is measured by the coefficient α in equation (9.4) :

$$(9.4) \quad i_p = i_0 + \alpha i_g + \beta \mu$$

If α in equation (9.4) is larger than one an additional government investment of R1 will lead to an additional private investment of more than R1. Furthermore, it is assumed that rising output generates further investment according to the accelerator principle in the form of coefficient β .

Equation (9.4) is substituted into the right hand side of equation (9.2) to give the following expression for total investment :

$$(9.5) \quad i = i_0 + (1+\alpha)i_g + \beta\mu$$

It is posited in equation (9.6) below that normalised government savings, s_g , are positively related to capacity utilisation, μ , through the coefficient z_1 , the marginal public savings rate. This assumption is based on the observation that an increase in output usually results in an increase in government revenues (Taylor, 1992:7). On the basis of past trends the value of 0.26 for z_1 was calculated for South Africa. Conversely, government domestic interest payments, j , and government foreign interest payments, ϵj^* may have a negative effect on government savings. The governments' share of total foreign interest payments, ϵ , is for the present purposes fixed at 0.42²¹. Government saving is thus described as in equation (9.6) :

$$(9.6) \quad s_g = z_0 + z_1\mu - j - \epsilon j^*$$

In equation (9.7) normalised private savings s_p are positively related to capacity utilisation μ through the coefficient σ_1 since savings are assumed to be positively related to output, X . Furthermore, private savings are positively related to the inflation rate p since real money balances between consumption and savings are assumed to be maintained. Private savings are also supplemented by government internal interest payments, j . Private savings are, however, negatively influenced by the private sector share of interest payments on foreign debt $(1-\epsilon)j^*$ and capital flight ϕ . According to Smit and Mocke (1991) the latter may not be insignificant in the South African context. Private savings are accordingly described as in equation (9.7) :

²¹ This could be revised downwards since it includes public corporations. Interest payments of the central government were R 224 million in 1988 which is equal to a share of 0.059, although this still excludes public enterprises. Interest payments of the latter could raise this share to about 10 per cent.

$$(9.7) \quad s_p = \sigma_0 + \sigma_1\mu + \sigma_2p + j - (1-\varepsilon)j^* - \phi$$

The public sector borrowing requirement (PSBR), defined as the difference between government investment and savings, is written as follows :

$$(9.8) \quad \tau\mu = i_g - s_g$$

or

$$\tau = (i_g - s_g)/\mu$$

In terms of actual output foreign savings are assumed to finance normalised imports of final goods, m , capital goods imports $(1-\Theta)i$, (where Θ is the locally supplied fraction of investment demand), interest payments on foreign debt j^* , and capital flight, ϕ . Furthermore, intermediate imports are assumed to depend on actual production levels according to $(a_0 + a_1\mu)$. Finally, it is assumed that exports are related to output according to $(e_0 + e_1\mu)$. If $e_1 > 0$ it would suggest a kind of crowding out effect in a sense that exporters cut back on foreign sales as domestic demand rises. For the present purpose e_1 is taken to be negative to reflect the export-orientated approach encouraged by the government during the past decade (see chapter 4, section 4.4.1). Total foreign savings are accordingly described as in equation (9.9) :

$$(9.9) \quad s_f = m + (1-\Theta)i + j^* + \phi + (a_0 + a_1\mu) - (e_0 + e_1\mu)$$

The modelling of inflation in CGE models is problematic, since through more than two centuries of economic thought only two inflation theories have been recognised, namely the monetarist and the structuralist approaches (Kindleberger, 1986:ii; Taylor, 1992:8). In the present model the structuralist model is followed, since it holds that money supply plays a passive role adjusting to the level of economic activity and the inflation rate

(Taylor, 1990:3). This approach is therefore in line with the recommendations from chapter 6 (see section 6.10) that money should be studied in an institutional and historical context. The institutional and historical contexts can be taken into account in a Gap model through an "inertia" component (Taylor, 1991b:9), on which the argument can be based that South Africa has grown accustomed to an inflation rate of around 15 percent through the indexation of wages and salaries. For present purposes the inertia coefficient, p_2 , has been set arbitrarily at 0.9, i.e. the inertial part of the inflation rate is 90 percent of the inflation of the previous period. Furthermore, the structuralist approach favours a markup pricing rule, as opposed to the marginalist pricing rule favoured by neo-classical economists (Taylor, 1988, 1990). If it is assumed that nominal wages increase with growth of aggregate demand per capita and that nominal wages represent variable costs (Taylor, 1990:232) then the inflation equation can be specified as follows :

$$(9.10) \quad p = p_0 + p_1\mu + p_2p_{-1}$$

It is clear from (9.10) that monetary variables do not feature at all. A larger budget deficit does, however, contribute to inflation through its positive relationship with capacity utilisation, μ .

The behavioural equations that deal with the financial sector are to a large extent identities. The relationship between the real and financial side of the model is of such a nature that the model represents a kind of financial programming approach where it is the intention to investigate changes in financial stocks and flows as a result of a change in real economic variables. Feedbacks from the financial sector back to the real economy occur only through interest payments (j and j^*) in equations (9.2) to (9.5). This may contradict the arguments in chapter 6 that financial intermediation has a strong impact on the real

economy. More subtle and elegant feedback mechanisms would need to be introduced in a more advanced model.

Bank deposits, ΔD , (financial aggregates are not normalised) are accommodating inflation and economic growth and may be determined by multiplying the sum of those two with total bank deposits from the previous period :

$$(9.11) \quad \Delta D = (p+g)D_{-1}$$

On the asset side of bank's balance sheets, changes in bank loans to the private sector ΔL depend on the demand for money in this period less the demand for money in the previous period. Demand for money in this period is determined by the transactions motive coefficient, ϕ . Interest rates do not play a role here although there are alternatives to holding money. Again this may be considered in future modelling. If P is the current price level, then the changes in bank loans are written as follows :

$$(9.12) \quad \Delta L = \phi PX - L_{-1}$$

The PSBR defined in equation (9.4) is financed in nominal terms ($\tau\mu PQ$) by government borrowing from the banking system, ΔH , the non-banking system, ΔA and the foreign capital markets ΔB_g . Thus equation (9.13) is obtained :

$$(9.13) \quad \tau\mu PQ = \Delta H + \Delta A + \Delta B_g$$

Similarly, private sector claims on the financial sector follow row 7 of table 45 since net nominal private savings $(s_p - i_p)PQ$ must be equal to changes in money supply ΔD plus government borrowing from the non-banking system ΔA less changes in money demand ΔL and private foreign borrowing, ΔB_p :

$$(9.14) \quad (s_p - i_p)PQ = (\Delta D + \Delta A) - (\Delta L - \Delta B_p)$$

Foreign savings in nominal terms, s_fPQ , are equal to changes in private foreign debt ΔB_p and in government foreign debt ΔB_g less changes in foreign exchange reserves, ΔR :

$$(9.15) \quad s_fPQ = \Delta B_p + \Delta B_g - \Delta R$$

Finally, domestic interest payments by the government and total foreign interest payments need to be spelled out to obtain a view of possible internal and external debt traps and the feedback from the financial sector to the real sector; domestic interest payments by the government in nominal terms jPQ is simply the product of interest rates (in turn the sum of the real interest rate r and the inflation rate p) and the government bonds, A , issued :

$$(9.16) \quad jPQ = (r + p)A$$

Total foreign interest payments j^*PQ is the product of the foreign interest rate r^* and the sum of private foreign debt B_p and government foreign debt B_g :

$$(9.17) \quad j^*PQ = r^*(B_p + B_g)$$

The model described in this section is characterised by a closure rule (see chapter 5, section 5.2) in which the financial accounts adjust to predetermined government investment levels. This investment driven closure is typically Keynesian by nature (Robinson, 1989:929). The closure rule argues that additional investment will have an upward influence on the aggregate price level P , so that with nominal wages fixed the real wage will decrease. This will induce firms to hire more labour and increase output. Given a fixed saving rate, higher savings will meet the initial assumed additional investment. The aggregate price level P is thus the equilibrating variable. The model is summarised in table

43. From table 43 be seen that the model has 16 equations and 16 parameters and is therefore internally consistent.

Table 43 : Summary of the Gap model for South Africa

Equation number	Equation
9.1	$X = \mu Q$
9.2	$s_p + s_g + s_f = i_p + i_g$
9.3	$g = g_0 + ki$
9.5	$i = i_0 + (1 + \alpha)i_g + \beta\mu$
9.6	$s_g = z_0 + z_1\mu - j - \epsilon j^*$
9.7	$s_p = \sigma_0 + \sigma_1\mu + j - (1 - \epsilon)j^* + \sigma_2p - \phi$
9.8	$\tau\mu = i_g - s_g$
9.9	$s_f = m + (1 - \Theta)i + j^* + \phi + (a_0 + a_1\mu) - (e_0 + e_1\mu)$
9.10	$p = p_0 + p_1\mu + p_2p_{-1}$
9.11	$\Delta D = (p + g)D_{-1}$
9.12	$\Delta L = \varphi PX - L_{-1}$
9.13	$\tau\mu PQ = \Delta H + \Delta A + \Delta B_g$
9.14	$(s_p - i_p)PQ = (\Delta D + \Delta A) - (\Delta L - \Delta B_p)$
9.15	$s_f PQ = \Delta B_p + \Delta B_g - \Delta R$
9.16	$jPQ = (r + p)A$
9.17	$j^*PQ = r^*(B_p + B_g)$

In order to allow the behavioural equations set out in the previous section reproduce the SAM in table 42, the parameters of the model are calibrated using the data contained in the table 42 financial SAM. The calibration is done through the software package TKSOLVER, which is a general purpose mathematical program. The equations of the model, as set out in table 43, are read into TKSOLVER, together with the values of the

parameters and variables. One then specifies the exogenous variables. This choice determines the closure rule followed. With the values of the exogenous variables given, TKSOLVER then simultaneously solves the system of equations to obtain the base year values of the endogenous variables. Calibration thus ensures that the behavioural equations reproduce the base year SAM. This procedure may result in certain parameters to deviate from their actual 1988 observations. For example the real interest rate r is estimated at -0.5 percent and the foreign real interest rate r^* at 8.8 percent. Thus in its current format the Gap model can be used only for illustrative purposes, and the results from the simulation should be interpreted with this in mind.

The values of parameters and variables as well as the sources of these data, are contained in tables 44 to 46. (The Reserve Bank Quarterly Bulletin is abbreviated as RBQB and the Development Bank of Southern Africa as DBSA).

TABLE 44 : BASE YEAR STOCKS AND FLOWS (R millions)

SYMBOL	VALUE	DESCRIPTION	SOURCE
X	227	Real output	1988 SAM
Q	271	Potential output	(X/ μ)
ΔD	25	Changes in bank deposits by private sector	RBQB, S-28
D ₋₁	182	Bank deposits held by private sector in 1987	
ΔL	29	Changes in bank loans to private sector	RBQB, S-28
P	1	Price level	base value
L-1	108	Bank loans to private sector in 1987	RBQB, S-28
ΔH	-0.2	Changes in bank loans to government	RBQB, S-28
ΔA	10	Changes in private sector loans to government	RBQB, S-28
ΔB_g	-0.5	Changes in government foreign debt	RBQB, S-28
ΔB_p	-6	Changes in private sector foreign debt	RBQB, S-28
ΔR	4	Changes in reserves	RBQB, S-28

Table 45 : Base year ratio variables

SYMBOL	VALUE	DESCRIPTION	SOURCE
μ	0.85	Capacity utilisation	RBQB, S-109
sp	0.1743	Normalised private saving	SAM
sg	-0.0047	Normalised budget deficit	SAM
τ	0.0407	Normalised PSBR	SAM
sf	-0.0102	Normalised trade deficit	SAM
ip	0.0299	Normalised private investment	SAM
ig	0.1295	Normalised government saving	SAM
g	0.0132	Capacity growth	RBQB, S-112
i	0.1594	Normalised total investment	SAM
p	0.1245	Inflation rate	RBQB, S-106

Table 46 : Parameters of gap-model for South Africa

SYMBOL	VALUE	DESCRIPTION	SOURCE
α	0.55	Government investment crowding-in coefficient	estimated
β	0.3077	Accelerator coefficient	calibrated
μ	0.04199	Normalised imports of final goods	SAM
Θ	0.8068	Share of locally supplied capital goods	SAM
ϕ	0.014	Normalised capital flight	assumption
ao	-0.0521	Intercept of intermediate import function	calibrated
a1	0.185	Intermediate import coefficient	SAM
eo	0.3014	Intercept of export function	calibrated
e1	0.1	Export rate w.r.t. m	assumption
po	-1.2710	Intercept of inflation rate	calibrated
p1	1.5	Effect of m on inflation	assumption
p2	0.9	Inertial effect of inflation	assumption
p-1	0.1339	Inflation rate in 1987	RBQB, S-106
j	0.0237	Normalised domestic interest payments by government	assumption
ϵ	0.4205	Government share of foreign interest payments	assumption
j^*	0.0143	Normalised foreign interest payments	RBQB, S-68
r	-0.0052	Domestic real interest rate	calibrated
r^*	0.087	Foreign interest rate	calibrated
go	-0.362	Base level of growth	calibrated
κ	0.31	Incremental capital:output ratio	DBSA
io	-0.1486	Investment function intercept	calibrated

In the next section, the model described by equations (9.1) to (9.17) is used to perform two policy experiments for South Africa. The results of these experiments should be interpreted in the light of the criticisms against Gap models. The *ad hoc* nature of Gap models has already been referred to in section 9.1. Together with a lack of explicit welfare statements this has caused Gap models not to be integrated into modern international economics.

Gap models can be criticised for their neglect of relative prices (Van Wijnbergen, 1986). This criticism is especially relevant if the Gap model is used in a medium or long-term growth context. Van Wijnbergen (1986) has incorporated in this context the real exchange rate into Gap models as an economy-wide relative price.

Despite these criticisms against Gap models, they are an important contribution to modelling in developing countries. In contrast to the models discussed in chapters 4 and 5, these models take financial variables into account. It was argued in chapter 6 that the financial sector has an important role to play in a developing country such as South Africa. Furthermore, the treatment of international trade, and the dependency of developing countries on imported capital goods in Gap models, have added realism to the modelling of international trade.

9.3 POLICY EXPERIMENTS

The policy experiments are performed on TKSOLVER by adjusting the relevant exogenous parameters and solving for the endogenous variables. In the present case an adverse external shock is simulated by an increase in the foreign interest rate r^* in

equation (9.17) from 0.087 to 0.127 and a drop in exports by decreasing e_0 in equation (9.9).

The simulation of the social wage entails additional social spending by the government and it is assumed to be financed by a higher budget deficit. Therefore, the government savings function in equation (9.6) is shifted downwards by lowering the intercept z_0 from -0.1960 to -0.2260. As a result of the social wage and following Kaldor's distributional theory (which were supported by the model results in chapter 4), it is assumed that the redistribution of income will lower the marginal savings rate σ_1 in equation (9.7) from 0.20 to 0.18. The reason is that a larger share of income is now allocated to lower income groups with lower savings rates. On the other hand, as a result of increased government social expenditure, the productivity is to increase by an upward shift in the growth equation (9.3). Both simulations are performed against the backdrop of rates of capacity growth which are 2 and 4 percent higher than the 1988 rate of 1,32 percent.

Although the underlying financial SAM in table 42 does not explicitly contain beginning and end stocks of financial assets and liabilities in addition to the real and nominal flows, the results can be examined over time by accumulating flows. In this simulations, the results were solved for up to the 10th period. Without additional elaboration this can be regarded as an average future period in which the effects of the endogenous variables have worked themselves through the economy. The results of the two policy simulations on the endogenous variables in the model are plotted over the 10 periods respectively in figures 2a to 2d and 3a to 3d.

The endogenous variables are the current account deficit s_f (figures 2A and 3A), capacity utilization μ (figures 3B and 3B), the inflation rate p (figures 2C and 3C) and additional foreign borrowing by the government ΔB_g (figures 2D and 3D).

Figure 2 : Impact of an adverse external shock

Figure 2A : On the current account deficit

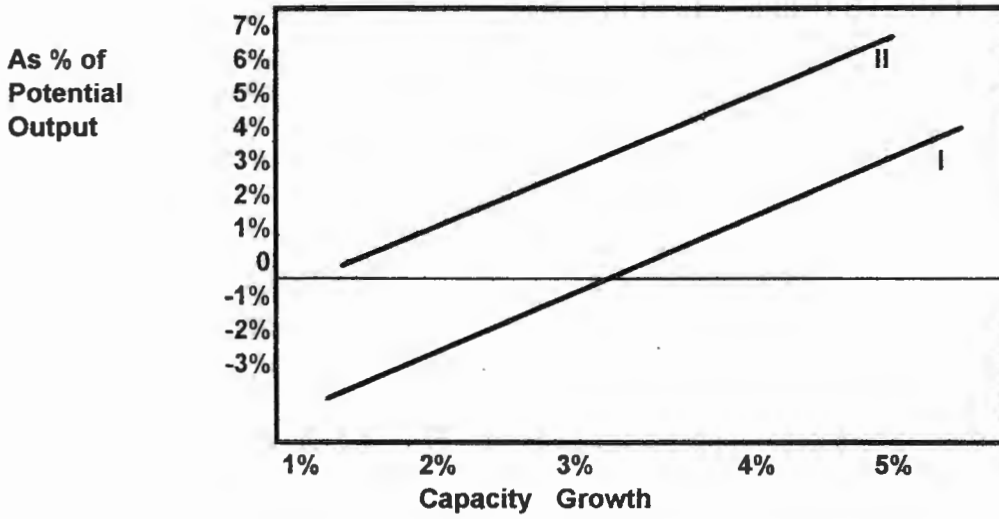


Figure 2B : On capacity utilisation

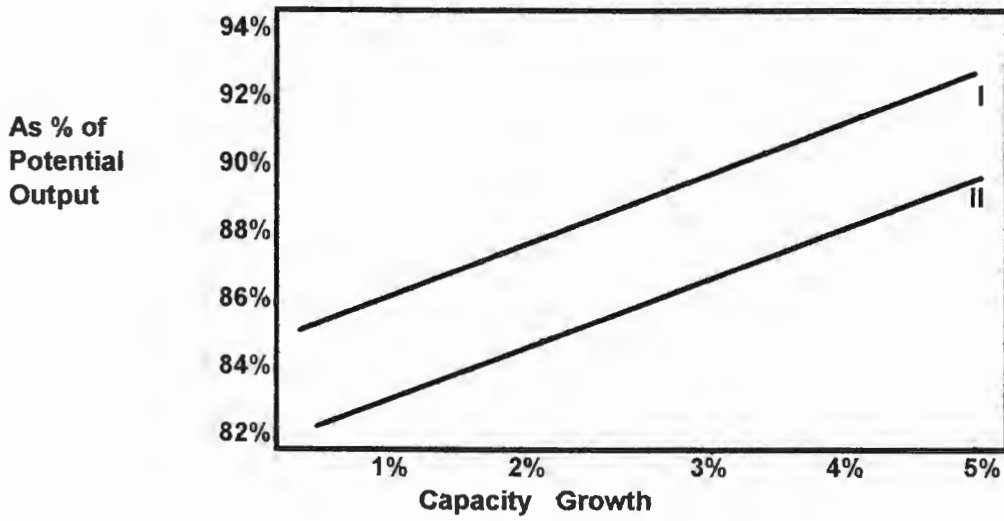


Figure 2C : On the inflation rate

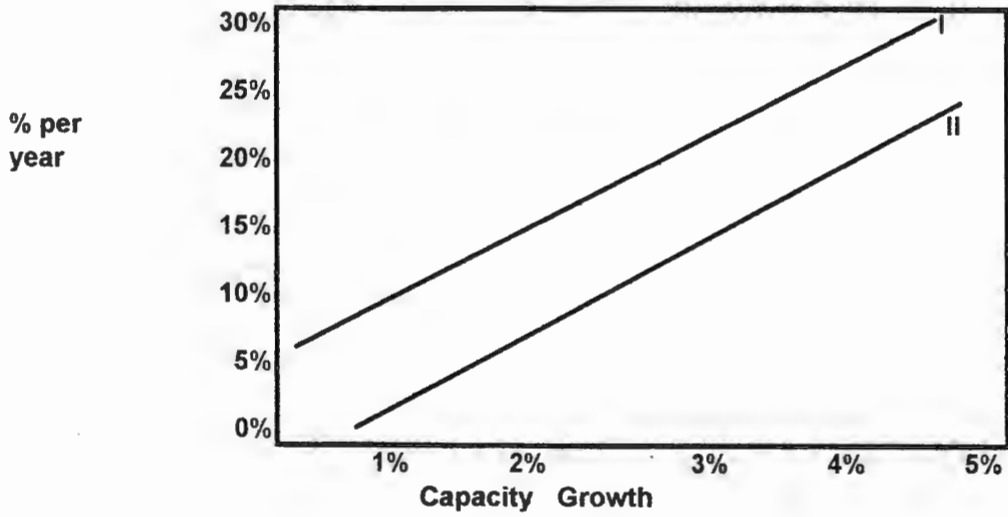


Figure 2D : On government foreign debt

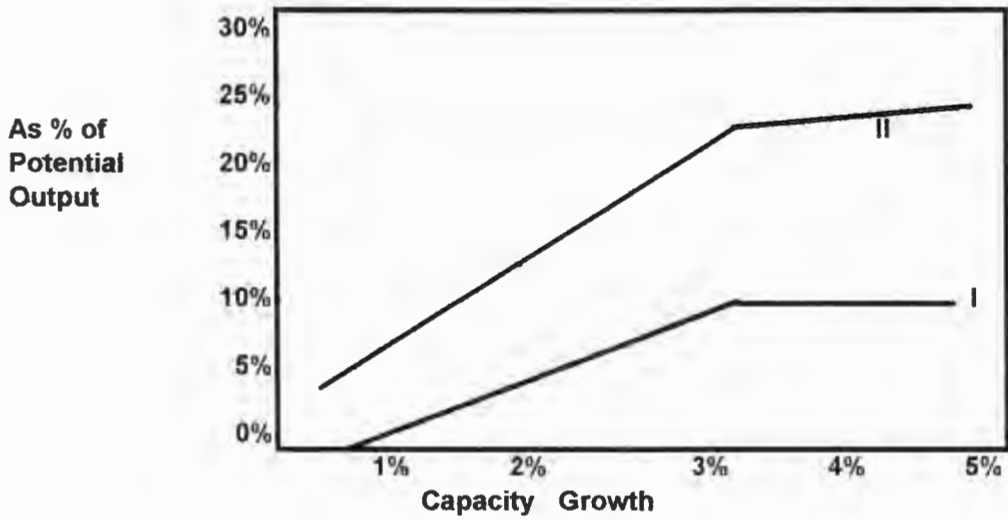


Figure 3 : The impact of a social wage

Figure 3A : On the current account deficit

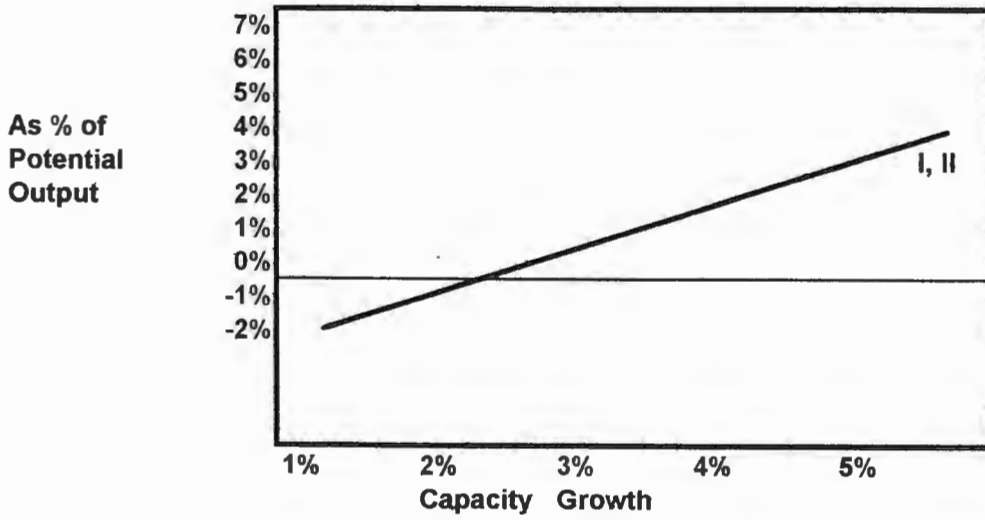


Figure 3B : On capacity utilisation

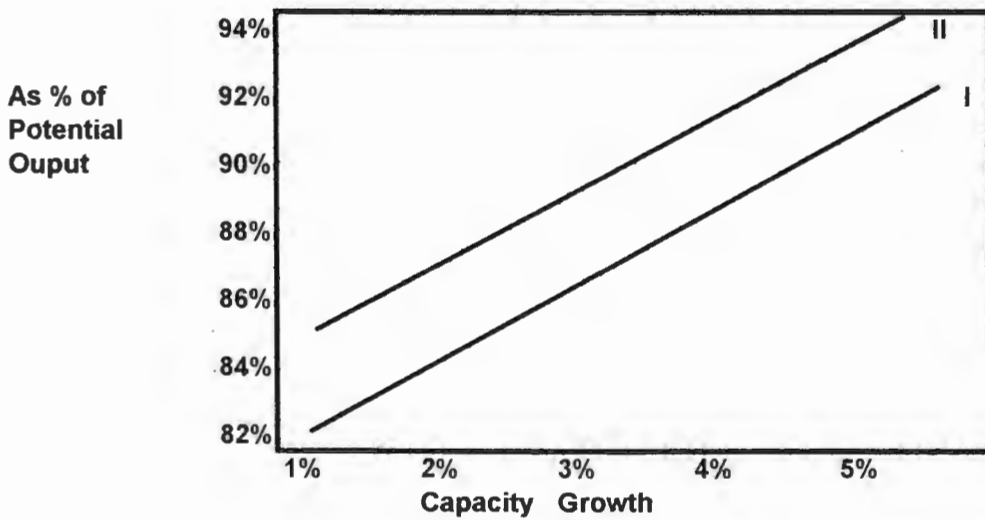


Figure 3C : On the inflation rate

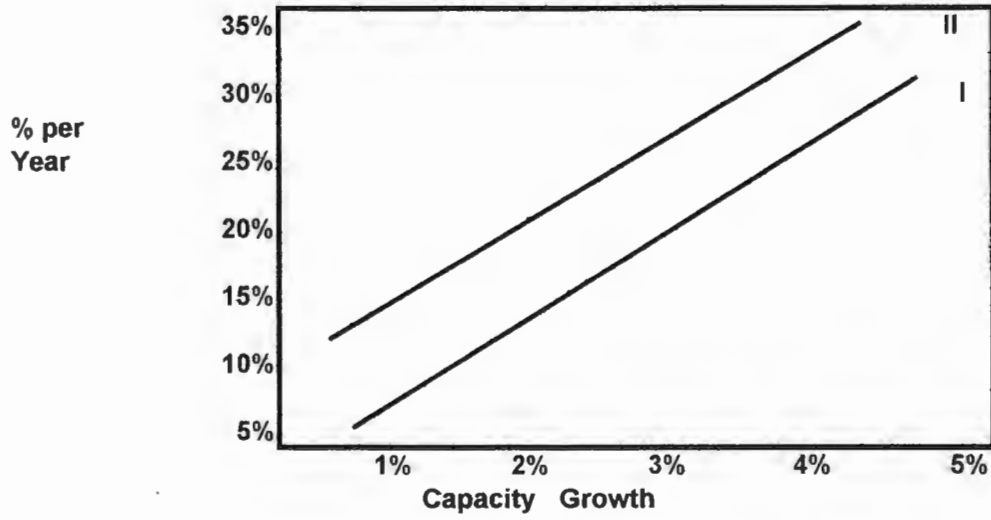
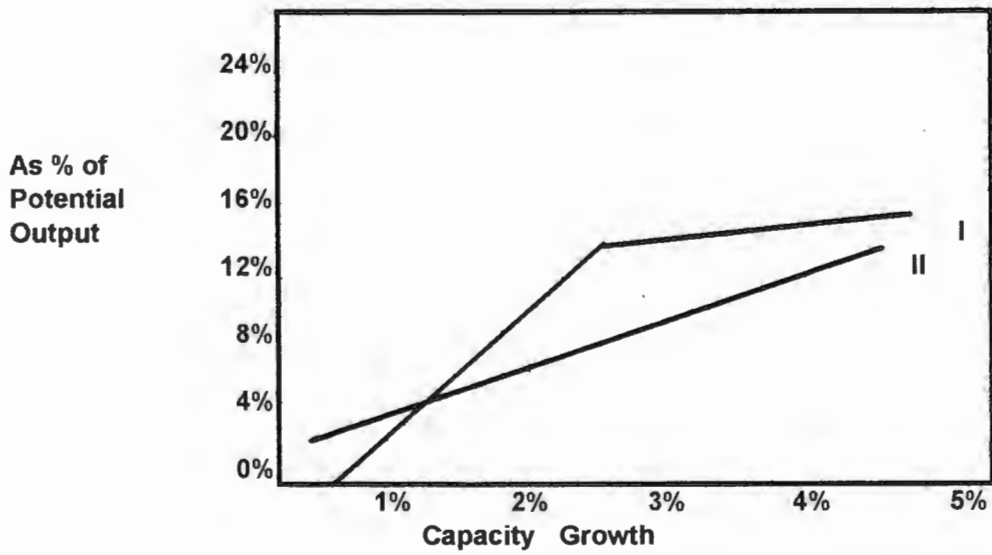


Figure 3D : On government foreign debt



What stories do these graphs tell? The line in each figure identified by (I) shows the base run in which the capacity growth rate is increased. As may have been expected, the current account deficit increases as a result of equation (9.9) since higher domestic economic activity will require imported intermediaries ($a_0 + a_1\mu$) and capital goods $(1-\Theta)i$, while the export-led component ($e_0 + e_1\mu$) does not compensate fully.

The higher capacity utilisation also has a strong positive impact on the inflation rate. This suggests that higher capacity growth can only be obtained at the price of higher inflation. The linearity of figure 2C suggests that each 1 percent increase in capacity growth g will lead to about 3 percent higher inflation.

Regarding the foreign debt of the government, figures 2A and 3B suggest that an increase in g will increase the foreign debt of government. This is caused by the fact that higher growth rates require further investment according to equation (9.3). This must be satisfied by both government and private sector. Although government saving s_g will increase according to equation (9.6) as a result of higher capacity utilisation, domestic interest payments j will also increase substantially as a result of the higher inflation rates p according to equation (9.16). The net effect is a more negative government savings s_g and, given the additional government investment i_g , an increase in the PSBR in equation (9.8).

Results from the two policy simulations are indicated by the lines identified as (II) in the graphs. An adverse external shock increases the current account deficit in figure 2A. At the same time less intermediate and capital good imports are available to maintain current production levels. As a result capacity utilisation μ decreases as can be seen in figure 2B. The drop in the inflation rate p in figure 2C can be explained by reference to the lower capacity utilisation rate μ . What may be lacking is the additional pressure on the inflation

rate in equation (9.10) that may be expected from a part monetisation of the higher PSBR. The latter results according to figure 2C in a higher government foreign debt. The PSBR is furthermore expected to increase due to higher foreign interest payments.

The establishment of a social wage does not influence the current account deficit. The government's deficit s_g increases by about 2,5 percent and the PSBR by about 1 percent. Although capacity utilisation μ increases, total investment decreases. The reason is that both the capacity growth rate g and the incremental output-capital ratio k in equation (9.7) are constant parameters while productivity increases in the form of a higher g_0 . Thus less investment i is required and therefore less imported capital goods, $(1-\theta)i$. Equation (9.9) thus absorbs opposing influences, i.e. a higher capacity utilisation μ and less capital imports. The net effect is more or less neutral. Due to a higher capacity utilisation μ the inflation rate increases by about 5 percent according to figure 3C. A social wage thus only be implemented with inflation.

The results from the gap model can now be generalised and compared to those derived from the models in chapters 4 and 5. An advantage of the present model is that, unlike the neo-classical models of chapters 4 and 5, it is of a more "structuralist" nature, and does not assume full capacity utilisation. This absence of full capacity utilisation indicated that the inflation rate may be sensitive to income redistribution. Together with the sensitivity of the South African economy to adverse external shocks this indicates that the scope for redistributive policies, though it exists, are limited over the short term. The inclusion of monetary variables in the model warned against income redistribution measures degenerating into a populist experiment in South Africa (see Dornbusch & Edwards, 1990). A typical populist experiment occurs when a new government wishes to fulfil its election promises and stimulate economic growth. In the process the budget deficit increases, inflation increases through the mechanisms outlined above and the real exchange

rate becomes overvalued. Consequently balance of payments disequilibrium may ensue. Dornbusch and Edwards (1990) point to the experience of Chili in this regard, and state that due to the balance of payments disequilibrium Chili had to implement an IMF structural adjustment package which left the country in a worse economic condition than before income redistribution policies were implemented. The fact that the models in chapter 4 pointed to the adverse balance of payments effects of income redistribution enforces the warning against a populist experiment. Together with the results of the second generation CGE model in chapter 5 it is clear that income redistribution in South Africa should in essence be a long term strategy, which should ideally be accomplished through higher education to disadvantaged groups. Moreover, as was pointed out in chapter 5, the South African economy should be restructured in order to make income redistribution over the long-term feasible, and to obtain the most beneficial results. The different forms this restructuring may take will now be considered.

The results from the models presented in this study imply that any restructuring of the South African economy should have at least three dimensions. First, following the successes of the East Asian "Newly Industrialised Countries" (NICs), and in accordance with the recent "Proposed revised long-term strategy" of the Economic Advisory Council of the State President (EAC, 1991:23), any economic reactivation and restructuring should be export led. The results from the model in chapter 5 (see section 5.4.4) supports this recommendation. In the context of the NICs Balassa (1982) concluded that export growth has made a substantial contribution to these economies. Chow (1988) furthermore found that growth of exports has developed manufacturing industry in these countries, which in turn has expanded exports themselves. Thus, exports and the development of manufacturing accompanied and reinforced each other in the NICs. Holden (1990) presents evidence that this effect can also be obtained in South Africa.

The development of export capacity in manufacturing would seem to be desirable from the discussions in chapter 4 on the structural distortions in the South African economy and from the sensitivity of the South African economy towards the external sector, as the model results of this chapter emphasised. The development of an export capacity for manufacturing could allow the second dimension of the economic restructuring to have a bigger chance of success, namely the substitution of imported capital and intermediate goods, by providing economies of scale necessary for low-cost production (Holden, 1990:267). In addition to the evidence provided by the experiments in chapter 5 for promoting exports, such as the lowering of tariffs and the liberalisation of the exchange rate, further measures need to be investigated. These measures could include what Jourdan (1992:20) calls a "mineral resource-based industrialisation" strategy. Such a strategy may entail the following :

(i) The transformation of minerals into finished products for the export market. Jourdan (1992:18) estimates that if 10 percent of South Africa's ferro-chrome production could be beneficiated, all gold exports may be replaced.

(ii) The development of a capital goods industry to service the resource sector and for exports. In this regard, Jourdan (1992:20) refers to the type of development that occurred in Sweden and in Finland, where the domestic mining sector provided the market stimulus for the establishment of world scale capital goods production. South Africa already has several mining and quarrying capital goods producers which could provide the basis for the development of this sector into a major actor on the world market.

The third dimension which a restructuring program should address concerns the government sector. In chapter 5 it was pointed out that the dominance of the government sector is symptomatic of the old apartheid-style of structuring the economy along racial

lines. The suggestion is made that the government become part of the solution, rather than remain part of the problem, of economic restructuring. This does not necessarily mean, however, that the state should limit its involvement in the economy by privatisation or by cutting budget expenditure. The emphasis should rather be on avoiding a "bloated bureaucracy syndrome" (Hugo & Stack, 1992:69) while increasing the effectiveness of government expenditure, especially on education (see chapter 4, section 4.4.9), through changing the composition of the budget expenditure. The scope for this can be created through political deregulation. Political deregulation should be accompanied by economic deregulation, such as the breaking up of conglomerates through anti-trust legislation or anti-monopoly commissions (Torr, 1992:166).

The government will also have to lead the reorientation of the production sector toward exporting and lessening its dependence on imports. In this regard, the involvement of the government is justified by Amsden's (1991) theory of late industrialisation. Herein it is argued that countries such as South Africa, which are late industrialisers, cannot rely only on "getting prices right" in order to compete internationally. Followers in the industrialisation process must adopt different policies than those of the leaders. In this context Amsden (1991:10) identifies as key instruments of industrial policy various forms of concessionary support. Because this cannot be applied to all firms or all sectors, selectivity is essential. This selectivity could be based upon an analysis of the sectors most likely to have a comparative advantage, or as in the case of Japan, where a comparative advantage could be build (Simkins, 1992:128). The Board of Industry and Trade recently supported a view of selective support based on dynamic comparative and setting down performance criteria for the granting of incentives (B.T.I., 1988:156).

In conclusion, it should be noted that "bureaucratic failure is as likely as market failure, and as the history of Africa shows, the effects could be worse" (Torr, 1992:167). The

people of South Africa should therefore ensure that bureaucratic failure be limited as far as possible, through insisting upon, and ensuring a democratic political dispensation in which the public sector is accountable to the people.

9.5 SUMMARY

This chapter introduced a simple CGE model to analyse income redistribution in South Africa and the vulnerability of the South African economy to external shocks. The model can be characterised as a Gap model and it includes the financial sector. The model is based on the simple 1988 financial SAM for South Africa that was compiled in chapter 8.

Two policy simulations were carried out, namely an adverse external shock as well as income redistribution through the imposition of a social wage. The results from the simulations should be interpreted with a number of shortcomings in mind, namely that the interactions between the financial real sectors of the SAM are not modelled in full detail and that the influence of monetary factors on the inflation rate is not directly taken into account. Furthermore the model can be described as *ad hoc* or "structuralist" in that the equations were not derived from an explicit optimisation procedure as in chapter 5. Nevertheless, by not assuming full capacity utilisation as the models in chapters 4 and 5 did, Gap models come closer to the reality in developing countries than many neo-classical models. The shortcomings of the model should furthermore be seen in the light of the fact that the purpose of the present chapter was to illustrate how a financial SAM can be used as a basis for a model, and to show how such a model may support economic policy making in South Africa. A second generation model based on a financial SAM is left as a topic for future research.

The results from the model were in agreement with those of the previous chapters. Thus the finding that the scope for short-term redistribution in the South African economy is limited, was confirmed. The contribution of including the financial sector was to warn of the danger of a populist experiment in South Africa. The model suggested that a social wage can only be established at the cost of additional inflation. Taken together with the results from chapters 4 and 5, it can be concluded that income redistribution in South Africa should be a long-term strategy, which should be accompanied by restructuring the economy. The lessons from the models in this study suggest that this restructuring should contain at least three dimensions. These are (i) expanding South Africa's exports of manufactured goods (ii) diminishing the dependence on imported intermediate and capital goods, and (iii) increasing the effectiveness of government involvement in the economy through political deregulation. To ensure the success of these measures, the public sector should be accountable to the people of South Africa. This may only be accomplished if a democratic political dispensation is established and cherished in South Africa.

A significant challenge facing South African economists is the formulation of appropriate policies to redress the unequal distribution of income and wealth. Ways in which the government can intervene to redress the unequal distribution of income and wealth have been the topic of many discussions in South Africa. Besides eradicating the unequal distribution of income and wealth from a moral point of view, it has recently been claimed that income redistribution in South Africa could be beneficial for economic growth. A criticism against this strategy is that it does not explain exactly where the envisaged growth through redistribution will come from. This criticism can be generalised against most research on income distribution and growth issues in South Africa, since a rigorous and consistent framework to underpin the analyses is missing.

In contrast to South Africa, the need for quantitative analysis of income redistribution policies has led to sophisticated empirical models, known as Computable General Equilibrium (CGE) models, being used in many other developing countries. These models are of a general equilibrium, as opposed to a partial equilibrium nature, since it is recognised that economies are complex systems subject to considerable interdependence between sectors, and that income redistribution policies might have significant feedback effects. A CGE model was defined as an economy-wide model that includes the

interaction between demand, income and production structure, and where prices are adjusted until decisions made in production are consistent with decisions made in demand.

CGE models require a consistent database, i.e. one that gives a consistent picture of production, income generation and income distribution, consumption, savings, investments, and foreign trade. The social accounting matrix (SAM) is such a database. A SAM was defined as a numerical representation of the economic cycle with emphasis on distributive aspects.

Four different SAMs exist for South Africa. They have, however, only been used in a limited way to analyse income redistribution issues. This points to the absence of a SAM and CGE modelling culture in South Africa. The observation that more than 35 developing countries already had SAMs before South Africa and that the two most recent SAMs are designated as "preliminary", supports this conclusion.

Although a greater use for SAMs and CGE models in South Africa has been propagated in a number of papers, the relatively limited use of these SAMs and CGE models might be due to their shortcomings. Foremost amongst these are the failure to reflect the financial sector in South Africa. If one accepts that the core of South Africa's first world economy consists of the well-developed financial sector then one has to determine what role this financial sector could play in income redistribution and economic growth.

Traditionally developing countries have made use of the national financial accounts to quantitatively analyse the influence of the financial sector on growth and development. By themselves, however, the national financial accounts reflect only the financial side of the economy. Subsequently uses of the national financial accounts have been limited. In South Africa the national financial accounts have also been under-utilised.

In the light of the preceding discussion, the primary objective of this study has been to provide a framework for analysing income redistribution and growth in South Africa by extending the present South African SAMs to include the financial sector. The secondary objective of this study has been to contribute towards establishing a SAM and CGE modelling culture in South Africa.

The historical origin and development of social accounting and computable general equilibrium modelling were reviewed in chapter 2. The first set of social accounts was compiled by William Petty in 1664 for the British economy. Petty was followed by Gregory King who used social accounts of England, France and the Netherlands in 1688 to correctly predict the end of the War of Augsburg. In France, de Boisguillebert and Vauban used the French social accounts to conclude that the French tax system was unfair and would lead to public discontent. Francois Quesnay illustrated the circular flow in the economy in 1758 in his *Tableau Economique*. This *Tableau* can be seen as the first economic model, and Quesnay preceded Keynes in anticipating the destabilising effects of underconsumption.

In 1874 Leon Walras described the circular flow of income in the economy through an explicit system of simultaneous equations, and paved the way for the development of the deductive side of economics. Walras' model is based on profit maximising firms and utility maximising consumers, and trade in each market takes place only after an equilibrium price has been determined in that market through a process called *tatonnement*. Walras assumed that a vector of prices existed that would ensure a general equilibrium. Walras could not, however, prove the existence of such an equilibrating price vector.

Walras' accomplishment was paralleled in 1936 by Wassily Leontief's input-output table for the United States. In the absence of proof that an equilibrating price vector exist, Leontief

assumed that production was not dependent on prices, and that prices remained constant. Notwithstanding these limiting assumptions, input-output tables are still widely used. More significant for the development of the inductive side of economics was the use of the input-output table by Richard Stone as a central building block for the United Nations system of national accounts in 1953. A pupil of Stone, Graham Pyatt, and his colleagues at the University of Warwick, extended the system of national accounts in the early 1970s and compiled the first SAM.

Because input-output tables are still important for modelling and social accounting, the basic principles of input output tables were discussed in chapter 2. Special reference was made to South Africa's input-output tables, because these tables are used in the compilation of South Africa's SAMs.

The extension of input-output modelling to linear programming by Dantzig was also discussed in chapter 2, and it was pointed out that the development of CGE models can be seen as an extension of input output models and linear programming. The development of CGE models was made possible in the 1970s by four breakthroughs in economic theory and practice. These were (i) the proof by Arrow and Debreu in 1954 of the existence of an equilibrating price vector, (ii) the establishment by Scarf in 1967 of a solution algorithm to solve equilibrium prices in an applied model, (iii) the improvement in computer technology and software such as GEMPACK, GAMS, HERCULES, OCTASOL, MAQMOD and ASAP and (iv) the construction of SAMs. It was noted that CGE models need a consistent database in order to represent the circular flow of income, and that a SAM is such a database. The common features shared by most CGE models were noted, and recent extensions of CGE modelling, such as micro-simulation models and models of the whole world economy, were mentioned.

CGE modelling in developing countries was led by Adelman and Robinson in 1978. Since then there have been a proliferation of CGE models for developing countries. This has been due mainly to three factors, namely (i) a shift in policy orientation in less developed countries from production and industrialisation towards basic needs and income distribution, (ii) the oil shocks of the 1970s which necessitated structural adjustment policies and (iii) the failure of traditional econometric models to underpin policy analysis in countries subjected to structural changes and where data availability and reliability are suspect.

In chapter 3 the way in which a SAM represents the economic cycle was illustrated, and it was showed that a SAM contains all the basic macroeconomic identities. To move from a SAM to a model, it is necessary to add behavioural equations to describe the way in which the values of the SAM were obtained. The different approaches towards specifying these equations have been labelled either as "first generation" or "second generation" models. First generation models refer to accounting and fixed-price multiplier models in the tradition of input-output modelling, while second generation models refer to price endogenous, multisector CGE models. Because most of the CGE models in South Africa up to date are of the first generation type, it was illustrated how a SAM can be used for multiplier analysis and multiplier decomposition.

In chapter 3 it was also described how a basic SAM format can be derived from basic principles and how a SAM can be compiled by following eight basic steps. These steps are (i) determining the overall design of the SAM, (ii) identifying the sources of data (iii) choosing the base year, (iv) defining the classifications to be employed, (v) preparing tabulation plans, (vi) deriving initial estimates for the cell values, (vii) cleaning the data and correcting errors and (viii) reconciling different sources of data. Since a comprehensive manual on the compilation of SAMs does not exist, it was suggested that

these steps be used as an organising framework for such a manual, which could facilitate the establishment of a SAM and CGE culture in South Africa.

In light of the theoretical discussion of chapter 3, the purpose of chapter 4 was twofold. First, the existing South African SAMs were presented and critically discussed. This was necessary in order to determine these SAMs' strengths and weaknesses. Four different SAMs for South Africa were presented. The first two are a national SAM and a regional SAM for 1978 which were compiled by the Central Economic Advisory Service (CEAS). The third SAM was compiled by the Development Bank of Southern Africa for 1988 and the fourth SAM by the Central Statistical Services (CSS), also for 1988. It was shown that these SAMs follow the same basic structure: an input-output table forms the central building block and is supplemented by data obtained mainly from household income and expenditure surveys and population census reports. As far as the two 1988 SAMs are concerned, the one by the CSS is probably more accurate, as it is based on household data from the 1990 population census, while the Development Bank's SAM used manpower surveys and the distribution matrix of the 1978 SAM. Both these SAMs have been designated as being "preliminary", reflecting perhaps the insecurity of compilers of SAMs in South Africa.

The strong point of these SAMs was shown to reside in the so-called distribution matrix, which shows the mapping of factor incomes from different occupation classifications to four household types, classified by race. From descriptive studies based on these SAMs a number of characteristics of the South African economy were derived. From these it is clear that any redistribution strategy in South Africa should take note that Black households are particularly disadvantaged with respect to (i) property incomes, (ii) transfers from government and (iii) transfers from abroad. Black households are also

dependent on low paying occupations, especially domestic services, through which they may be susceptible to shocks to White incomes.

The weakness of the SAMs is that, although they are all based on the same format and are thus easily comparable, the classifications of the 1978 SAM were perpetuated. These classifications are not optimal for South Africa's needs, since no distinction is made between rural and urban households and between formal and informal activities. Furthermore, due to a lack of a SAM culture in South Africa, the South African SAMs tend to be dated by the time their compilation are complete.

The second purpose of chapter 4 was to consider the results from first generation models based on the South African SAMs. The results were not only interpreted in the light of the structure and characteristics of the underlying SAMs, but also against the background of the structural distortions in the South African economy. In addition to the unequal distribution of income these distortions were identified as (i) a high degree of dependence on imported intermediate and capital goods, (ii) the failure of manufacturing to develop a significant export capacity; and (iii) the increasing dominance of the government sector in the South African economy.

The results from the first generation models emphasise that income redistribution might cause a shift in aggregate demand in favour of basic goods such as food, clothing, housing, public transport and furniture. This shift may stimulate GDP growth. The negative effects of income redistribution would seem to entail first, that the propensity to save in the economy could decrease, which could worsen the current account. Second, a decrease in White incomes could lead to erosion of the government's direct tax base, necessitating increases in regressive indirect taxes such as VAT. Third, a decrease in White incomes could lead to a decline in Black income through their dependency on

domestic service workers. In the CSS's SAM this dependency is less acute than in the previous SAMs.

The negative effects of income redistribution, seem to imply that such a strategy would have to be accompanied by import substitution and/or export promotion, and that the income redistribution would only be successful over the longer term if it is achieved through significant retraining and education of Blacks.

Although the above results point to CGE models being suitable for analysing income redistribution issues, these models are still mainly of the first generation type in South Africa. First generation models are demand driven, and it should be no surprise that they all find income redistribution to be expansionary. Thus, before conclusions were made regarding the appropriate income distribution strategy in South Africa, the above results were complemented by the results from a second generation model.

A conceptual framework for the construction of such a second generation CGE model was set out in chapter 5. This framework is known as the transactions value (TV) approach. It was shown that the transactions value (TV) approach offers a way of implementing a SAM-based CGE model without much toil and cost.

The transactions value approach uses the SAM for both empirical and theoretical description of the economy. The empirical description is given by a SAM with numerical values in the cells while the theoretical description is given by algebraic expressions which describe the way prices and transaction values in each cell are determined, and how macro closure is obtained. The novelty of the TV approach is that while the traditional approach to modelling typically specifies how prices and quantities are determined, the TV approach specifies how transaction values are determined.

The TV approach makes use of a software package known as HERCULES to solve the model. This software uses the GAMS system to provide a user-friendly interface for input-output but has separate software for the analysis and solution of the general equilibrium model. The user only has to select the institutions and the functional forms of the behavioural equations. HERCULES has a menu of some 20 admissible functional forms from which items can be selected. The system imposes consistency checks on the selections made and then requests values for all non-distributive parameters, such as elasticities. HERCULES then uses a base year SAM to calibrate the model. Any perturbations are solved in respect of this base year SAM and the output is a new SAM. The advantages of this approach are that it offers computational ease, a solution to the model is guaranteed to exist and a natural starting point for experiments is provided. The limitations of this approach is that it is not dynamic, but static, and is less useful in describing short-run adjustment. The functional forms employed by HERCULES are based on the assumptions of utility and profit maximisation subject to certain constraints, and gives HERCULES a neo-classical reference. For structuralists like Taylor (1990) this is not acceptable. The implementation of a second generation "structuralist" CGE model for South Africa remains as a topic for future research.

The results of four experiments from a second generation CGE model were reported. This model was based on the Development Bank's 1988 SAM, and made use of the TV approach. The experiments reported were (i) a ten percent increase in real government consumption, (ii) a ten percent increase in export demand, (iii) a ten percent increase in export and import prices and (iv) a 50 percent reduction in import tariffs.

The results from the experiments were consistent on a number of issues. First, the type of closure rule under which the experiments are performed is crucial for the results. In the

South African case, the vital closure concerns the exchange rate regime. Very different effects were obtained depending on whether the exchange rate was floating or fixed. However, a flexible exchange rate was seen to give the most beneficial results throughout.

Second, the special role played by the mining sector in the South African economy was distinguished. Moreover, the role of the mining sector is of such a nature that in many experiments the mining sector moved in a direction opposite to the other domestic sectors. This indicates that the South African economy may experience a Dutch Disease in the event that gold prices increase substantially, and the exchange rate is allowed to appreciate.

Third, it was noticeable that the South African economy is particularly vulnerable to external shocks.

Fourth, liberalising trade should be considered in South Africa. The experiment which had the most favourable effect on real growth and income redistribution was a reduction of 50 percent in the import tariff.

Finally, although some of the simulated policies did have some effect in redressing the unequal distribution of income, these effects were marginal. Rather, it seemed as if the effects in the model were of a "trickle down" kind. This points to the fact that restructuring of the economy may be needed before demand management strategies will have beneficial effects on income distribution. The form that this restructuring can take was discussed after the results from a model based on a financial SAM, had been considered.

In order to construct a financial SAM that would be able to take the relevant interactions between the real and the financial sectors into account, the role of money and finance in the economy were discussed. Special reference was made to the role of money and finance in a developing economy.

Discussing the role of money and finance involved issues such as (i) whether money is neutral, i.e. do changes in the money supply affect real output, and (ii) whether money is endogenously determined by output and prices, or whether money exogenously determines output and prices.

The classical economists dichotomised the economy into a real and financial sector. In this way they reduced money to a neutral "oil" needed only to ensure that transactions proceed smoothly. Within the neo-classical theory, Patinkin argued that money is non-neutral, by invoking the real balance effect. Attempts to incorporate money into the Walrasian general equilibrium system also led to the conclusion that money is non-neutral. More precisely, it is accepted that a monetary economy can be viewed as suffering from a positive externality, since the real value of any firm's liquidity holdings is affected by the pricing decisions made by other firms.

The classical economists employed the quantity theory of money, in conjunction with the dichotomy of the economy into separate real and financial sectors, to argue that the money supply is exogenous. The modern monetarist tradition, with its prescription of a "k-percent" rule for growth in the money supply, derives directly from the classical quantity theory.

Although Keynes himself held money to be exogenously determined in the General Theory, he paved the way for Tobin and Arrow to point to the endogeneity of money.

Tobin and Arrow refined and extended Keynes' concept of liquidity preference. This concept was shown to give a theoretical foundation to the national financial accounts. Recently the post-Keynesians argued that during the time of the classical economists, when money consisted mainly of metallic money, it was exogenous, but that the subsequent expansion of banking and the establishment of central banks to act as lenders in the last resort have resulted in money becoming endogenous.

From the discussion of the role of money and finance in developing countries, the foremost conclusion was that economic growth and development, and financial structure are inextricably linked. The general idea is that financial structures allow investments to be undertaken more efficiently. A financial structure provides a vehicle for mobilising savings as well as a mechanism for gathering information on borrower default risk. Thus financial intermediaries may encourage a switch in savings from unproductive to productive assets. The financial intermediaries can calculate the average demand for early withdrawal due to idiosyncratic events and adjust their investment portfolios to accommodate this better than the individual can. For example, the creation of capital markets in developing countries can help these countries face fluctuations in export earnings by accumulating reserves during periods of upswing and by drawing them down and/or increasing foreign borrowing during periods of downswing.

Not only does a financial structure allow investment to be undertaken more efficiently, it can also contribute towards the quality of investments undertaken. In this respect the importance of financial liberalisation and the establishment of positive real interest rates were stressed.

The role of the financial sector in economic development depends on the stage of development an economy finds itself in. During the early stages of development, money

and finance may be supply-leading, i.e. stimulate and cause real economic growth and development. During these early stages growth and development are stimulated mainly through financial services which make it cheaper and less risky to trade goods and services than to borrow and lend. Without money the economy would be confined to barter, which inhibits specialisation. The financial sector thus provides a medium of exchange, avoiding the double coincidence of wants needed in a barter economy. In this respect financial intermediaries play an important role in overcoming friction by reducing search and information costs.

During the latter stages of economic growth, as the financial sector becomes more sophisticated and powerful (but also more concentrated), the financial sector fulfills an important role by facilitating economic growth and development. Moreover, during these stages regulation of the financial sector becomes important, since the financial sector could be destabilising. Financial intermediaries service the liquidity needs of agents. The better developed the financial system, the more alternative liquid assets are offered. During periods characterised by systemic risk, as is the case at present in South Africa, economic agents may be reluctant to save substantial parts of their wealth in illiquid assets. These effects might be amplified into a destabilising crisis by the financial system.

One of the policy recommendations that follows from the above is that the encouragement of the financial sector in South Africa might have supply-leading effects, due to the duality in the system and the fact that a large proportion of the population, especially in the periphery, have a disproportionately small access to financial services. However, given the developed nature of the South African financial system, and the large degree of concentration, it might also be destabilising. Thus the financial system needs to be encouraged on the one hand, by bringing more people closer to financial services, but on the other hand needs to be regulated to prevent liquidity preference from leading to

overtly destabilising speculation. Encouragement of the financial sector implies amongst other things that the alienation felt by many Blacks towards it, must be overcome. One way of achieving this may be by adjusting the banking sector to the needs of informal credit associations.

Regulation of the financial system, although necessary, should not lead to financial repression. This means that real interest rates should be positive and consistent with exchange rate policy. Lowering the inflation rate is important, because it will allow lower nominal interest rates and because it may counteract liquidity preference. Obtaining a lower inflation rate may require strict control over the government deficit, so that the government does not succumb to the temptation of employing the inflation tax. Furthermore, it was suggested that inflation be contained through some institutional framework set up between the unions and employers, where they can agree on target increases in nominal wages which could be related to productivity increases. Regulation of the financial sector should also support regional development. In this regard a regional liquidity reserve was suggested. This could consist of banks buying bonds from regional authorities in proportion to the percentage of their deposits coming from that region. This suggestion needs to be further researched.

The above policy recommendations were preliminary. It was suggested that a financial SAM could be an appropriate tool with which these recommendations could be empirically evaluated.

In the light of the role of the financial sector presented in chapter 6, the purpose of chapter 7 was to give an overview of the national flow of funds accounts and to show how these accounts can be used as a building block for SAMs.

The national flow of funds accounts were defined as one component of the national accounts system, which shows the financial transactions between broad sectors of the economy, thus linking the savings and investment aggregates. The purpose of the accounts is to reflect the financial flows generated by the surplus units seeking appropriate investment outlets, including those provided by the opportunity of financing the activities of the deficit units.

The national flow of funds accounts were first envisaged by Hicks in 1942. In 1947 Copeland compiled a set of national flow of funds accounts for the United States. The basic idea underlying Copeland's accounts is the idea of the financial system as consisting of different institutions that make decisions about their portfolios of assets and liabilities. This implies that the national flow of funds accounts can be used to investigate portfolio instability due to incorrect investment decisions.

Although the national flow of funds may improve the understanding of the financial interactions in the market, and of portfolio instabilities, far more effort is still devoted to data gathering than to empirical analyses. The different types of analyses that these accounts can be used for are (i) historical descriptions, (ii) surplus-deficit analysis, (iii) financial planning, (iv) monetary approaches to the balance of payments and (v) money market analyses.

It was pointed out that the statistical format of the South African national flow of funds accounts is known as a sources-usage format. An alternative format, a sector-claim format, was illustrated. It was argued that in this format the national flow of funds accounts can be incorporated into a SAM, since it is square, and contains savings and investment vectors through which it could be linked to a SAM of the real economy.

In chapter 8 the national flow of funds accounts were linked with a SAM of the real economy in four ways. The first resulted in a financial SAM for 1988 that contained only financial flows. A second financial SAM was obtained by rearranging the national flow of funds accounts into an institution by institution matrix and by distinguishing between low-skilled and high-skilled households. The final two financial SAMs compiled both contained initial and end stocks of financial assets in addition to the financial flows. These two SAMs were for 1990, and therefore required a real SAM for 1990. Only the control totals of these SAMs were compiled; the compilation of a disaggregated real SAM for 1990 is left as a topic for future research.

Compiling the two SAMs with initial and end stocks proved to be problematic, since no consistent data source exists on these stocks. In the one SAM, the initial stocks were obtained from an integration over the flows contained in the national flow of funds accounts since 1980. The advantage of this method is that financial SAMs of different dimensions can readily be obtained.

The other SAM with financial stocks was cast in an institution by institution framework. To obtain values for the financial stocks a number of strong assumptions were made concerning data from the Reserve Bank's Quarterly Bulletin. For example, investment stocks of the banking and non-banking sectors were extrapolated by means of regression analysis from 1988 to 1989; capital flight of households was assumed to amount to Rm 15 000 and household capital stock was assumed to be equal to 25 percent of the sum of firms' and the government's capital stock.

The simple 1988 financial SAM for South Africa compiled in chapter 8 was used in chapter 9 as the basis for a CGE model. This CGE model is based on a gap-model, which includes the financial sector. Two policy simulations were carried out, namely an

adverse external shock as well as income redistribution through the imposition of a social wage. The results from these simulations were interpreted with the model's shortcomings in mind, namely that the interactions between the financial real sectors of the SAM are not modelled in full detail and that the influence of monetary factors on the inflation rate is not taken directly into account. Furthermore the model can be described as ad hoc or "structuralist" in that the equations were not derived from an explicit optimisation procedure. Nevertheless, by not assuming full capacity utilisation as the models in chapters 4 and 5 did, this model comes closer to the reality in developing countries than many neo-classical models. The shortcomings of the model should also be seen in the light of the fact that the purpose of chapter 9 was to illustrate how a financial SAM can be used as a basis for a model, and to show that such a model may support economic policy making in South Africa. A second generation CGE model based on a financial SAM is left as a topic for future research.

The results from the model were in agreement with those of the previous chapters. Thus the finding that the scope for short-term redistribution in the South African economy is limited, were confirmed. The contribution of including the financial sector were to warn of the danger of a populist experiment in South Africa as the model suggested that a social wage can only be established at the cost of rising inflation. Taken together with the results from chapters 4 and 5, it was concluded that income redistribution in South Africa should be a long-term strategy, which should be accompanied by restructuring the economy. The results from the models presented in this study imply that this restructuring should have at least three dimensions.

First, following the successes of the East Asian "Newly Industrialised Countries" (NICs), any economic restructuring should be export led. In the NICs the growth of exports has

developed manufacturing industry, which in turn has led to expanded exports. It was pointed out that this effect may also be obtained in South Africa.

The development of export capacity could allow the second dimension of the economic restructuring, namely the substitution of imported capital and intermediate goods, to have a bigger chance of success by providing economies of scale necessary for low-cost production. Beside the evidence provided by the experiments in chapter 5 for promoting exports, such as the lowering of tariffs and the liberalisation of the exchange rate, further measures need to be investigated. These measures could include a "mineral resource-based industrialisation" strategy. Such a strategy could entail the following :

(i) The transformation of minerals into finished products for the export market. It has been estimated that if 10 percent of South Africa's ferro-chrome production could be beneficiated, all gold exports could be replaced.

(ii) The development of a capital goods industry to service the resource sector and for exports. In this regard the type of development that occurred in Sweden and in Finland, where the domestic mining sector provided the market stimulus for the establishment of world scale capital goods production, could serve as an example. South Africa already has several mining and quarrying capital goods producers which could provide the basis for the development of this sector into a major actor on the world market.

The third dimension of economic restructuring concerns the government sector. In chapter 5 it was pointed out that the dominance of the government sector is symptomatic of the old apartheid style of structuring the economy along racial lines. It was suggested that the government should avoid a "bloated bureaucracy syndrome" while increasing the effectiveness of government expenditure through changing the composition of budget

expenditure. The scope for this can be created through political deregulation. Political deregulation should be accompanied by economic deregulation, such as the breaking up of conglomerates through anti-trust legislation or anti-monopoly commissions.

The government will also have to lead the reorientation of the production sector toward exporting and lessening its dependence on imports. In this regard, the involvement of the government is justified since South Africa is a late industrialiser. Late industrialisers cannot only rely on "getting prices right" in order to compete internationally. In addition they must make use of various forms of concessionary support. Because this cannot be given to all firms or all sectors, selectivity is necessary. Selectivity could be based upon an analysis of sectors' comparative advantages, or as is done by Japan, where a comparative advantage can be built.

It should be noted, however, that bureaucratic failure is as likely as market failure. The people of South Africa should therefore ensure that bureaucratic failure be limited as far as possible, through insisting upon, and ensuring a democratic political dispensation in which the public sector is accountable to the people.

To conclude, this study has presented evidence that SAMs and CGE models, especially when the role of the financial sector is taken into account, can be valuable tools to assist economists in the formulation of appropriate policies to redress the unequal redistribution of income and wealth in South Africa. Although it has been shown that SAMs and CGE models are capable of providing fresh insights on policy options not available from any other source, they remain auxiliary instruments to assist policy makers, and cannot replace human ingenuity and compassion in the formulation of policies to address poverty and development in South Africa.

APPENDIX A

GREGORY KING'S SOCIAL ACCOUNTING MATRIX
FOR ENGLAND, 1664 (Millions of Pounds)

Ranks, Degrees and Qualifications	Number of Families	Heads per Family	Number of Persons	Income per Family	Income per Head	Expence per Head	Increase per Head	Total Increase
Temporall Lords	160	40	6400	2800	70	60	10	64
Spiritual Lords	26	20	520	1300	65	55	10	5.2
Baronets	800	16	12800	880	55	51	4	51.2
Knights	600	13	7800	650	50	46	4	31.2
Esquires	3000	10	30000	400	40	37	3	90
Gentlemen	12000	8	96000	240	30	27.5	2.5	240
Persons in greater offices	5000	8	40000	240	30	27	3	120
Persons in lesser offices	5000	6	30000	120	20	18	2	60
Eminent Merchants	2000	8	16000	400	50	40	10	160
Lesser Merchants	8000	6	48000	200	33.3	28.3	5	240
Persons in Law	10000	7	70000	140	20	17	3	210
Eminent Clergy	2000	6	12000	60	10	9	1	12
Lesser Clergy	8000	5	40000	45	9	8	1	40
Better freeholders	40000	7	280000	84	12	11	1	280
Lesser freeholders	140000	5	700000	50	10	9.5	0.5	350
Farmers	150000	5	750000	44	8.8	8.55	0.25	187.5
Persons in liberal arts and sciences	18000	5	80000	60	12	11.5	0.5	40
Shopkeepers and tradesmen	40000	4.5	180000	45	10	9.5	0.5	90
Artizans	60000	4	240000	40	10	9.5	0.5	120
Naval officers	50000	4	200000	80	20	18	2	40
Military officers	4000	4	16000	60	15	14	1	16
Common seamen	50000	3	150000	21	7	7.5	-0.5	-75
Labouring people	364000	3.5	1274000	15	4.3	4.4	-0.1	-127
Cottagers & Paupers	400000	3.25	1300000	5	1.5	1.75	-0.25	-325
Common souldiers	35000	2	70000	14	7	7.5	-0.5	-35
Vagrants			30000		2	4	-2	-60

(Source : Stone, 1985 : 8)

APPENDIX B :

A LIST OF CGE APPLICATIONS TO DEVELOPING COUNTRIES

(Listed in alphabetical order according to country)

1) ALGERIA

Gelb, A and Conway, P. 1984. Oil windfalls in a controlled economy : a "fix-price" equilibrium analysis of Algeria. Discussion paper no 94, Development Research Department. Washington DC : The World Bank.

2) BRAZIL

Lysy, F J and Taylor, L. 1980. The general equilibrium income distribution model. *in* Taylor, L Bacha, E, Cardoso, E and Lysy, F J *eds.* Models of Growth and Distribution for Brazil. Oxford : Oxford University Press.

Sadoulet, E. 1985. Investment priorities and income distribution : the case of Brazil in 1970. *Journal of Policy Modeling*, 8(2).

Tourinho, O. A. F. 1985. Optimal foreign borrowing in a multisector dynamic equilibrium model : a case study for Brazil. Energy Laboratory Working Paper no 85, Centre for Policy Research. MIT : Cambridge MA.

3) CAMEROON

Benjamin, N. C. and Devarajan, S. 1985. Oil revenues and economic policy in Cameroon : Results from a Computable General Equilibrium model. World Bank Staff Working paper no 745. Washington DC : The World Bank.

Benjamin, N.C. and Devarajan, S. 1985. Oil revenues and the Cameroonian Economy. *in* Zartmann, I.W. and Schatzberg, M. *eds.* The Political Economy of Cameroon. New York : Praeger Press.

4) CHILE

Condon, T., Corbo, V. and de Melo, J. 1985. Productivity growth, external and capital inflows in Chile during 1977-81 : a general equilibrium analysis. *Journal of Policy Modeling* : 8(2).

5) COSTA RICA

Seth, R. 1986. Costa Rica : an assessment of alternative borrowing strategies. Mimeo : Country Policy Department. Washington : The World Bank.

6) INDIA

Becker, C.M., Mills, E.S. and Williamson, J. 1985. Modeling Indian migration and city growth 1960 - 2000. Discussion paper no 1138, Harvard Institute of Economic Research. Harvard University : Cambridge MA.

Mitra, P. and Suresh, T. 1986. Coping with exogenous internal and external shocks: India 1973-74 to 1983-84. Mimeo : Country Policy Department. Washington : The World Bank.

APPENDIX B : (CONTINUED)

7) INDONESIA

Gelb, A. 1985. Are oil windfalls a blessing or a curse ? Policy exercises with an Indonesia-like model. Discussion Paper no. 133. Development Research Department. Washington DC : The World Bank.

Gelb, A. 1985. The impact of oil windfalls : comparative statics with an Indonesia-like model. Discussion Paper no. 133. Development Research Department. Washington DC : The World Bank.

8) IVORY COAST

Michel, G. and Noel, M. 1984. The Ivorian economy and alternative trade regimes. IN Zartmann, W. and Delgado, C. eds. The political economy of Ivory Coast. New York : Praeger.

9) KENYA

Roe, A.R. and Shymalendu, P. 1986. Kenya's adjustment to the oil crisis, 1972-1982 : a further analysis. Mimeo : Country Policy Department. Washington DC : The World Bank.

10) KOREA

Adelman, I. and Robinson, S. 1978. Income distribution policy in developing countries : a case study of Korea. Stanford : Stanford University Press.

11) MEXICO

Kehoe, T.J. and Serra-Puche, J. 1983. A computational general equilibrium model with endogenous unemployment : an analysis of the 1980 fiscal reform in Mexico. *Journal of Public Economics*, 22(1).

Kehoe, T.J., Serra-Puche, J. and Solis, L. 1984. A general equilibrium model of domestic commerce in Mexico. *Journal of Policy Modeling*, 6(1).

Serra-Puche, J. 1983. A general equilibrium model for the Mexican Economy. In Scarf, H. and Shoven, J.B. eds. *Applied General Equilibrium Analysis*. Cambridge : Cambridge University Press.

12) NICARAGUA

Gibson, B. 1985. A structuralist macromodel for Post-Revolutionary Nicaragua. *Cambridge Journal of Economics*, 9(4).

13) PAKISTAN

McCarthy, F. and Taylor, L. 1980. Macro-food policy planning : a general equilibrium model for Pakistan. *Review of Economics and Statistics*, 62(1).

14) SENEGAL

Ghanem, H. 1985. Senegal : a study of alternative foreign borrowing strategies. Discussion Paper no 1985 : Country Policy Department. Washington DC : The World Bank.

APPENDIX B (CONTINUED)

15) THAILAND

Amranand, P. and Grais, W. 1984. Macroeconomic and distributional implications of sectoral policy interventions : an application to Thailand. World Bank Staff Working Paper no. 627. Washington DC : The World Bank.

Drud, A. and Grais, W. 1983. Macroeconomic adjustment in Thailand : Demand management and supply conditions. *Journal of Policy Modeling*, 5(2).

Kharas, H. and Shishido, H. 1986. Thailand : an assessment of alternative borrowing strategies. *Journal of Policy Modeling*, 8(3).

16) TURKEY

Dervis, K. and Robinson, S. 1982. A general equilibrium analysis of the causes of a foreign exchange crisis : the case of Turkey. *Weltwirtschaftliches Archiv*, 118(2).

Lewis, J.D. and Urata, S. 1983. Anatomy of a balance of payments crisis : application of a computable general equilibrium model to Turkey, 1978-1990. *Economic Modelling*, 1(3).

17) YUGOSLAVIA

Robinson, S. and Tyson, L.D. 1985. Foreign trade, resource allocation, and structural adjustment in Yugoslavia : 1976-1980. *Journal of Comparative Economics*, 9.

APPENDIX C : BASIC FORMAT OF THE 1978 SA SAM
(R millions, 1978 prices)

EXPENDITURES															
	PRODUCTN ACTIV'S 24 Sector	CURRENT ACCOUNTS				CAPITAL ACCOUNTS			REST OF WORLD				TOTALS		
		FACTORS		INSTITUTIONS		Household	Producers	Government	CURRENT ACCOUNTS			Capital			
		Capital	Labour	Household	SWA				Government	Household	Producers	Government	Factors	Goods	Transfers
PRODUCTN ACTIVITIES (24 Sectors)	33857			17607	414	1782	1282	4228	2515		12607			-669	73821
FACTORS	Capital Labour (4 rows by 10 occupations)	17210 16038			582	12	785 3448	-.54	-.980	0	285				17246 20080
INSTITUTIONS	Households (4 rows by 7 income groups)		4988	19603	359		1012						138		26000
	SWA		103	457			14								547
Government	a) Property income		653												653
	b) Transfers		51		71	1									240
	c) Direct taxes		2309		2034	38							117		4832
	d) Indirect taxes	1563			1584	32		25	154	21		44			3433
	e) Subsidies	-383			-185	-4	582								0
CAPITAL ACCOUNTS	Households		1297		2129	48									3474
	Producers		6083												6083
	Government		913				905								1818
ROW	a) Factor payment	555	1588		13										2194
	b) Goods	4881			1228	32	444	387	2088	381					8598
	c) Transfers		32		120		6								128
	d) Balance curr acc												1330		1330
	Capital acc							1834	605	-1108					1330
	Residual		-669												-669
TOTALS		73821	17246	20080	28000	574	8978	3474	6083	1818	295	12651	250	1330	-669

(Source : CEAS, 1986 : 27)

**APPENDIX D : BASIC FORMAT OF THE 1978 REGIONAL SA
SAM (R millions, 1978 prices)**

	PRDUCT'	INCOME & EXPENDITURE			Capital	REST	OF WORL	TOTAL
	ACTIV'S	Househ	Govment	Corporate	Account	Current	Capital	
PRDUCT'N ACTIVITIES (22 Sectors)	33865	18221	1782		6979	12599		73446
Households (4 races by 8 regions)	21013	574	4474	16		138		26215
Govment Corporations	1038 5009	3852		2360	200	161		7611 5009
Capital	5692	2177	905	2601				11375
ROW								
Current	6829	1391	450	32	2866		1330	12898
Capital					1330			1330
TOTAL	73446	26215	7611	5009	11375	12898	1330	

(Source : CEAS, 1986 : 83)

APPENDIX E : BASIC FORMAT OF THE 1988 SA
SAM OF THE DEVELOPMENT BANK (Rmillion, 1988 prices)

	PRDUC'N ACTIV'S	FACTORS		CURRENT ACCOUN INSTITUTIONS		CAPITAL ACCOUN		REST OF WORLD			Residual	TOTAL
		Capital	Labour	Househo	Govment	Govment	Non-Govt	Factors	Goods	Transfers		
PRDUC'N ACTIVITIES (34 Sectors)	155452			93043	10088	6058	31553		57856		-1480	352569
FACTOR Capital	83904				7951		-7084	1652				86423
Labour (4 races by 10 occupation groups)	75040			2202	21954							99196
INSTIT Households (4 races by 6 income classes)		24821	99196	1291	5385					363		135894
Govment		2518								400		2518
a) Property income		109			153							662
b) Transfers		10165			14497							24662
c) Dir tax					10491							23825
d) Indirect tax	9176					827	3264		267			23825
e) Subsidies	-1318			-1444	3992	-5	-25		-1200			0
CAPITAL Govment		4895			-1247							3648
Non-Govment		38082		3609								41691
ROW												9388
a) Factors	2210	7127		51								9388
b) Goods	28106			6981	3234	1323	6900					46544
c) Transfers		186		162	330							878
d) Curr acc										2728		2728
e) Capital acc						-4355	7083					2728
Residual		-1480										-1480
TOTAL	352584	86423	99196	135893	51667	3648	41691	1652	56923	763	2728	-1480

APPENDIX F : BASIC FORMAT OF THE 1988 SA
SAM BY THE CENTRAL STATISTICAL SERVICES
(R millions, 1988 prices)

EXPENDITURES

	PRDUC'N ACTIV'S	FACTORS		INSTITUTIONS		CAPITAL ACCOUN		REST OF WORLD			Residual	TOTAL
		Capital	Labour	Househo	Govment	Govment	Non-govt	Factors	Goods	Transfers		
PRDUC'N ACTIVITIES (23 Sectors)	155446			93562	10476	6228	32388		57164		-1680	353584
FACTOR												
Capital	83704				7951	-185	-8899	1652				86224
Labour (4 races by 13 occupation groups)	76021			1996	21179							99196
INSTIT												
Households (4 races by 6 income classes)		24822	99196	1940	5365					363		131684
Govment												
a) Property income		2516										2516
b) Transfers		109		153						400		662
c) Dir tax		10165		14497								24662
d) Indirect tax	9029			10067	720	662	3058		260			23825
e) Subsidies	-1318			-1444	3992	-5	-25		-1200			0
CAPITAL												
Govment		4895			-1247							3649
Non-Govt		38082		3609								41690
ROW												
a) Factors	2209	7127		52								9388
b) Goods	28494			7060	2901	1303	6086					45844
c) Transfers		186		162	330							678
d) Curr acc balance										2728		2728
						-4354	7082					2728
Residual		-1680										-1680
TOTAL	353584	86224	99196	131684	51667	3649	41690	1652	56224	763	2728	-1680

(Source : CSS, 1993 : 49 - 50)

APPENDIX G

A CGE MODEL IN TRANSACTIONS VALUE FORMAT

(The numbers in the cells are the numbers of the corresponding equations in chapter 5)

	FACTORS			INSTITUTIONS			ACTIVITIES			
	LABOUR	CAPITAL		HOUSEHOLDS		GOVMENT	ACT A		ACT B	
		ACT A	ACT B	TOTAL	TOTAL	DISCR.	NET	GROSS	NET	GROSS
				INCOME	CONSUMP-	CONSUMP-	OUTPUT	OUTPUT	OUTPUT	OUTPUT
					TION	TION				
LABOUR							(5.1)		(5.2)	
CAPITAL A							(5.3)			
CAPITAL B									(5.4)	
INCOME	w.L	(5.3)	(5.4)							
TOT.CONSUMPTION				(5.19b)						
DIS.CONSUMPTION					(5.22)					
GOVERNMENT										
NET OUTPUT A										
GROSS OUTPUT										
NET OUTPUT B								(5.5)		(5.6)
GROSS OUTPUT										
DOMESTIC										
EXPORTS										
IMPORTS										
COMPOSITE					(5.20)	(5.23)	(5.26)			(5.9)
COMM II					(5.21)	(5.24)	(5.27)	(5.7)		(5.10)
REST OF WORLD								(5.8)		
SAVING				(5.19a)			(5.28)			
ACT A										
ACT B										
TOTALS										

APPENDIX G (CONTINUED)

	COMMODITIES				REST OF THE WORLD	CAPITAL ACCOUNT		TOTALS
	COMM 1 DOMES- TIC	EXPORTS	IMPORTS	COMM II COMPo- SITE		SAVING	ACT A	
LABOUR								
CAPITAL A								
CAPITAL B								
INCOME								
TOT.CONSUMPTION								
DIS.CONSUMPTION								
GOVERNMENT	(5.14)	(5.16)	(5.18)	(5.15)				
NET OUTPUT A								
GROSS OUTPUT								
NET OUTPUT B								
GROSS OUTPUT								
DOMESTIC					(5.13)			
EXPORTS								
IMPORTS			(5.17)					
COMPOSITE						(5.32)	(5.34)	
COMM II						(5.33)	(5.35)	
REST OF WORLD					(5.29)			
SAVING					(5.29)			
ACT A						(5.30)		
ACT B						(5.31)		
TOTALS								

APPENDIX H

NASIONALE FINANSIËLE REKENINGE
Vloeië vir die jaar 1991¹
R miljoene

Sektore Transaksieposte	Finansiële tussengangers / Financial intermediaries												
	Buitelandse sektor Foreign sector		Monetêre owerheid Monetary authority		Ander monetêre instellings ³ Other monetary institutions ³		Openbare Beleggings-kommissarisse Public Investment Commissioners		Versekeraars en pensioen-fondse Insurers and pension funds		Ander finansiële instellings Other financial institutions		
	B S	A U	B S	A U	B S	A U	B S	A U	B S	A U	B S	A U	
01. Netto besparing	-7 422		393		2 394				318		79		
02. Voorsiening vir waardevermindering			8		140				753		1 022		
03. Kapitaaloordragte													
04. Bruto investering				36	495					3 449	360		
05. Finansieringsoorskot (+) of -tekort (-) (B)	-7 422		365		2 039				-2 378		741		
06. Netto finansiële beleggingsoorskot (+) of -tekort (-) (A)		-7 422		364	2 039					-2 378	741		
08. Finansiële laste (Totaal B 9 - 33)	3 977		3 725		27 233		7 457		56 441		2 356		
07. Finansiële bates (Totaal A 9 - 33)		-3 445		4 089	29 272		7 457		54 063		3 097		
09. Goud- en ander buitelandse reerwes	3 009			2 416	593								
10. Kontant en onmiddellike opeisbare deposito's by monetêre instellings ²		242	6 511	-38	5 849	-1 078		-32	3 832		87		
11. Ander kort- en middeltermyn- deposito's by monetêre instellings ²		2 769		1	14 829				6 412		-343		
12. Langtermyndeposito's by monetêre instellings ²		19		-10	-1 600				2 120				
14. Deposito's by ander finansiële instellings									39		361		
15. Deposito's by ander instellings							7 457		7 457		-126		
16. Staatkiewissels				426	746			-1 326	60				
17. Ander wissels				-896	-3 482	-6 161		-1 659	-1 333				
18. Lenings en voorskotte van bankinstellings				2 209	-527	27 767				122			
19. Handelskrediet en ander korttermyn- lenings	321	-6 462	-2 036		4 454	352				1 043	2 931	-9	31
20. Korttermynstaatsseffekte		70		151		-1 272		2 514	945			66	
21. Langtermynstaatsseffekte		127		65		756		5 230	1 304			14	
22. Nie-bemarkbare obligasies van die sentrale regering		661		1 724				1 369	3				
23. Effekte van plaaslike owerhede						56		6	315				
24. Effekte van openbare ondernemings		682		-35		-465		294	5 560		37	28	
25. Ander skuldbriewe en voorkeur- aandele				-566	601	3 193		363	809	705	6	48	
26. Gewone aandele	583	-1 744	14		546		1 092	156	21 445	1 736	1 295		
27. Buitelandse tak-/hoofkantoor-saldo's	-65	-420			-411	-30			-9	-35			
28. Langtermynlenings	64	611							-35	1 326	186	1 383	
29. Verbandlenings				4		2 993				304		350	
30. Ledebeleg in lewensversekerings- en pensioenfondse									51 928				
31. Bedrae ontvangbaar/betaalbaar									1	1 316	1	32	
32. Ander bates/laste	65		-750	-1 376	7 521	1 277		-394	2 426	-643	38	231	
33. Sluitpos (saam met pos 32)													

B = Bronne A = Aanwendings

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1. 'n Negatiewe bedrag dui op 'n afname in daardie betrokke pos. In die geval van laste (bronne) dui dit op 'n afname in die beskikbare bron van fondse en by bates (aanwendings) op 'n verdere bron van fondse.
2. Naamlik S A Reserwebank, Korporasie vir Openbare Deposito's, Tesouriermuntlaste, deponisionerende instellings, die Landbank, onderlinge bouverenigings en die Pospaarbank.
3. Insluitende onderlinge bouverenigings en die Pospaarbank.

NATIONAL FINANCIAL ACCOUNTS
Flows for the year 1991¹
R millions

APPENDIX H (CONTINUED)

Algemene owerheid General Government				Korporatiewe sake-ondernemings Corporate business enterprises				Huishoudings, ens. Households, etc.		Totaal Total		Sectors Transactions
Sentrale regering en provinsiale administrasies Central government and provincial administrations		Plaaslike owerhede Local authorities		Openbare sektor Public sector		Private sektor Private sector		B S	A U	B S	A U	
B S	A U	B S	A U	B S	A U	B S	A U					
-11 178		-752		-65		13 044		4 245		1 056		01. Net saving
1 413		1 436		12 067		20 198		9 953		46 990		02. Provision for depreciation
	80	80								80	80	03. Capital transfers
	3 631		2 252		9 916		19 187		8 720		48 046	04. Gross investment
-13 476		-1 488		2 086		14 055		5 478		-		05. Financing surplus (+) or deficit (-) (S)
	-13 476		-1 488		2 086		14 055		5 478			-06. Net financial investment surplus (+) or deficit (-) (U)
19 407		2 756		6 340		34 930		38 218		202 840		08. Financial liabilities (Total S 9 - 33)
	5 931		1 268		8 426		48 985		43 696		202 839	07. Financial assets (Total U 9 - 33)
										3 009	3 009	09. Gold and foreign reserves
	5 404		241		2 079		2 655	-1 032		12 360	12 360	10. Cash and demand deposits with monetary institutions ²
	-1 569		293		1 421		6 340	-495		14 829	14 829	11. Other short and medium-term deposits with monetary institutions ²
	-680		-46		555		1 726	-5 284	-1 600	-1 600	-1 600	12. Long-term deposits with monetary institutions ²
					-36	28	-9	395	389	389	389	14. Deposits with other financial institutions
				195	-85	63	243	-104	130	7 615	7 615	15. Deposits with other institutions
-654			27		6	-6 561				-654	-654	16. Treasury bills
										-10 043	-10 043	17. Other bills
		131		118		10 378		19 756		29 977	29 977	18. Loans and advances by banking institutions
	587	1 482	545	1 914	1 940	3 139	24 707	14 704	382	25 013	25 013	19. Trade credit and other short-term loans
3 952			-70				475		1 073	3 952	3 952	20. Short-term government stock
12 401			5		971		3 927		2	12 401	12 401	21. Long-term government stock
			36		18				-89	3 704	3 704	22. Non-marketable bonds of the central government
3 704		392							-3	392	392	23. Securities of local authorities
			3	8 391			1 684		678	8 429	8 429	24. Securities of public enterprises
				47	-397	2 840	862			4 256	4 256	25. Other loan stock and preference shares
				1 027	-960	20 677	93		2 397	24 178	24 178	26. Ordinary shares
										-485	-485	27. Foreign branch/head office balances
4	1 574	320	-104	2 255	1 549	2 590	-149	807	1	6 191	6 191	28. Long-term loans
			41	-9	133	1 081	-1	2 752		3 823	3 823	29. Mortgage loans
							5 406		46 522	51 928	51 928	30. Members' interest in life assurance and pension funds
				-5 326		1 348	-5 324			-3 976	-3 976	31. Amounts receivable/payable
	615	431	54	-1 945	1 085	-831	7 284	199	-981	7 153	7 152	32. Other assets/liabilities
												33. Balancing item (with item 32)

S = Sources U = Uses

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1. A negative amount reflects a decrease in that item. In the case of liabilities (sources) it denotes a reduction in the available sources of funds and in the case of assets (uses) it indicates an additional source of funds.
2. Namely S A Reserve Bank, Corporation for Public Deposits, Treasury coin liabilities, deposit-taking institutions, the Land Bank, mutual building societies and Post Office Savings Bank.
3. Including mutual building societies and Post Office Savings Bank.

APPENDIX I
DESCRIPTION OF THE DATA SOURCES FOR THE REAL SIDE OF THE
FINANCIAL STOCK/FLOW SAM FOR SOUTH AFRICA (see table 43)

Rmillions (1990)

CELL	VALUE	COMPONENTS	DESCRIPTION	SOURCE
Gross value of production				
(9,1)	198915		Intermediate deliveries	Update from 1988 SAM
(11,1)	101787		Operating surplus	
		53204	Net operating surplus	Quarterly Bulletin S-75
		43058	Allowance for depreciation	Quarterly Bulletin S-75
		5525	Revaluation of inventories	Quarterly Bulletin S-91
(12,1)	106997		Private sector wages & salaries	Update from 1988 SAM
(15,1)	27352		Net indirect taxes	Quarterly Bulletin S-75
(16,1)	32599		Imported intermediate inputs	Update from 1988 SAM
Gross operating surplus				
(13,2)	43703			
		7217	Net payments for capital	See cells (16,2) & (11,7)
		3178	Government property income	Quarterly Bulletin S-96
		10180	Corporate Savings	Quarterly Bulletin S-94
		11054	Interest on government debt	Quarterly Bulletin S-96
		53204	Net operating surplus	Quarterly Bulletin S-75
(15,2)	3178		Government property income	Quarterly Bulletin S-96
(16,2)	9025		Factor payments for capital	
		65812	Imports of goods and services	Quarterly Bulletin S-57
		53984	Imports: goods & non-factor service	Quarterly Bulletin S-77
		2803	Factor payments for labour	See cell (16,3)
(18,2)	37318		Gross saving by firms	
		40199	Gross savings by firms	Quarterly Bulletin S-42/43
		-34371	Gross investment by firms	Quarterly Bulletin S-42/43
		31488	Gross investment by firms	Update from 1988 SAM
(19,2)			Gross savings by banks	
		3124	Gross savings by banks	Quarterly Bulletin S-42/43
		-1366	Gross investment by banks	Update from 1988 SAM
		1491	Gross investment by banks	Quarterly Bulletin S-42/43
(20,2)	8267		Allowance for depreciation : HH	
		8409	Gross investment by households	Update from 1988 SAM
		-2252	personal savings	Quarterly Bulletin S-93
		2110	Financing balance for HH	Quarterly Bulletin S-42/43
(21,2)	4636			
		9364	Gross investment by government	Quarterly Bulletin S-93
		-944	Government savings	Quarterly Bulletin S-96
		-3784	Financing balance by the government	Quarterly Bulletin S-42/43
Remuneration				
(14,3)	137395		Remuneration of residents	Quarterly Bulletin S-95
	2803		Payments for labour	
		140198	Remuneration of employees	Quarterly Bulletin S-75
Current income and expenditure of incorporated business enterprises				
(14,4)	35933			
		35836	Household income from property	Quarterly Bulletin S-95
		97	Current transfers from businesses	Quarterly Bulletin S-95
(15,4)	15530			
		15381	Direct taxes by businesses	Quarterly Bulletin S-94
		149	Current transfers to government	Quarterly Bulletin S-94

APPENDIX I (CONTINUED)
DESCRIPTION OF THE DATA SOURCES FOR THE REAL SIDE OF THE
FINANCIAL STOCK/FLOW SAM FOR SOUTH AFRICA (see table 43)

Rmillions (1990)

CELL	VALUE	COMPONENTS	DESCRIPTION	SOURCE
(16,4)	261		Current transfers to rest of world	Quarterly Bulletin S-94
(17,4)	-8021		Residual	Quarterly Bulletin S-77
Personal income & expenditure				
(9,5)	143785		Locally supplied private consumption expenditure	Update from 1988 SAM
(12,5)	2793		Household services & domestic services	Quarterly Bulletin S-80
(16,5)	8229		Imported private consumption	Update from 1988 SAM
		154675	Private consumption expenditure	Quarterly Bulletin S-80
		132	Transfers to the rest of the world	Quarterly Bulletin S-95
(15,5)	24039			
		23831	Direct taxes	Quarterly Bulletin S-95
		208	Current transfers to government	Quarterly Bulletin S-95
(20,5)	2252		Personal savings	Quarterly Bulletin S-95
Current income & expenditure of general government				
(9,6)	16866		Locally supplied gov exp	Update from 1988 SAM
(11,6)	30408		Government wages & salaries	Update from 1988 SAM
(16,5)	3913		Imported gov exp	Update from 1988 SAM
		51028	Consumption expenditure	Quarterly Bulletin S-96
		161	Transfers to rest of world	Quarterly Bulletin S-96
(14,6)	7371		Current transfers to HH	Quarterly Bulletin S-96
(15,6)	6696		Subsidies	Quarterly Bulletin S-96
(21,6)	944		Savings	Quarterly Bulletin S-96
Exports				
	69487		Exports of goods & non-factor services	Quarterly Bulletin S-96
(11,7)	1810		Factor payments	
		71297	Exports of goods & services	Quarterly Bulletin S-57
(11,7)	399		Current transfers to households	Quarterly Bulletin S-95
(12,7)	459		Current transfers to government	Quarterly Bulletin S-96
(22,7)	-5787		Balance on current account	Quarterly Bulletin S-57
Investment				
(9,9)	46615		Domestically supplied investment goods	
(16,9)	9537		Imported investment goods	
		-5525	Revaluation of inventories	Quarterly Bulletin S-91
		50627	Gross domestic investment	Quarterly Bulletin S-93
(16,1)	31488		Firm investment	Update from 1988 SAM
(19,1)	1366		Bank investment	Update from 1988 SAM
(20,1)	8409		Household investment	Update from 1988 SAM
(21,1)	9364		Government investment	Update from 1988 SAM

APPENDIX J :

CHANGES IN ASSETS/LIABILITIES OF INSTITUTIONS IN FSAM 1990 (R millions)

1) FIRMS

	80	81	82	83	84	85	86	87	88	89	90	TOTAL END '89
Investment	13383	16588	14382	16504	17073	16331	18318	23174	29562	34579	34371	199894
Savings	7616	7078	4020	7975	8447	8315	10035	11301	11321	12577	10446	88685
Depreciation	5510	6527	7995	9590	10814	13974	18084	20553	23430	28342	29753	144819
CHANGES IN ASSETS												
Money	3045	2978	2655	3961	8869	6978	10075	14860	21467	25671	24530	100557
Securities	2057	3170	5096	4227	6015	8154	8216	9078	10668	12656	13891	69337
Loans	3426	6671	8147	8449	7803	12068	13268	19699	14069	6919	20627	100519
Shares	1859	1455	1448	3604	2922	5188	5757	4021	3963	16103	12806	46320
Other	318	-242	2047	184	1822	771	2523	5289	-1987	2710	2599	13435
CHANGES IN LIABILITIES												
Money	1168	1060	1106	1333	2544	2211	5784	4964	3725	4229	7908	28124
Securities	1132	1521	3628	1217	1200	4980	2489	3216	4510	5462	7593	29355
Loans	2255	6526	8438	6163	7643	-1290	685	11790	4363	12186	18185	58759
Shares	2236	1985	1552	5432	3866	5461	4374	4182	4358	14294	6787	47740
Pensions	3919	5117	6856	8063	9352	12272	15731	19707	22108	23202	34680	126327
Other	252	806	1162	99	636	4073	975	1333	3473	-1412	-7024	11399

APPENDIX J : (CONTINUED)

2) HOUSEHOLDS

	80	81	82	83	84	85	86	87	88	89	90	TOTAL END 89
Investment	2027	4542	3472	2266	4683	3434	3228	4215	6776	6077	9179	40720
Saving	2298	1856	1415	1148	1866	2963	1303	3824	3151	2054	2252	21878
Depreciation	1677	2031	2524	2996	4104	4045	5026	5810	6763	6949	9037	41925
CHANGE IN ASSETS												
Money	4269	4812	4540	4624	4820	3740	2109	3614	6954	3092	1825	42574
Securities	486	96	101	94	365	905	377	1152	-136	-754	-409	2686
Loans	59	-4	80	56	-162	249	1020	87	-47	149	752	1487
Shares	-129	-96	3	96	135	-74	414	686	376	-105	51	1306
Pensions	3928	5177	6897	8077	9518	12180	15809	19954	22432	23519	34751	127491
Other	86	0	0	1095	55	0	0	-1229	0	-2686	-4950	-2679
CHANGE IN LIABILITIES												
Money	0	0	0	0	0	0	0	362	0	0	0	362
Securities	25	8	52	-11	-49	32	60	68	83	0	0	268
Loans	6694	9096	9302	12537	13412	13008	13803	19881	26251	17747	19960	141731
Shares	0	0	0	0	0	1	91	0	0	0	0	92
Pensions	0	0	0	0	0	0	0	0	29	0	0	29
Other	32	1536	1867	-362	77	385	0	-1466	78	2515	9950	4662

APPENDIX J : (CONTINUED)

3) FINANCIAL INTERMEDIARIES

	80	81	82	83	84	85	86	87	88	89	90	TOTAL END 89
Investment	207	196	293	84	201	278	346	695	834	772	1491	3906
Savings	463	457	681	808	1067	1258	1401	1409	1583	1987	2212	11114
Depreciation	21	25	29	38	55	52	66	200	237	920	912	1843
CHANGE IN ASSETS												
Gold & Reserves	1377	-1542	180	571	345	658	-196	2245	-1235	199	878	2602
Money	1463	173	-147	953	428	1011	2553	27	1535	1633	318	9629
Securities	762	-1121	1486	1447	116	1521	2808	2715	4482	3911	1518	18127
Loans	5453	10192	6186	11317	15432	9604	7530	16588	22518	23849	23077	128669
Shares	319	461	411	286	258	729	-352	621	281	55	718	3069
Other	649	1977	409	-1171	1642	3606	2052	-413	7180	14463	5732	30394
CHANGE IN LIABILITIES												
Money	8199	6764	7647	8945	12739	9656	12695	16020	29685	33405	17298	145755
Securities	85	-114	490	586	1575	1353	-4	125	-977	451	503	3570
Loans	466	2048	531	1931	741	2680	-1454	-926	3921	786	4679	10724
Shares	129	-8	195	456	331	564	70	789	472	480	1406	3478
Other	859	1131	-760	724	1923	1825	1967	5056	751	6461	6712	19937

APPENDIX J : (CONTINUED)

4) GENERAL GOVERNMENT

	80	81	82	83	84	85	86	87	88	89	90	TOTAL END 89
Investment	2377	3000	3131	3259	3671	4337	5272	4917	5918	7791	5721	43673
Savings	2593	1944	822	-1250	-3312	-1718	-3243	-5880	-2905	-2683	-1554	-15632
Depreciation	591	707	854	1073	1177	1416	1688	1936	2449	2181	3491	14072
CHANGE IN ASSETS												
Gold & Reserves	134	-24	-113	0	10	-92	2	0	-1	0	1	-84
Money	547	-494	2180	546	780	-1007	3057	1097	4769	6466	-2786	17941
Securities	10	0	11	5	11	-8	8	-5	282	-389	-148	-73
Loans	1797	2087	2014	-533	334	832	711	-1680	2071	1315	2069	8948
Shares	527	566	132	84	14	-80	-15	549	136	20	5	1933
Others	100	2265	-867	-762	2	889	2095	1500	733	-377	4299	5576
CHANGE IN LIABILITIES												
Money	11	40	21	-82	4	22	-14	-52	-4	-1125	0	-1179
Securities	1975	806	4020	4018	3953	4401	8965	9980	11020	9613	7600	58751
Loans	127	1825	691	256	709	78	448	599	954	1724	639	7411
Shares	0	140	53	116	0	0	0	0	0	0	320	309
Pensions	9	60	41	14	166	-92	78	247	324	325	71	1172
Other	137	1621	27	-1546	2125	666	694	-7	2070	5356	-1476	11143

APPENDIX J : (CONTINUED)

5) FOREIGN SECTOR

	80	81	82	83	84	85	86	87	88	89	90	TOTAL END 89
Savings	-2830	3701	2920	-265	1410	-5925	-7196	-6152	-2939	-3108	-5787	-20384
CHANGE IN ASSETS												
Money	54	485	-451	193	390	1169	671	1696	-1305	775	1329	3677
Securities	-98	57	501	82	137	883	106	-378	-705	-96	857	489
Loans	-871	1155	2380	2177	-229	-5647	-4294	-3741	-2267	371	-2141	-10966
Shares	86	-233	-188	-1127	1120	-235	-1263	-1086	204	-754	-4229	-3476
Other	979	-543	666	-431	1242	0	450	-561	0	-1190	32	612
CHANGE IN LIABILITY												
Gold	1511	-1548	67	652	355	566	-194	2245	-1236	199	879	2617
Money	0	0	2	0	0	0	0	0	14	3	0	19
Securities	7	9	-10	0	-26	8	5	0	-17	-4	16	-28
Loans	322	360	-66	584	669	2629	3051	128	471	-1385	422	6763
Shares	297	36	-5	-2	252	0	6	39	130	545	838	1298
Other	843	-1637	0	0	0	0	-2	-330	-446	0	-520	-1572

APPENDIX K
 FINANCIAL PORTFOLIO MATRIX FOR SOUTH AFRICA
 1990 (R millions)

	PORTFOLIO OF FIRMS							PORTFOLIO OF BANKS							
	Capital	Money	Secure	Loans	Shares	Pension	Other	Capital	Gold	Money	Secure	Loans	Shares	Pension	Other
Initial balance:															
Capital	198894							3906							
Gold								2820							
Money		72433							-138128						
Secure			38982							14357					
Loans				41780							117945				
Shares					-1420								-409		
Pension						-126327								0	
Other							2036								10457
Changes in:															
Gold								878							
Money		18822							-16880						
Secure			6298							1015					
Loans				2442							18398				
Shares					8019								-888		
Pension						-34680								0	
Other							9823								-980
Investment	34371							1481							
End stock:															
Capital	-234285							-5387							
Money		-89055							-3488						
Secure			-48280							153108					
Loans				-44202							-15572				
Shares					-4388								-136343		
Pension						161007								1087	
Other							-11659								-9477
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX K (CONTINUED)
 FINANCIAL PORTFOLIO MATRIX FOR SOUTH AFRICA
 1990 (R millions)

	PORTFOLIO OF HOUSEHOLDS							PORTFOLIO OF GOVERNMENT							
	Capital	Money	Secure	Loans	Shares	Pension	Other	Capital	Gold	Money	Secure	Loans	Shares	Pension	Other
Initial balance:															
Capital	40720							43673							
Gold								-84							
Money		42574							19120						
Secure			2418							-56824					
Loans				-140244								1537			
Shares					1214								1624		
Pension						127469								-1172	
Other							-7341								-5685
Changes in:															
Gold									1						
Money		1823								-2786					
Secure			-408								-7746				
Loans				-18208								1430			
Shares					51								-315		
Pension						34751								-71	
Other							-14600								5775
Investment	9179							5721							
End stock:															
Capital	-49669							-5397							
Money		-44389							83						
Secure			-2009							-16334					
Loans				159432							66572				
Shares					-1265							-2967			
Pension						-162250							-1309		1243
Other							22241								-210
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX K (CONTINUED)
FINANCIAL PORTFOLIO MATRIX FOR SOUTH AFRICA
1990 (R millions)

	PORTFOLIO		OF	REST OF THE WORLD				
	Capital	Gold	Money	Secure	Loans	Shares	Pension	Other
Initial balance:	0							
Capital		-2536						
Gold			1999					
Money				1867				
Secure					-20998			
Loans						-1009		
Shares							0	
Pension								413
Other								
Changes in :								
Gold		-879						
Money			1319					
Secure				844				
Loans					-3062			
Shares						5067		
Pension							0	
Other								482
Investment	0							
End stock:	0							
Capital		3415						
Money			-3318					
Secure				-2711				
Loans					24060			
Shares						-4058		
Pension							0	
Other								-895
TOTAL	0	0	0	0	0	0	0	0

APPENDIX L :

CAPITAL FLIGHT IN SOUTH AFRICA, 1970-1990
BALANCE OF PAYMENTS MEASURE, (Rmillions)

Year	Amount
80	1999
81	-985
82	-543
83	-133
84	1192
85	3301
86	1316
87	647
88	2412
89	-1086
90	2412
Total end 89	12704

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