Technical Paper Series

Technical Paper 2006: 1

Compiling National, Multiregional and Regional Social Accounting Matrices for South Africa

Elsenburg
November 2006

PROVIDE PROJECT

The Provincial Decision-making Enabling Project

Overview

The Provincial Decision-Making Enabling (PROVIDE) Project aims to facilitate policy design by supplying policymakers with provincial and national level quantitative policy information. The project entails the development of a series of databases (in the format of Social Accounting Matrices) for use in Computable General Equilibrium models.

The National and Provincial Departments of Agriculture are the stakeholders and funders of the PROVIDE Project. The research team is located at Elsenburg in the Western Cape.

PROVIDE Research Team

Project Leader:	Cecilia Punt
Senior Researchers:	Kalie Pauw
	Melt van Schoor
Junior Researchers:	Benedict Gilimani
	Lillian Rantho
Technical Expert:	Scott McDonald
Associate Researchers:	Lindsay Chant

PROVIDE Contact Details

Private Bag X1
Elsenburg, 7607
South Africa

ceciliap@elsenburg.com
+27-21-8085191
+27-21-8085210

For the original project proposal and a more detailed description of the project, please visit www.elsenburg.com/provide

Compiling National, Multiregional and Regional Social Accounting Matrices for South Africa[1]

Abstract

This report provides a technical description of the development of a set of Social Accounting Matrices (SAMs) for South Africa for the base year 2000. The set of SAMs consists of a national SAM, four regional SAMs and a multiregional SAM. The point of departure is a National Accounting Matrix (NAM) for South Africa. The report discusses the structure of each type of SAM, the main data sources that were used and the way in which different sets of data were organised for inclusion in the SAM. Entropy techniques were used to estimate missing information in order to derive complete and consistent SAMs. The theory and practical implementation of the entropy techniques are discussed in this report. The large number of accounts included in the SAMs warranted that the entropy estimation be introduced in different phases in order to ease the complexity of the problem. The SAMs all contain substantial detail on the agricultural industry. The inclusion of various different tax accounts allows for fiscal policy analysis. Detailed factor and household accounts capture the functional distribution of income to households, making the SAMs suitable to analyse the effects of policy changes on income redistribution using Computable General Equilibrium (CGE) models and microsimulation techniques.

[1] The main authors of this paper are Cecilia Punt, Melt van Schoor and Scott McDonald.

Table of contents

List of tables

Executive Summary

This report provides a technical description of the development of a set of Social Accounting Matrices (SAMs) for South Africa for the base year 2000. The set of SAMs consists of a national SAM, four regional SAMs and a multiregional SAM. The point of departure for the development of the set of SAMs is a National Accounting Matrix (NAM) for South Africa. The report discusses the structure of each type of SAM, the main data sources that were used and the way in which different sets of data were organised for inclusion in the SAM. Entropy estimation techniques were used to estimate missing information in order to derive complete and consistent SAMs. The theory and practical implementation of the estimation techniques are discussed in this report.

The SAM for South Africa has 558 accounts, which can be grouped into 7 broad aggregates – commodities (116, of which 20 are for agriculture), activities/industries (166, of which 70 are for agriculture), margins (2), factors (98), institutions (173), capital (2) and international trade (1). The institutions consist of sub-aggregates – households (162), incorporated enterprises (1) and government (10). The commodity and activity accounts are largely based upon the account classification scheme used in the supply and use tables for South Africa published by Statistics South Africa. The factor and household categories are identified firstly by province of residence, then population group and then by other selected criteria such as gender and education level of head of household, and skill level of factor group. Government tax accounts include commodity taxes and subsidies, production taxes and subsidies and direct taxes on households and enterprises. Commodity taxes that appear in the SAM include value added tax on domestic goods and services, value added tax on imported goods and services, excise duties and import duties. Activity taxes include production taxes and value added tax refunds. The discussion in the report follows the development of a general SAM, which has an aggregated agricultural account, and then proceeds to describe the method followed to disaggregate the agricultural account. The agricultural commodity accounts reflect the pattern of commodity production in the South Africa, while the agricultural activity accounts classify farms by regions within provinces.

The regional SAMs are based on the four regions identified for purposes of the PROVIDE Project. The four regions are 1) Northern Cape and Western Cape, 2) Eastern Cape and KwaZulu-Natal, 3) North West, Free State and Gauteng, and 4) Mpumalanga and Limpopo. Each regional SAM contains detailed accounts for the particular region and accounts for the other three regions are aggregated and appear as an account called “Rest of South Africa”. The commodity accounts (48 accounts) and non-agricultural activity accounts (approximately 33

accounts) in the regional SAMs are derived from aggregations of the commodity and activity accounts in the national SAM and are consistent for each of the regional SAMs, except for selected industries that are not found in a particular region. The number of accounts in each of the regional SAMs varies between 143 and 173 depending mainly on the number of agricultural activity, household and factor accounts in each. The factor and household accounts in the regional SAMs correspond to those for the particular region in the national SAM. Compared to the national SAM a distinction is made between provincial government and the consolidated government in the regional SAM. With regard to trade a distinction is made between trade with the rest of South Africa and trade with the rest of the world.

In the multiregional SAM detailed accounts for each of the four regions appear and, compared to the regional SAM, there is therefore no need for a "Rest of South Africa" account. The interregional trade flows depict between which two regions the trade is taking place. The multiregional SAM has 624 accounts. Regional information from the regional SAMs is retained for the commodity, activity, factor, household and provincial government accounts. The accounts for enterprises, consolidated government, capital and stock changes present national level information.

Statistics South Africa was the main supplier of data for the SAM. Data were also obtained from the South African Revenue Service (SARS), the South African Reserve Bank (SARB) and National Treasury. The values for the National Accounting Matrix (NAM) were obtained from the SARB quarterly bulletins while data on trade and taxes were obtained from SARS. Supply and use tables, GDP figures and data on agriculture, mining and manufacturing, households and factors were obtained from Statistics South Africa. National Treasury supplied information on provincial government expenditure.

Data from different sources provide the initial estimates for the SAM even though the data are usually neither complete nor consistent. This leads to a SAM that is not balanced, i.e., the row and column totals do not equate. An important part of the development of a SAM is therefore to estimate missing data and thereby balance the SAM. Entropy estimation techniques are used in the estimation and balancing process. The large number of accounts included in the SAMs warranted that the estimation be conducted in different phases in order to ease the complexity of the problem.

Two additional types of accounts for the SAM were investigated but not included in the final versions. A first attempt was made to include home production for home consumption in the SAM, but due to the relatively small contribution of this activity to GDP and the unreliable nature of the data it was decided not to include it. Preliminary research has been

done on trade data to distinguish between different international trade partners for inclusion in the SAM. This area of work shows potential and will be taken forward in future research.

1. Introduction

This paper discusses the technical aspects of the development of a series of Social Accounting Matrices (SAMs) for South Africa, which is one of the core objectives of the PROVIDE Project. These include a detailed national SAM, an integrated (multiregional) SAM for South Africa and four regional SAMs. The National Accounting Matrix (NAM) for South Africa, which represents the most aggregated version of a SAM, forms the point of departure for all the other detailed SAMs. The regional SAMs are based on the four regions identified for purposes of the PROVIDE Project: namely 1) Northern Cape and Western Cape, 2) Eastern Cape and KwaZulu-Natal, 3) North West, Free State and Gauteng, and 4) Mpumalanga and Limpopo. The four regional SAMs each contain detailed accounts on one particular region of South Africa, while the multiregional SAM contains detailed accounts on all four regions.

The economic information contained in the SAMs is for the year 2000. The choice of 2000 as a base year for the national SAM stems from the fact that 2000 was the most recent year for which supply and use tables were available, while the bulk of other information, e.g. on trade, household and factor incomes and expenditure, were also available for 2000. The 2000 supply and use tables are the first tables that contain information from the 1996 Census of Manufacturing that provides most of the activity/industry data in the SAM.

This report discusses the different data sources used and how the data were organised to provide a set of first best estimates, or a prior SAM. The structure of the SAM makes a modular approach in the development of the SAM appropriate. The data for each of the submatrices of the SAM are compiled separately before linking all the submatrices together. This approach allows for the updating of individual data components of the SAM when more recent information becomes available.

Data from different sources provide the initial estimates for the SAM even though the data are usually neither complete nor consistent. This leads to a SAM that is not balanced, i.e., the row and column totals do not equate. An important part of the development of a SAM is therefore to estimate missing data that supplement the existing data in order that row and column totals of the SAM will equate. Theoretical aspects of estimation techniques, as well as the practical implementation of the procedures, are discussed in this report.

The next section presents an overview of the general structure of the SAMs developed as part of the PROVIDE Project. The main data sources that were consulted are described in section 3. The compilation of the NAM for South Africa is discussed in the fourth section. In section 5 an overview of the development of the best estimate national SAM with a single commodity and a single activity account for agriculture is presented. The disaggregation of

the single commodity and activity accounts for agriculture into multiple agricultural accounts are discussed in section 6. In section 7 the development of the four regional SAMs are discussed. The steps to derive the multiregional SAM from the four regional SAMs are outlined in section 8. Details of the estimation procedure to derive a complete and consistent micro SAMs are presented in section 9. Some issues that still need to be addressed are highlighted in section 10. Tables of SAM accounts and various mappings are included in the appendix.

2. Main structural features of the PROVIDE SAMs for South Africa

2.1. What is a Social Accounting Matrix?

A Social Accounting Matrix (SAM) is a data set in the form of a square matrix in which each account has both a row and a column. The column entries record the expenditures/payments/out-goings for each account, while the incomes/receipts/in-comings for each account are recorded as row entries. As such a SAM represents a form of double entry bookkeeping where each entry is a transaction, i.e., each entry has both price and quantity dimensions, which identifies both the source and destination of the transaction and the prices for each and every entry in a row must be identical. Therefore the total expenditures by each account must be exactly equal to the total receipts for each account: hence the respective row and column sums for a SAM must equate. Consequently a SAM provides a complete and consistent set of information about an economic system for a given year in an efficient and simple way. Moreover, it will provide that information in a manner that is consistent with the aggregate/macro accounts for the system. Furthermore, in the context of an entire economy, a SAM will contain not only the information provided by the national accounts but also further details on the transactions between various groups of agents within the system. For a theoretical discussion of Social Accounting Matrices see PROVIDE Background Paper 2003:4 (PROVIDE 2003).

2.2. General account structure of a Social Accounting Matrix

Table 1 is a representation of a SAM, which broadly follows the System of National Accounts. The layout of the PROVIDE SAMs were chosen to conform to the class of supply and use SAMs that can be used for the calibration of Computable General Equilibrium models. The PROVIDE SAM does not employ the reduced form input-output structure that is common in the literature because such a format requires information that are unavailable and the alternative of imposing restrictive assumptions is deemed inappropriate.[2] The major difference between this SAM and an SNA 1993 SAM is in the treatment of the distribution of

[2] Such input-output data can be prepared as a separate exercise.

income. The SNA 1993 uses a two-stage mapping, first and second stage distribution of income[3]. There are many alternative ways to layout a SAM. In general however SAMs are constructed with 7 types of account and each type may contain numerous (sub) accounts:

- Commodity accounts
- Trade and transport margins
- Activity (or production) accounts
- Factor accounts
- Institutional accounts
- Capital accounts
- Rest of the World accounts.

A list of accounts of the national SAM appears in Table 15 to Table 20 in the appendix.

2.3. General account structure of the regional and multiregional SAMs

Table 2 is a representation of a regional SAM. Compared to the national SAM in Table 1 two additional types of account appear: a provincial government account and an account to capture trade with the rest of South Africa (RoSA). The accounts broadly correspond to that of the national SAM, except that each regional SAM contains only the agricultural activity, household and factor accounts relevant to that particular region. The regional SAMs contain an aggregation of the commodity and activity accounts found in the national SAM. There are 48 commodity accounts included in each regional SAM. There are approximately 33 non-agricultural activities included since not all activities are found in each region. The total number of activities for each region also depends on the number of agricultural activities per region. The list of accounts for each of the regional SAMs appear in Table 21 to Table 24 in the appendix.

Table 3 is a simplified version of the structure of a regional SAM as presented in Table 2 and is used to contrast the structure of the regional SAM in Table 2 with that of the multiregional SAM in Table 4. A regional SAM shows the detail of one region, while the information for the other regions are aggregated and displayed as the Rest of South Africa. The multiregional SAM displays detail on all the regions; hence there is no Rest of South Africa account included in the multiregional SAM. The interregional trade flows indicate between which regions goods and services are traded, as well as household and factor transfers between regions. The list of accounts for the multiregional SAM appears in Table 25 of the appendix.

[3] The 1998 National SAM by Statistics SA is an example of a SAM that follows the SNA.

Table 1: Schematic of a national SAM

	Commodities	**Activities**	**Factors**	**Household**	**Enterprises**	**Government**	**Capital**	**Rest of World**	**Account Total**
Commodities	Marketing Margins	USE Matrix		Household Consumption		Central Government Expenditure	Investment Expenditure and Stock Changes	Exports of Goods & Services	Commodity Demand
Activities	SUPPLY Matrix								Production
Factors		Remuneration of Factors						Factor Income from RoW	Incomes to Factors
Households			Distribution of Factor Incomes	Inter Household Transfers	Distribution of Enterprise Income	Transfers to Households		Remittances from RoW	Household Income
Enterprises			Distribution of Factor Incomes			Transfers to Enterprises		Enterprise Income from RoW	Enterprise Income
Government	Commodity Taxes	Production Taxes	Factor Taxes	Hhold Income Tax & Transfers to Government	Ent Income Tax & Transfers to Government			Current Transfers from RoW	Government Income
Capital			Depreciation	Household Savings	Enterprise Savings	Government Savings	Total Stock Changes	Capital Account Balance	Savings
Rest of World (RoW)	Imports of Goods & Services		Factor Payments to RoW	Remittances to RoW	Enterprise Payments to RoW	Current transfers to RoW		Re-exports	Imports of G&S from RoW and Transfers to RoW
Totals	Commodity Supply	Cost of Production	Expenditure on Factors	Household Expenditure	Enterprise Expenditure	Government Expenditure	Investment Expenditure	Exports of G&S to RoW and Transfers from RoW	

Table 2: Detailed schematic of a regional SAM

	Commodities	**Activities**	**Factors**	**Household**	**Enterprises**	**Provincial Government**	**Consolidated Government**	**Capital**	**Rest of South Africa**	**Rest of World**	**Account Total**
Commodities	Marketing Margins	USE Matrix		Household Consumption		Provincial Government Expenditure	Central Government Expenditure	Investment Expenditure and Stock Changes	Exports to RoSA	Exports to RoW	Commodity Demand
Activities	SUPPLY Matrix										Production
Factors		Remuneration of Factors							Factor Income from RoSA	Factor Payments from RoW	Incomes to Factors
Households			Distribution of Factor Incomes	Inter Household Transfers	Distribution of Enterprise Income		Transfers to Households		Remittances from RoSA	Remittances from RoW	Household Income
Enterprises			Distribution of Factor Incomes				Transfers to Enterprises		Enterprise Payments from RoSA	Enterprise Income from RoW	Enterprise Income
Provincial Government							Transfers to Provincial Gov				Provincial Gov Income
Consolidated Government	Commodity Taxes	Production Taxes	Factor Taxes	Hhold Income Tax & Transfers to Government	Ent Income Tax & Transfers to Government					Current Transfers from RoW	Government Income
Capital			Depreciation	Household Savings	Enterprise Savings		Government Savings	Total Stock Changes	"Internal" Capital Account Balance	"External" Capital Account Balance	Savings
Rest of South Africa (RoSA)	Imports from RoSA		Factor Income to RoSA	Remittances to RoSA	Enterprise Payments to RoSA			Investment expenditure in RoSA			Imports from and Transfers to RoSA
Rest of World (RoW)	Imports from RoW		Factor Payments to RoW	Remittances to RoW	Enterprise Payments to RoW		Current transfers to RoW			Re-exports	Imports from and Transfers to RoW
Totals	Commodity Supply	Cost of Production	Expenditure on Factors	Household Expenditure	Enterprise Expenditure	Government Expenditure	Government Expenditure	Investment Expenditure & Stock Changes	Exports to and Transfers from RoSA	Exports to and Transfers from RoW	

Table 3: Schematic of a regional SAM

	Region 1	Rest of South Africa	Rest of World	Total
Region 1	Region 1 SAM	Exports to South Africa from Region 1	Exports to Rest of World from Region 1	Income by Region 1
Rest of South Africa	Imports from South Africa to Region 1			
Rest of World	Imports from Rest of World to Region 1			
Total	Expenditure by Region 1			

Table 4: Schematic of a Multiregional SAM

	Region 1	Region 2	Region 3	Region 4	National Institutions & Capital	Rest of World	Total
Region 1	Intra-region[1] component of Region 1 SAM	Exports[2] to Region 2 from Region 1	Exports to Region 3 from Region 1	Exports to Region 4 from Region 1	Consumption expenditure, investment & transfers to Region 1	Exports to RoW from Region 1	Income by Region 1
Region 2	Imports[2] to Region 1 from Region 2	Intra-region component of Region 2 SAM	Exports to Region 3 from Region 2	Exports to Region 4 from Region 2	Consumption expenditure, investment & transfers to Region 2	Exports to RoW from Region 2	Income by Region 2
Region 3	Imports to Region 1 from Region 3	Imports to Region 2 from Region 3	Intra-region component of Region 3 SAM	Exports to Region 4 from Region 3	Consumption expenditure, investment & transfers to Region 3	Exports to RoW from Region 3	Income by Region 3
Region 4	Imports to Region 1 from Region 4	Imports to Region 2 from Region 4	Imports to Region 3 from Region 4	Intra-region component of Region 4 SAM	Consumption expenditure, investment & transfers to Region 4	Exports to RoW from Region 4	Income by Region 4
National Institutions and Capital	Savings, tax, transfers from Region 1	Savings, tax, transfers from Region 2	Savings, tax, transfers from Region 3	Savings, tax, transfers from Region 4		Net current transfers & capital account balance	National Institution Income
Rest of World	Imports to Region 1 from RoW	Imports to Region 2 from RoW	Imports to Region 3 from RoW	Imports to Region 4 from RoW			Income to Rest of World from SA
Total	Expenditure by Region 1	Expenditure by Region 2	Expenditure by Region 3	Expenditure by Region 4	National Institution Expenditure	Expenditure by Rest of World to SA	

[1]The intra-region component of each region includes the commodity, activity, factor and household accounts.
[2] Interregional trade includes trade in goods and services, remittances and interhousehold transfers.

3. Main data sources

Table 5 gives an overview of the main data sources used for each type of account included in the SAMs for South Africa.

Table 5: Data sources for each type of account in the SAMs

Type of account	Statistical sources
Commodity and activity accounts	2000 SU-tables (SSA, 2003) Statistical Release P0441 November 2004 (SSA, 2004a) 1993 Census of Agriculture (CSS, 1998) 2002 Census of Agriculture (SSA, 2004b) 1996 Census of Mining (SSA, 2001k) 1996 Census of Manufacturing (10 reports) (SSA, 2001) SARB Quarterly Bulletin (SARB, December 2004)
Factor accounts	2000 SU-tables (SSA, 2003) 2000 Income and Expenditure Survey (SSA, 2002a) 2000 Labour Force Survey (SSA, 2001l) 1993 and 2002 Census of Agriculture (CSS, 1998 and SSA, 2004b) SARB Quarterly Bulletin (SARB, December 2004)
Household accounts	2000 Income and Expenditure Survey (SSA, 2002a) 2000 Labour Force Survey (SSA, 2001l) SARB Quarterly Bulletin (SARB, December 2004)
Corporations / Enterprises	2000 Income and Expenditure Survey (SSA, 2002a) SARB Quarterly Bulletin (SARB, December 2004)
Government accounts	SARB Quarterly Bulletin (SARB, December 2004) 2000 SU-tables (SSA, 2003) 2000 Excise duty data (SARS, 2000a) 2000 Import duty data (SARS 2000c) 2000 Value added tax data (SARS 2000d) Budget review 2001 (National Treasury, 2001)
Capital accounts	2000 SU-tables (SSA, 2003) SARB Quarterly Bulletin (SARB, December 2004)
Trade	2000 SU-tables (SSA, 2003) 2000 Import and export data (SARS, 2000b) SARB Quarterly Bulletin (SARB, December 2004)

3.1. South African Reserve Bank Quarterly Bulletin

The Quarterly Bulletin of December 2004 published by the South African Reserve Bank (SARB, 2004) provided the bulk of the data for the NAM described in section 4. The statistical tables published in the Quarterly Bulletins contain data on money and banking, the capital market, the national financial account, public finance, international economic relations, national accounts, general economic indicators and other key information. The tables used to determine the values for the NAM are National Government Finance (S-54), Balance of payments (S-86), Services, income and transfers (S-90), National income and production accounts of SA (S-112), Financing of gross capital formation (S-132), Current income and expenditure of incorporated business enterprises (S-135), Current income and expenditure of general government (S-136) and Current income and expenditure of households (S-137). The figures in the quarterly bulletin enter directly into the NAM, discussed in section 4.

3.2. 2000 Supply and Use Tables

The supply and use tables (SU-tables) for South Africa for 2000 (SSA, 2003) report the value of transactions in goods and services in the South African economy for a specific year in matrix format. The SU-tables serve as a co-ordinating framework to ensure the numerical consistency and accuracy of national data obtained from different sources i.e. industrial surveys, household surveys, investment surveys and foreign trade statistics. According to the compilers the SU-tables are completely reconciled with the national accounts estimates of gross domestic product (GDP) by activity and the expenditure on GDP, but there are still significant discrepancies between the supply and use of products at a more detailed level. Firms are assigned to activities according to the principal product of the firm. Therefore activities are defined by commodity definitions. The activities included in the SU-tables by Statistics SA follow the 1993 Standard Industrial Classification (SIC) (CSS, 1993). The only commodity for which there is no corresponding activity is Financial Services Indirectly Measured (FSIM). The commodity and activity lists are well documented by Statistics SA (see SSA, 2003) and serve as a point of departure for the commodity and activities included in the PROVIDE Project SAMs. Deviations for project purposes from the classifications as found in the reports on the SU-tables are documented in section 5.2.

The use table for 2000 allocates the expenditure by 94 industries on intermediate inputs of 95 different commodities, or groups of commodities. The use table also reports the value of final demand for each of the commodities with regard to exports, household and government consumption expenditure, fixed capital formation and changes in inventories respectively. The use table further reports gross value added, compensation of employees, net taxes and gross operating surplus for each industry. The use table reports a residual that indicates the discrepancy between the value of supply and use for each commodity. These residuals sum to zero, but are substantial (up to 40% of the total supply) for individual commodities (SSA, 2003). These residuals are not explicitly eliminated during the process of deriving a prior SAM, but are dealt with as part of the process of estimating missing information as discussed in section 9. Intermediate and final consumption expenditure is valued at purchasers' prices in the 1993 System of National Accounts. The use table presents the use of products at purchasers' price (SSA, 2003). The purchasers' price is defined as the amount paid by the purchaser, excluding any deductible value added tax (VAT) or similar deductible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place. For purposes of the SA SAM deductible VAT is included in the purchaser's price. The deductible VAT is treated as a production subsidy and hence is included as a payment from government to activities (or negative tax). Because all CGE models contain the assumption of the law of one price, it

implies that prices are common across the rows of the SAM. The deductible VAT was therefore separated from intermediate consumption as reported in the use table, and recorded as a payment from government, in order to adhere to the assumption of the law of one price.

The supply matrix for 2000 (SSA, 2003) indicates the values of 153 products produced by each of the 94 activities. For purposes of the PROVIDE SAM these 153 products were aggregated to the 95 commodity groups used in the use tables and in the 1998 and 1999 versions of the supply table. Entries in the off-diagonal elements of the supply matrix are only found in cases where multiple products are produced by an activity. The supply matrix also records imports, trade and transport margins and net taxes for each commodity. Output is valued at basic prices in the 1993 System of National Accounts. The supply table presents the supply of products at basic prices. The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable plus any subsidy receivable on that unit as a consequence of its production or sale. Basic prices exclude any transport charges invoiced separately by the producer. The total supply of products at basic prices can be divided according to its origin, i.e., whether the products are domestically produced or imported (SSA, 2003).

The SU-table information enter directly into the detailed supply and use matrices of the SAM by multiplying the ratios of each with the total figures for the supply and use matrices as reported in the NAM. The information in the use table on stocks and investment were used. The information on GOS was used in combination with information from the production accounts see section 3.3. The information reported in the SU-tables on imports and exports and household consumption were not used; the data from SARS and the 2000 Income and Expenditure Survey were used instead.

3.3. Statistical Release P0441, November 2004

A key figure for a NAM, which is not published in the Quarterly Bulletin of SARB, is gross output by activities. The annual production accounts, Table 12 of Statistical Release P0441 published by Statistics South Africa (SSA, 2004), provides an estimate of gross output at basic prices. The Statistical Release P0441 published in the third quarter of every year contains annual estimates per region. The published production accounts report the national level output at basic prices, intermediate consumption, gross value added at basic prices, other taxes on production, other subsidies, value added at factor cost, compensation of employees and gross operating surplus/mixed income. The Statistical Release also contains gross domestic product by province. The reports provide information by 10 main industry categories. All of this information was used in the SAMs.

Statistical Release P0441 contains reduced version supply and use tables for each year from 1997 until 2003. The tables contain only nine industry and nine commodity categories. These supply and use tables were compiled after the benchmarking process conducted earlier in 2004. The values of the supply and use tables for 2000 therefore differ from those in the detailed supply and use tables discussed in the previous section. The data contained in the reduced version supply and use tables do not enter directly into the priors for the SAMs, but they were used to provide control totals during the estimation process. The calculated totals of the submatrices of the detailed SAMs were therefore constrained to add up to the values of the supply and use tables. See section 9 for more details on the estimation process.

3.4. 2000 Income and Expenditure Survey

Data from the Income and Expenditure Survey of 2000 (IES 2000) (SSA, 2002a) provide the bulk of information for the household accounts. The IES is conducted by Statistics South Africa every five years and records the detailed income and expenditure of households. These surveys were originally designed, and are still used, to determine weights for the South African Consumer Price Index. However, being the only survey of its type in South Africa, the IES is also used by social scientists and policymakers researching the earning and spending capacity and expenditure patterns of South African households. As such it forms an important data source for the household expenditure matrix in the SAM, as well as various other cells or sub-matrices in the SAM containing information on income or expenditure activities of households. Originally some 30 000 households were interviewed for the IES 2000, but many records were dropped by Statistics South Africa from the dataset due to data problems such as incomplete questionnaires.

The official Statistical Release P0111 included 26 309 households, and after some further 'cleaning', which formed part of the PROVIDE Project's work during 2004, 26 183 households remained in the final dataset on which the household account data in the SAM is based (see PROVIDE Technical Paper 2005:1 for detail on how the final IES 2000 dataset was created). In total there are approximately 900 questions in the IES 2000 questionnaire covering all income and expenditure-related activities of households during a particular period. All monthly figures were annualised and income and expenditure items in the IES 2000 were mapped to the relevant SAM accounts. The IES 2000 data were also used to form representative household groups that form the household accounts of the SAM (see PROVIDE Technical Paper 2005:2).

Income and expenditure data from the IES 2000 were organised to calculate the within-household group income and expenditure totals for all income and expenditure categories. Individual households in the IES 2000 were also linked to households and their members in the Labour Force Survey of September 2000 (LFS 2000:2) in order to map factor income data

with households. Not only is the IES 2000 based on the same set of households interviewed for the LFS 2000:2, but they were also conducted at around the same time in 2000, which makes the merging possible (see section 3.5). All data reported in the IES 2000 were first transformed to annual data before the within-group totals were calculated. The survey sampling weights provided with the IES 2000 and the LFS 2000: 2 were used throughout to correct for any sampling bias introduced in the estimation of total incomes and expenditures of household and factor groups.

3.5. 2000 Labour Force Survey

The Labour Force Survey of September 2000 (LFS 2000:2) (SSA, 2001l) was used to obtain employment data for the SAM. The LFS, which is conducted twice every year, replaced the October Household Surveys, which were conducted annually until 1999. The LFS includes data on respondents' occupation groups, industries in which they are employment and wages or salaries earned during a specific period. Although the IES 2000 also contains such employment data the LFS 2000:2 was preferred for a number of reasons.

- The LFS 2000:2 and IES 2000 are designed so that they can be merged, i.e., households in the IES 2000 can be linked to the same households in the LFS 2000:2 because the same households were interviewed for both surveys.
- Since education data in the LFS 2000:2 had to be extracted and linked to the IES 2000 for the purpose of forming household groups in any event, the LFS 2000:2 employment data were available within the IES 2000 dataset.
- Since the LFS 2000:2 is designed specifically to gather information on employment and related activities of the population, the quality of the data is presumed to be better. For example, the IES 2000 only asks a single question to determine a person's occupation or industry code. In contrast, occupation and industry codes in the LFS 2000:2 are based on a series of questions. Consequently there are fewer 'unspecified' factors and industries in the LFS 2000:2, which suggests that the information supplied can be used to determine more accurately what the correct factor or industry codes should be.

The activities in the SAM are based on the 1993 Standard Industrial Classification (SIC) codes (CSS, 1993). All factors report on the type of business and type of work performed, and from this information Statistics South Africa classified industries according to the SIC codes. However, the codes are only published as three-digit SIC codes in the LFS 2000:2 whereas the fully disaggregated set of SIC codes has four digits. As a consequence the activity codes extracted from the LFS 2000:2 are not at the desired level of disaggregation. 61 activities are formed initially, and then 13 of these are disaggregated further after the value-added sub-matrix has been extracted to MS Excel. The disaggregation is done by using the relative value added between industries in the 94 groups based on information contained in the supply and

use tables for 2000 on value-added. Table 26 in the appendix shows how the initial mapping between the SIC codes and the 61 LFS 2000:2 activities was done. It also shows the ratios into which some of these activities are split into more disaggregated activity groups to form 94 activities as they appear in the SAM.

Once all representative factor and activity groups have been formed, the factor-activity (or value-added) sub-matrix in the SAM can be estimated. This sub-matrix summarises information on the flow of resources, in the form of total wages or salaries, from industries to factors. The household-factor sub-matrix shows how this wage or salary income is distributed between households, the owners of factors. The household groups were derived from the IES 2000, which was merged with the LFS 2000:2 before creating this sub-matrix. Note that data on household income from non-labour factors of production such as capital (gross operating surplus) are obtained from the IES 2000. Other institutions such as government and incorporated business enterprises may also own non-labour factors of production. Data on the distribution of factor income to these institutions are not included in the LFS 2000:2 or IES 2000, but are obtained from the SARB Quarterly Bulletins.

3.6. 2000 Trade Data

Import and export data were obtained from the South African Revenue Service (SARS, 2000b). Various trade data sets are available from SARS. The trade dataset that contains postal code information was used, bearing in mind that this data was also used for deriving the trade figures for each of the regional SAMs. The information on different trading partners (indicated by country codes) were not used in this version of the SAM, but might be used in future versions. Quantities in various different units as well as the custom's value of imports and exports are reported by SARS. The data on quantities were not used. Trade data were sorted according to the type of product. Products were assigned a 9-digit tariff, where the first eight digits correspond to the codes used in the Harmonised System of Accounts (HS). The data therefore had to be mapped firstly to the Standard Industrial Classification (SIC) codes (CSS, 1993) and then to the 95 commodity accounts included in the SAM. The mapping (Kuhn, 1999) is not included in the Appendix due to its length.

In addition to the SARS data, trade data from Global Insight (Global Insight, 2004) were also used. Global Insight reports trade by 34 SIC groups and this was used as control totals on the postal code data from SARS. The postal code data from SARS report trade by the postal code of the importer or exporter and therefore does not give an accurate indication of the flow of trade into and out of a province. Global Insight undertake "cleaning" of the postal code data to get a better representation of trade per province. For details on the method of organising trade data for inclusion in a Social Accounting Matrix refer to PROVIDE Project Technical Paper 2004:2 (PROVIDE 2004).

3.7. 2000 Excise Duty Data

During 2000 specific excise duties were levied on petroleum and hydro-carbons (fuel levies), liquor products and tobacco products, while *ad valorem* excise duties were levied on cosmetics, television receptors, audio equipment, etc. The SARB Quarterly Bulletin (SARB, 2004) provides control totals for a) fuel levies and b) other excise duties in the table entitled "National Government Finance". The "other excise duties" category consists of both levies on liquor and tobacco products and *ad valorem* excise duties. Detailed data on excise duties were obtained from South African Revenue Service (SARS, 2000a).

As is usually the case, an important step from the perspective of developing the SAM is to map the different excise duty values to appropriate SAM commodity groups. Fuel levies are relatively straightforward, as they are paid only on Petroleum Products (SAM commodity category C32). Similarly duties on liquor and tobacco products are all paid on Beverages and Tobacco Products (SAM commodity category C16). The *ad valorem* duties cover a range of SAM commodity categories. The contribution of each commodity category in the PROVIDE SAM to *ad valorem* duty revenue, as calculated from the SARS data, is indicated in Table 6.

Table 6: Share of *ad valorem* excise duties generated by different SAM commodity categories

SAM category	Description	Share of total *ad valorem* duties
C31	Recorded media products	0.07%
C39	Soap products	23.30%
C40	Other chemical products	0.17%
C44	Glass products	0.12%
C59	General machinery	1.15%
C64	Other special machinery	2.42%
C66	Office machinery	0.03%
C73	Radio and television products	10.01%
C74	Optical instruments	0.02%
C75	Motor vehicles	62.71%
C80	Other manufacturing	0.01%
		100.00%

There were discrepancies between the totals calculated from the detailed SARS data and the reported SARB control totals. The SARB control total for fuel levies was used (R14.63 billion). The calculated total for the levies on liquor and tobacco products derived from the detailed SARS data provided another control total (R7.88 billion). The control total for the *ad valorem* duties was then derived as the difference between the reported control total for "other excise duties" and the duties on liquor and tobacco products (R1.27 billion). The total revenue from *ad valorem* duties was then distributed across commodities according to the ratios in Table 6.

3.8. 2000 Duties on Imports

Data on duties collected on imports were obtained from the South African Revenue Service (SARS, 2000c). There are two sets of data that can be used to derive tariff rates on custom's value of imports, as well as rates of other duties on imports. The first set is referred to as "duties collected" by SARS officials and is extracted by SARS using file layout option CEI375. Each data row contains the following information: country code, tariff (Harmonised System (HS) code), custom's value, value added tax (VAT), custom's duty, *ad valorem* duty and surcharge. The second data set is referred to as "tax collected". It is extracted by SARS with file layout option CEI 327 and contains the following information for each row of data: tariff (Harmonised System (HS) code), custom's value, value added tax (VAT), custom's duty, *ad valorem* duty and surcharge, quantity code 1, quantity 1, quantity code 2, quantity 2 quantity code 3, quantity 3. The main difference between the options is therefore that option CEI375 includes country code information, but no quantity information when compared to option CEI327. The country code information is important to derive country specific tariff rates if multiple trade partners are to be included in the SAM for trade policy analysis.

The data from the two options look quite different, the dataset for 2000 from option CEI327 contains almost 4 million rows of data, while that of option CEI375 contains less than 100 000 data rows. The total custom's value reported in the two sets differs by approximately eight percent. According to SARS officials differences such as these arise due to changes/corrections that are made to the data. These changes are however not carried out consistently over all datasets, because of the magnitude of the datasets. The smaller dataset was used for this analysis, because it contains the country code information relevant for the inclusion of multiple trade partners (potentially in later versions of the SAM). Because the dataset was relatively small it was possible to analyse the raw data in more detail before inclusion in the SAM.

The dataset contains the country code of the origin of the imports, the custom's value, and additional payments, i.e. value added tax, surcharges, *ad valorem* duties and custom's duties respectively. Import duties, for purposes of the SAM, include the surcharges, *ad valorem* duties and custom's duties reported in the detailed data from SARS. VAT on imports is retained as a separate category in the SAM. Similar to the trade data, the tariff revenue data are classified according to the Harmonised System of Accounts (HS). The data therefore also had to be mapped first to the Standard Industrial Classification (SIC) codes and then to the 95 commodity accounts included in the SAM. The same mappings were used as for the trade data (section 3.6).

Besides the mentioned discrepancies between the two datasets on import tariffs, the custom's value reported in the dataset that was used differs by four percent from the custom's

value reported in the trade data that was used. For individual commodities these differences are however substantially larger. This has serious implications for the import tariff data in the SAM. The actual reported import duties are used in the SAM, hence the import tariff rates that can be estimated from the SAM are different from the implicit rates derived from the tariff revenue data.

VAT on imports was derived in two parts: non-service commodities and service commodities. The duties collected data obtained from SARS report mainly on non-service commodities. For non-service commodities the reported VAT figures were included in the SAM as reported in the SARS dataset. For service commodities the VAT on imports were estimated by applying a VAT rate to the value of service imports as estimated from the SARS trade data discussed in section 3.6. The VAT rate used was 14 percent for all service commodities, except for transport services (SAM account C87), for which it was set at 7 percent because of certain exclusions in the industry.

3.9. 2000 Domestic Value Added Tax Data

Data on value added tax on domestic goods were obtained according to the payments from and refunds to registered vendors classified according to the main industry in which the vendor operates. VAT payments are captured in the SAM by commodity, while the refunds are reported by activity (refer to Table 9). VAT payment data therefore had to be mapped to the 95 commodities in the SAM and VAT refund data to the 94 activities included in the SAM.

The VAT refund data are relatively straightforward, because the data is recorded by activity. The Vendors and Employers Trade Classification Guide (SARS, 2003) reports the industry codes used to classify VAT data. The codes broadly correspond to SIC codes and were mapped accordingly. See Table 27 in the Appendix for the mapping.

Deriving domestic VAT payment data by commodity from the reported data by activity was, and remains, a challenge. Each activity is potentially a multiproduct firm that pays VAT on the various commodities it supplies. For each activity the total VAT payment must be disaggregated across commodities supplied by that activity. Information contained in the supply table (SSA, 2003) was used to estimate VAT payments at a commodity level. The VAT rate for each commodity as derived from the duties data (see section 3.8) was applied to the values in the supply table. The values obtained were then scaled in order that the total VAT paid by each activity corresponds to the VAT payments reported by SARS.

Exemption and zero rating of various commodities add another complexity to the data. It implies that the effective VAT rate is much lower than 14 per cent for certain commodities,

while the effective VAT refunds for certain activities are much lower than 14 per cent. Furthermore, not all industries are registered for VAT. An entirely satisfactory way of handling these complexities has yet to be found, but given the growing importance of VAT as a source of tax revenue it was deemed important to attempt to incorporate these issues in the SAM.

VAT on imports is derived from a different dataset as discussed in section 3.8.

3.10. 1993 and 2002 Agricultural Census Data

Detailed agricultural data were obtained from the Agricultural Census for 1993 and 2002. The 1993 Census of Agriculture (CSS, 1998) was the most comprehensive source of agricultural information at the time of compiling the SAMs. It supplies a vast amount of monetary and non-monetary data for statistical regions and magisterial districts within each province. The subsequent Agricultural Survey for 1996 (SSA, 1999) reports less information than the 1993 Census of Agriculture and it reports information only at provincial level, with no information at sub-provincial level. Data from this survey were therefore not used for purposes of the national SAM. The information contained in the 2002 Census for Commercial Agriculture (SSA, 2004b) is only at provincial level[4]. The census covered the whole country, including the former TBVC states and so-called self-governing territories. The 2002 Census for Commercial Agriculture was based on business registered for VAT at SARS. For purposes of the SAM, the data contained in the 2002 Census of Agriculture is supplemented with 1993 data where necessary. For the disaggregation of the agricultural accounts (discussed in section 6) the 2002 Census of Agriculture is used to supply the control totals at province level, while the distribution across the different agricultural regions within each province is derive from the information in the 1993 Census of Agriculture[5]. The modular structure of the SAM development programme however makes it possible to update the agricultural information as when new information becomes available.

Some of the data presented in the 1993 Census of Agriculture (CSS, 1998) that were used in the PROVIDE SAM include the gross income per commodity, labour remuneration per race group and fairly detailed current and capital expenditure. The census also provides non-monetary data that can be used in satellite accounts when policy impacts on land use and employment are analysed. These include the number of proprietors, regular and casual employees, the number and area of farming units, the area planted to each crop and the volume of production. As mentioned before, the data are available at sub-provincial level.

4 The detailed reports per province only appeared after the finalization of the SAMs.

5 Although the 1993 data are quite dated, it has been found that during the estimation process discussed in section 9 some of the figures do actually adjust in accordance with known changes that have taken place during the past decade.

The 2002 Census of Agriculture (SSA, 2004b) provides similar information to the 1993 Census of Agriculture, but only at provincial level. The census includes much less information on hectares, production volumes, etc. The key monetary information required for the SAM is however reported. This includes the gross income per commodity, labour remuneration and fairly detailed current and capital expenditure.

In the Agricultural Census' the income data are organised by province/region, while expenditure data are organised by commodity. Hence, the data are reported in the format that is required for inclusion in a supply and use SAM, thereby simplifying the disaggregation of the agricultural account. The disaggregation of the agricultural account is described in more detail in section 6. The choice of agricultural commodity and activity accounts for the SAM as listed in Table 16 and Table 17 in the appendix was largely informed by the level of detail in the 1993 Census of Agriculture.

The Report on the Survey on Large and Small Scale Farming (SSA, 2002b) makes a first attempt at presenting data on non-commercial agriculture in South Africa. The report states (see Table B of the mentioned report) that North West generates 72% of total income, compared to the 10% reported in the 2002 Census of Agriculture (SSA, 2004b). This raises questions about the reliability of the results and it was decided not to use the information. To the knowledge of the authors no other information on non-commercial agriculture is available. The information contained in the SAM therefore, regretfully, still only represents commercial agriculture.

3.11. 1996 Census of Manufacturing

The 1996 Census of Manufacturing reports statistics on the manufacturing industry for South Africa (SSA, 2001a) as well as for each of the nine provinces (SSA, 2001b to j). Ten reports are therefore available. The report on the 1996 Census of Manufacturing for South Africa predates the provincial reports. It was found that the reported values for South Africa are inconsistent with the totals calculated from the data for the nine provinces. The information contained in the 1996 Census of Manufacturing were not used in the national SAM, but only to estimate provincial shares for use in the regional and multiregional SAMs. All the required information for the national SAM were obtained from the SU-tables (see section 3.2). The 1996 Census of Manufacturing reports a wide range of statistics. Two sets of data from Table 10 in the 1996 Census of Manufacturing were used to determine provincial level data for the regional and multiregional SAMs:

- Intermediate consumption figures entered into the Use matrix;
- Values on output were included in the Supply matrix.

Table 10 in the 1996 Census of Manufacturing reports principal statistics according to major manufacturing group and statistical region. Only provincial level data were used and not data per statistical region. The major manufacturing groups correspond only roughly with the SAM activities. The major groups were therefore matched as closely as possible to the SAM activities. The major groups were different for each of the provinces, reflecting the different production patterns in the various provinces. In instances where a major group included more than one SAM activity the values were divided between the appropriate SAM categories. Because of the extent of the mapping files they are not included in this report.

3.12. 1996 Census of Mining

The information contained in the 1996 Census of Mining were not used in the national SAM, but only to estimate provincial shares for use in the regional and multiregional SAMs. The 1996 Census of Mining (SSA, 2001k) reports principal statistics regarding the mining industry according to province, statistical region and type of mine. The principal statistics include number of establishments; and number of employees; value of salaries and wages; stores consumed or purchased and transfers in; total income; sales, transfers out and work done; net profit; opening value of fixed assets; and capital expenditure. Two sets of data from Table 10 in the 1996 Census of Mining were used to determine provincial level data for the regional and multiregional SAMs:

- The values for total income provided the priors for supply by industry;
- Intermediate consumption was derived from stores consumed or purchased and transfers in.

The 1996 Census of Mining reports data on fourteen different mining categories. “Coal and lignite” is included in the corresponding category in the SAMs (A2). Similarly “Gold and uranium” is included in the corresponding category in the SAMs (A3). All the other mining categories in the Census are included in the SAM category called “Other Mining” (A4).

The 1996 Census of Mining reports data on a provincial level, but in the majority of the cases the information for two or more provinces were lumped together. This is probably due to confidentiality issues when few mining establishments are found in a province. The implication is that the reported data were not suitable for inclusion in the SAMs because of the random aggregation of provincial data. However, the totals per mining category were available as well as the totals per province. Entropy estimation techniques (see section 9) were applied to estimate the missing information in order to obtain a set of suitable priors (by mining category and by province) that can be included in the SAM.

3.13. 2000 Budget Review

A report on the Budget Review is published annually by National Treasury. The Budget Review for 2001 (National Treasury, 2001) covers the economic policy and outlook; the fiscal policy and budget framework, revenue issues and tax proposals; asset liability management; medium term expenditure estimates; and the provincial and local government. The data on provincial government that are obtained from the section on provincial and local government in the Budget Review for 2001 are used specifically in the regional and multiregional SAMs.

Two tables in the Budget Review for 2001 supplied all the necessary information to disaggregate the provincial government account. In order to distinguish between provincial government spending and spending by consolidated government the 2000/01 revised estimates reported in Table 7.1 on the division of revenue between the spheres of government (Annexure E of the Budget Review for 2001) were used. To disaggregate the provincial expenditure between the nine provinces the 2000/01 revised estimates reported in Table 7.3 on the total transfers to provinces were used.

4. Compiling a National Accounting Matrix (NAM) for South Africa

The National Accounting Matrix (NAM) for South Africa (see Table 7) provides the control totals for each of the submatrices of the detailed national SAM for South Africa. The base year for the NAM is 2000. The main data source that was used is the Quarterly Bulletin of December 2004 published by the South African Reserve Bank (SARB, 2004). A key figure for a SAM, which is not published by SARB, is gross output by activities. The annual production accounts in Table 12 of Statistical Release P0441 published by Statistics South Africa (SSA, 2004) provided an estimate of gross output at basic prices.

A few issues need to be highlighted:

- The residual in the national accounts published by SARB (6011J) was absorbed as savings by enterprises in order to derive a balanced NAM.
- The tax accounts were disaggregated. The derivation of the detailed tax revenues for the NAM is therefore discussed in more detail in section 4.8. Different information sources were used for this purpose.
- An additional factor account for land was created.
- Only net interhousehold transfers are typically recorded in a SAM. Therefore interhousehold transfers in the NAM are zero. Interhousehold transfers are recorded in the detailed SAM as discussed in section 5.
- In the SAM framework as set out in Table 7 marketing margins are included in the commodity-by-commodity submatrix, which sums to zero in the case of a NAM. Marketing margins are however recorded in the detailed SAM as discussed in section 5.

Table 7: A NAM for South Africa for 2000 (R million)

		1	2	3	4	5	6	7	8	9	10	11	12
		Commodities	**Activities**	**Factors**			**Households**	**Enterprises**	**Government**		**Capital**		**Rest of World**
				Capital	*Labour*	*Land*			*Taxes*	*Expend*	*Investment*	*Stock changes*	
1	**Commodities**	0	1 088 770	0	0	0	580 802	0	0	167 348	139 648	7 096	257 011
2	**Activities**	1 893 686	0	0	0	0	0	0	0	0	0	0	0
	Factors												
3	*Capital*	0	374 312	0	0	0	0	0	0	0	0	0	15 190
4	*Labour*	0	442 301	0	0	0	0	0	0	0	0	0	2 242
5	*Land*	0	3 458	0	0	0	0	0	0	0	0	0	0
6	**Households**	0	0	91 667	440 299	3 216	0	112 441	0	29 687	0	0	260
7	**Enterprises**	0	0	143 455	0	173	0	139 834	0	51 747	0	0	0
	Government												
8	*Taxes*	117 232	-15 155	0	0	0	87 848	33 248	0	0	0	0	0
9	*Expenditure*	0	0	0	0	0	1 870	9 687	223 173	0	0	0	481
	Capital												
10	*Savings*	0	0	119 237	0	0	6 922	39 919	0	-20 526	0	0	1 192
11	*Stock changes*	0	0	0	0	0	0	0	0	0	7 096	0	0
12	**Rest of World**	229 757	0	35 143	4 244	69	128	80	0	6 955	0	0	27 254
13	**Totals**	**2 240 675**	**1 893 686**	**389 502**	**444 543**	**3 458**	**677 570**	**335 209**	**223 173**	**235 211**	**146 744**	**7 096**	**303 630**

Each row of the NAM is discussed separately. The rows and columns in Table 7 are numbered for the reader to identify the relevant submatrix that is referred to, e.g. household consumption in the submatrix in the first row and sixth column will be referred to as SM1:6. If more than one description appears, the first corresponds to the submatrix descriptions in Table 1 and the second to the descriptions of the totals in the SARB Quarterly Bulletin. The numbers at the end indicate the code used in the SARB Quarterly Bulletin followed by the page number.

4.1. Commodity row

SM1:1 Marketing Margins: Net margins equal zero and no control total reported, therefore derived as part of micro SAM development;

SM1:2 Intermediate consumption: Table 12, Statistical Release P0441 (Stats SA, 2004), plus value added tax (VAT) refunds (see section 4.8);

SM1:6 Final consumption expenditure by households 6007J S-112;

SM1:9 Final consumption expenditure by general government 6008J S-112;

SM1:10 Investment: Gross fixed capital formation 6009J S-112, plus the reported residual 6011J S-112;

SM1:11 Stock changes: Change in inventories 6010J S-112;

SM1:12 Exports: Exports of goods and services 6013J S-112;

4.2. Activity row

SM2:1 Supply of commodities by activities: The value of intermediate consumption: Table 12, Statistical Release P0441 (Stats SA, 2003a), plus the gross value added at basic prices 6645J S-112[6].

4.3. Factor row: Gross Operating Surplus (GOS)

SM3:2 GOS income: Net operating surplus 6001J S-112, plus consumption of fixed capital 6002J S-112, less income from land (see section 4.5);

SM3:12 GOS income from Rest of the World: Direct investment 5704J S-90, and non-direct investment 5705J S-90.

4.4. Factor row: Labour

SM4:2 Labour income: Compensation of Employees 6000J S-112;

SM4:12 Labour income from Rest of the World: Compensation of employees 5703J S-90.

[6] Note that value added tax (VAT) does not have to enter into the calculation, because the VAT refund is added to intermediate consumption, but subtracted from gross value added at basic prices. The net effect is therefore zero. However, the inclusion of VAT enables the disaggregation of VAT from other taxes in order to allow for fiscal policy analysis.

4.5. Factor row: Land

SM5:2 Income from land. Estimated as the rental value of land using an extension officer's rule of thumb of 7.5 percent of gross income (three percent of gross income per hectare times a factor of 2.5). For a more detailed discussion see sections 5.1.5 and 6.2.5.

4.6. Household row

SM6:3 Income to households from non-corporate business enterprises balances the GOS account: Net operating surplus 6001J S-112, less net operating surplus of incorporated business enterprises 6220J S-135, less GOS payments to rest of the world 5724Y + 5725Y S-90, plus GOS receipts from rest of the world 5704Y + 5705Y S-90, less income from land (see SM6:5);

SM6:4 Income to households from labour: Compensation of employees 6240J S-137;

SM6:5 Income to households from land: No control total available, assumed to be 93% of total income from land (the other 7% are assumed to accrue to enterprises SM7:5, and foreign land owners SM12:5);

SM6:6 Interhousehold transfers: Net transfers are zero in a NAM, therefore discussed as part of micro SAM development in section 5.1.6;

SM6:7 Household income from incorporated business enterprises: Income from property 6241J S-137, plus current transfers from incorporated business enterprises 6231J S-137, less income to households from non-corporate business enterprises (SM6:3);

SM6:9 Government transfers to households: Current transfers from general government 6257J S-137;

SM6:12 Remittances from rest of the world: Current transfer receipts - other sectors 6243J S-137.

4.7. Enterprise row

SM7:3 Distribution of factor income: Net operating surplus 6220J S-135, less income from land (see SM7:5);

SM7:5 Income to enterprises from land: no control totals available, assumed to be 5% of total income from land (the other 95% is assumed to accrue to domestic landowners SM6:5, and foreign land owners SM12:5);

SM7:7 Transfers to enterprises: Net income calculated as enterprise account residual;

SM7:9 Government transfers: Interest on public debt 6255J S-136.

4.8. Government taxes row

4.8.1. Control totals from SARB

SM8:1 Commodity taxes: Taxes on products 6603J S-112;

SM8:1 Commodity subsidies: Subsidies on products 6604J S-112;
SM8:2 Production (activity) taxes: Other taxes on production 6600J S-112;
SM8:2 Production (activity) subsidies: Other subsidies on production 6601J S-112;
SM8:3 Tax on GOS: None reported;
SM8:4 Tax on labour: None reported;
SM8:5 Tax on land: None reported;
SM8:6 Household tax: Current taxes on income and wealth 62451J S-137;
SM8:7 Enterprise tax: Current taxes on income and wealth 62301J S-135.

Table 8 shows the control totals for the tax accounts identified by SARB (SARB, 2004). The treatment of value added tax (VAT) causes some of these totals to change as described in the next section. The values in Table 8 should therefore be compared to values in Table 9 for a better understanding of the implications of the treatment of VAT. The household and enterprise taxes are not influenced and therefore not reported here.

Table 8: Commodity and activity tax account control totals from SARB (R million)

	Tax / Subsidy	1 Commodities	2 Activities	Total
a	Commodity taxes	87 816	0	
b	Commodity subsidies	-3 886	0	
c	Activity taxes	0	20 138	
d	Activity subsidies	0	-1 991	
	Total	83 930	18 147	102 077

4.8.2. Derived control totals for detailed tax accounts

Table 9 indicates the estimated control totals for the different commodity and activity tax accounts in the national SAM. The control total for subsidies on commodities remains unchanged and the control totals for tax on activities remain unchanged. Total commodity tax reported by SARB is divided into excise duties, import duties, value added tax on imports and value added tax on domestically produced goods. Total activity subsidies are divided into general production subsidies (the same value as reported by SARB) and a value added tax refund[7]. It should be noted that the total net tax on commodities and activities is the same in Table 8 and in Table 9. The only difference at commodity and activity level is that the refund is shown at the activity level and hence gross value added tax is shown at the commodity level. Table 8 only reports net value added tax at the commodity level.

[7] The value of the VAT refund is added to intermediate consumption as reported by Statistics South Africa. See section 3.2.

Table 9: Derived tax account control totals (R million)

	Tax / Subsidy	1 Commodities	2 Activities	Total
a1	Import duties	8 336	0	
a2	Value added tax on imports	29 036	0	
a3	Value added tax domestic	59 166	0	
a4	Excise duties	24 580	0	
b	Subsidy on products	-3 886	0	
c1	Production tax	0	20 138	
c2	Value added tax refund	0	-33 302	
d	Subsidy on production	0	-1 991	
	Total	117 232	-15 155	102 077

The control totals for import duties, net value added tax and excise duties were taken from the table on National Government Finance (SARB, 2004). The sum of these three values represented 96 per cent of the commodity tax reported in the table on National Income and Production accounts for South Africa (SARB, 2004). The figures were scaled to add up to the reported commodity tax. The scaled values were included in the NAM. The reported and scaled values are presented in Table 10.

Table 10: Reported and derived detailed tax account control totals (R million)

	Tax / Subsidy	Reported	Scaled
a1	Import duties	8 067	8 336
a2	Value added tax on imports	28 100	29 036
a3	Value added tax domestic	57 258	59 166
a4	Excise duties	23 788	24 580
c2	Value added tax refund	-33 302	-33 302
a	Total	83 912	87 816

The control total for import duties is derived from the reported value for total taxes on international trade and transaction 4592M on page S-55 of the SARB Quarterly Bulletin. The control total for the various taxes were computed as follows:

- Excise duties (R23 788 million) equal the sum of the fuel levy 4579M, plus other excise duties 4580M on page S-54.
- The control total for *net* VAT (both on domestic production and imports) (R52 057 million) was taken from the page S-54, i.e. VAT 4578M. Although the SARB bulletin indicates on page S-54 VAT as falling in the category of "Domestic taxes on goods and services", the detailed VAT data obtained from SARS indicate that this is the net figure on both imports and domestic production, since there is no reference to VAT under the category "Taxes on international trade and transactions", and no explicit recording of VAT refunds to producers. The figure reported by SARB roughly corresponds to the net VAT figure obtained from SARS.

- The control totals for VAT on domestically produced goods and the VAT refund were taken as reported by SARS in the detailed data obtained from them.
- The control total for VAT on imports was calculated as the residual. Although data on VAT on imports are available, these exclude VAT on imported services, hence the detailed data provides an underestimate of the total VAT on imports.

4.9. General government row

SM9:6 Transfers from households: Current transfers receivable from households 6252J S-136;

SM9:7 Transfers from enterprises: Income from property 6250J S-136, plus current transfers receivable from incorporated business enterprises 6232J S-136;

SM9:8 Transfer from tax accounts to general government: taxes on production 6603J S-136, plus other taxes on production 6600J S-136, less subsidies on products 6604J S-136, less subsidies on production 6601J S-136, plus current taxes on income and wealth 6251J S-136;

SM9:12 Transfers from rest of the world 6253J S-136;

SM9:13 Total government income: Current income 6254J S-136, less subsidies 6005J S-136.

4.10. Capital row: Savings

SM10:3 GOS savings: Consumption of fixed capital 6002J S-132;

SM10:6 Household savings: Savings by households 6200J S-132;

SM10:7 Savings by enterprises: Corporate savings 6201J S-132, plus residual 6011J S-112;

SM10:9 Government savings: Saving of general government 6202J S-132;

SM10:12 Capital account balance: Foreign investment 6206J S-132;

SM10:13 Total savings: Gross capital formation 6180J S-132 plus residual 6011J S-112.

4.11. Capital row: Stock changes

SM11:10 Stock changes: Change in inventories 6010J S-112.

4.12. Rest of the World row

SM12:1 Imports: Imports of goods and services 6014J S-112;

SM12:3 Factor payments to rest of world: Direct investment income 5724Y, plus non-direct investment income 5725Y S-90, less income from land (see SM12:5);

SM12:4 Factor payments to rest of world: Income payments - compensation of employment 5723Y S-90;

SM12:5 Factor payments to rest of world: Income from land. No control totals available, assumed to be 2% of total income from land (the other 98% is assumed to accrue to domestic landowners SM6:5 and enterprises SM7:5);

SM12:6 Household remittances: Transfers to the rest of the world 6248J S-137;

SM12:7 Enterprise payments to rest of the world: Current transfers to the rest of the world 6233J S-135;

SM12:9 Government transfers to the rest of the world: Current transfer payments - central government 5727Y S-90;

SM12:12 Current account balance: Merchandise exports 5000J S-86, plus net gold exports 5001J S-86, plus service receipts 5002J S-86, less merchandise imports 5003J S-86, less payments for services 5004J S-86.

5. Compiling a prior (unbalanced) detailed SAM for South Africa

A prior micro SAM refers to a SAM that is compiled from different, usually inconsistent, data sources that leads to a SAM for which the row and column totals usually do not equate. The process of deriving the prior SAM is discussed here, while the estimation of the missing data to derive a complete and consistent SAM is discussed in section 9.

5.1. The Best Estimate Programme

The best estimate or prior SAM is an unbalanced SAM that contains data from different sources that have not been reconciled. The best estimate SAM is the prior used in the entropy estimation programme that is used to estimate missing information in order to derive a SAM with equal row and column totals. Data for each of the submatrices are derived from various data sources and organized according to the accounts included in the SAM. The data by submatrix and any other data, such as control totals, are then included in an Excel workbook. A program in GAMS is used to organize the data in SAM format. The program developed for the national SAM furthermore ensures that the total of each of the submatrices of the SAM is consistent with that of the NAM. This feature facilitates the estimation process and allows for a first check on accuracy in the GAMS code. It also implies that the original data that are read in to GAMS provide the coefficients, shares or structural information, which are then multiplied with the control totals from the NAM. There is an amount of subjectivity in the way in which the shares are calculated, i.e. column coefficients vs. income (row) shares. The methods of calculation are therefore discussed here in more detail.

In SAM development, data are used mainly for one of two purposes: either to provide a control total for an account or submatrix, or to provide structural information or coefficients, which can be multiplied by a control total, thereby deriving values, the total of which will be consistent with the mentioned control total. As discussed in section 4, the control totals for each of the submatrices of the national SAM are provided by the NAM in Table 7. Structural information can include row or column coefficients, where row coefficients will sum to one

when summing across the row and columns coefficients will sum to one when summing down the column.

Note the following conventions with regard to the equations: **SAM** represents the prior SAM, **val** represents the value of whatever data is used, and **NAM** represents the NAM as discussed in section 4. With regard to subscripts, the first letter represents the row accounts and the second letter the column accounts. Therefore $\mathbf{val_{c,a}}$ indicates the values for intermediate input use as found in submatrix 1:2, where commodities (c) are purchased by activities (a). The subscripts for the NAM, which refer to scalars, are in upper case. The subscripts used for the accounts in the detailed SAM are in lower case and these refer to vectors. The accounts, followed by NAM and SAM subscripts respectively, are the following:

- Commodities: C, c
- Activities: A, a
- Factors: F, f
- Labour: FL, fl
- Capital: FC, fc
- Land: FLD, fld
- Households: H, h

The description of how the data were handled is carried out according to the rows of the SAM and the submatrices within each row. The same convention is thus followed as for the NAM presented in Table 7 and discussed in section 4.

5.1.1. Commodity row

SM1:1 *Marketing margins*. The 2000 supply table reports total margins per commodity, with the balancing items (negative entries) recorded for trade (C85) and transport (C87) respectively. This implies that the sum of margins for all commodities sum to zero. The ratio between the two balancing items is used to split trade and transport margins for all other commodities, hence the relative contribution of trade and transport margins respectively to total margins for each commodity will be the same. The margins paid on various commodities, i.e. the positive entries in the supply table, are distinct from the margins received by C85 and C87 (negative entries). Hence for purposes of the detailed SAM two additional accounts are created to capture the transactions on trade and transport margins. The margin row accounts capture the positive margin entries in the supply table, while the margin column accounts capture the negative entries. The negative entries are transposed hence the values enter as positive entries into the SAM. Because of benchmarking the total value of supply at basic price (domestic supply plus imports) included in

the NAM is different to that in the 2000 supply table. The total value of margins in the supply table is scaled to reflect the increase in supply at basic prices as a result of benchmarking. The proportion of total margins relative to supply at basic prices therefore remains the same as what it was in the 2000 supply table.

SM1:2 *Intermediate consumption.* Intermediate input coefficients are derived from the use table by expressing each value in the intermediate input use section of the use table as a percentage of the sum of these values. These shares are then multiplied with the control total from the NAM.

$$SAM_{c,a} = val_{c,a} \Big/ \sum_{c,a} val_{c,a} * NAM_{C,A}$$

SM1:6 *Final consumption expenditure by households.* Coefficients are derived from the consumption expenditure data reported in the IES 2000. These shares are then multiplied with the control total from the NAM.

$$SAM_{c,h} = val_{c,h} \Big/ \sum_{c,h} val_{c,h} * NAM_{C,H}$$

SM1:9 *Final consumption expenditure by general government.* All government consumption demand is recorded as consumption of the commodity 'government services'. Consumption of government services by government is therefore equal to the NAM total for this submatrix.

SM1:10 *Investment*. The control total is taken from the relevant submatrix of the NAM. The coefficients are derived from the use table for 2000, the data indicated as F5 Fixed Capital Formation.

$$SAM_{c,INVESTMENT} = val_{c} \Big/ \sum_{c} val_{c} * NAM_{C,INVESTMENT}$$

SM1:11 *Stock changes*. The control total is taken from the relevant submatrix of the NAM. The coefficients are derived from the use table for 2000, the data indicated as F6 Changes in Inventories.

$$SAM_{c,STOCKCHANGES} = val_{c} \Big/ \sum_{c} val_{c} * NAM_{C,STOCKCHANGES}$$

SM1:12 *Exports of goods and services*. The control total is taken from the relevant submatrix of the NAM. The coefficients are derived from 2000 trade data for South Africa obtained from calculations based on data from SARS, Statistics South Africa and Global Insight. Refer to section 3.6 and PROVIDE Technical Paper 2004:2 (PROVIDE, 2004) for details about mapping and organising the trade data for inclusion in the SAM.

$$SAM_{c,ROW} = val_c \Big/ \sum_c val_c * NAM_{C,ROW}$$

5.1.2. Activity row

SM2:1 *Supply of commodities by activities*. The supply table provides the structural information for production of commodities by activities. The supply of domestic services is derived separately as there is no commodity for 'domestic services' in the supply table. The supply must equal demand of domestic services by households. Hence the control total is taken from the supply matrix of the NAM (SM2:1) less total demand for domestic services by households captured in SM1:5 as part of the priors that have already been calculated. In the first equation the coefficients calculated from the supply table are multiplied with the reduced NAM total. In the second equation the production of domestic services by domestic services activity is set equal to the demand for domestic services by households.

$$SAM_{a,c} = val_{a,c} \Big/ \sum_{a,c} val_{a,c} * (NAM_{A,C} - \sum_h SAM_{c(domesticservices),h})$$

$$SAM_{a(domesticservices),c(domesticservices)} = \sum_h SAM_{c(domesticservices),h}$$

5.1.3. Factor row: Gross Operating Surplus (GOS)

SM3:2 *GOS income*. The control total is taken from the relevant submatrix of the NAM. The coefficients are derived from the IES 2000.

$$SAM_{fc,a} = val_{fc,a} \Big/ \sum_a val_{fc,a} * NAM_{FC,A}$$

SM3:12 *GOS income from Rest of the World*. The value is taken from the relevant submatrix of the NAM.

5.1.4. Factor row: Labour

SM4:2 *Labour income*. The coefficients are derived from the data contained in the 2000 Labour Force Survey (SSA, 2001l) and the 2000 Income and Expenditure Survey (SSA, 2002a). For a detailed description of the surveys, the treatment of the data and principles upon which the 88 labour groups were derived, see PROVIDE Technical Papers 2005:1 and 2005:2 (PROVIDE 2005a and 2005b). The control total is taken from the relevant submatrix of the NAM. The payments to labour by households, which are recorded as part of household consumption in the IES 2000, are included in this submatrix (see section 5.2.1).

$$SAM_{fl,a} = val_{fl,a} \Big/ \sum_{fl,a} val_{fl,a} * NAM_{FL,A}$$

SM4:12 *Labour income from Rest of the World*. The control total is taken from the relevant submatrix of the NAM. To the knowledge of the author no information is available from which coefficients can be derived. Each labour category therefore is assumed to receive an equal proportion of the total labour income from abroad.

$$SAM_{fl,ROW} = NAM_{FL,ROW} / n$$

where *n* is the number labour accounts that record domestic labour income. Hence if no labour income is recorded in SM4:2 for a specific labour account, that account will remain a zero account.

5.1.5. Factor row: Land

SM5:2 *Income from land*. The gross income and hectares per agricultural region are available to estimate the gross income per hectare. The 1993 Census of Agriculture was used to provide structural information by agricultural activity, while the 2002 Agricultural Census was used to provide control totals per province. The rental value of land per hectare was then estimated using an extension officer's rule of thumb of 7.5 percent of gross income per hectare (three percent of gross income per hectare times a factor of 2.5). The rental value per hectare per region was multiplied by the number of hectares per region to obtain the total rental value per region for 2002. These values were deflated to reach values for 2000, which were used in the agricultural version of the SAM. These values were summed across all regions to get an estimate of total factor income from land that was used in the NAM as presented in SM5:2 in Table 7.

5.1.6. Household row

SM6:3 *Income to households from non-incorporated business enterprises*. The control total is taken from the relevant submatrix of the NAM. The shares are derived from GOS income reported in the Household Income and Expenditure Survey (IES 2000).

$$SAM_{h,FC} = val_{h,FC} \Big/ \sum_{h} val_{h,FC} * NAM_{H,FC}$$

SM6:4 *Income to households from labour*. The control total is taken from the relevant submatrix of the NAM. The shares of labour income earned by each household are derived from labour income reported in the IES 2000. These shares are multiplied by the control total from the NAM to derive labour income to each household.

$$SAM_{h,FL} = val_{h,FL} \Big/ \sum_{h} val_{h,FL} * (NAM_{H,FL})$$

Then the shares of payments to each household from particular labour categories are determined, based on information derived from the Labour Force Survey. See PROVIDE Technical Papers 2005:1 and 2005:2 (PROVIDE 2005a and 2005b) for details on the handling of the survey data and forming of representative household groups.

$$SAM_{h,fl} = val_{h,fl} \Big/ \sum_{fl} val_{h,fl} * SAM_{h,FL}$$

SM6:5 *Income to households from land*. The control total is taken from the relevant submatrix of the NAM. The distribution across provinces was derived from each province's share in the rental value of land. For lack of more accurate data the share of income accruing to each household within a province was assumed proportionate to the share of each household in GOS income.

$$SAM_{h,FLD} = val_{h,FLD} \Big/ \sum_{h} val_{h,FLD} * NAM_{H,FLD}$$

SM6:6 *Interhousehold transfers*. No control total is available from the NAM. A control total was derived by using the share of total household expenditure for all households paid in the form of transfers, multiplied by the NAM total for total household expenditure. Data on interhousehold transfers in the IES 2000 are problematic for two reasons: a) the national-level transfer payments by households are not equal to the national-level transfer receipts reported by households, and b) there are no information that can be used to map incomes and receipts between different representative households. The information collected from the IES 2000 provides the row and column totals of the interhousehold transfers sub-matrix (matrix T). Cell t_{ij} of matrix T is calculated as

$$t_{ij} = \frac{\sum_j t_{ij} . \sum_i t_{ij}}{\sum_i \sum_j t_{ij}}$$

where *i* and *j* denote the rows and columns respectively. It can be verified that summing the above expression over *j* gives the vector of column (expenditure) totals, while summing over *i* gives the vector of row (income) totals. The sum of all the cells is of course the total value of transfer incomes or payments. The next step is to calculate the net receipts of each household group. This can be done by subtracting from matrix T its transpose, thus giving a symmetrical matrix $T^s = T - T'$ for which $t_{ij} = -t_{ij}$. All diagonal entries of the net transfers matrix are zero (t_{ij} = 0 for all $i = j$). The final interhousehold transfer matrix is created by keeping all positive entries and setting all negative entries equal to zero. See PROVIDE Technical Paper 2005:1 (PROVIDE 2005) for a more detailed

description. The total of the interhousehold transfers submatrix in the micro SAM was derived by calculating household transfer expenditure reported in the IES2000 as a share of total household expenditure reported in the IES2000 and multiplying this share by the total household expenditure in the NAM. The coefficients of the interhousehold transfers matrix were then multiplied with this estimated submatrix total.

SM6:7 *Household income from incorporated business enterprises*. The control total is taken from the relevant submatrix of the NAM. The shares are derived from enterprise income reported in the IES 2000.

$$SAM_{h,ENTERPRISE} = val_{h,ENTERPRISE} \Big/ \sum_{h} val_{h,ENTERPRISE} * NAM_{H,ENTERPRISE}$$

SM6:9 *Government transfers to households*. The control total is taken from the relevant submatrix of the NAM. The shares are derived from government transfers reported in the IES 2000.

$$SAM_{h,GOVERNMENT} = val_{h,GOVERNMENT} \Big/ \sum_{h} val_{h,GOVERNMENT} * NAM_{H,GOVERNMENT}$$

SM6:12 *Remittances from rest of the world*. The control total is taken from the relevant submatrix of the NAM. Structural information from total income by household as derived from information contained in the IES 2000 (not explicitly reported). The distribution of foreign transfer receipts is weighted according to each household's share of total (national) transfer receipts, i.e. foreign transfers follow the same distribution pattern as domestic transfers.

$$SAM_{h,ROW} = val_{h} \Big/ \sum_{h} val_{h,ROW} * NAM_{H,ROW}$$

5.1.7. Enterprise row

SM7:3 *Distribution of factor (GOS) income*. The value is taken from the relevant submatrix of the NAM.

SM7:5 *Distribution of factor (land) income*. The value is taken from the relevant submatrix of the NAM.

SM7:7 *Transfers to enterprises*. The value is taken from the relevant submatrix of the NAM.

SM7:9 *Government transfers*. The value is taken from the relevant submatrix of the NAM.

5.1.8. Government taxes row

SM8:1 *Commodity taxes*. Taxes on products are divided into import duties, VAT and excise duties. The control total for each tax account is taken from the relevant

submatrix of the NAM. The shares of import duties paid on each commodity are based on the shares derived from duties collected data from SARS. The duties include custom's duties, surcharges and *ad valorem* duties.

$$SAM_{DUTIES,c} = val_c \Big/ \sum_c val_{DUTIES,c} * NAM_{DUTIES,C}$$

The shares of VAT payments on each commodity are based on VAT data by commodity. VAT payment data are recorded at the industry. Data at the commodity level are estimates based on industry level data. (See section 3.9.)

$$SAM_{VAT,c} = val_c \Big/ \sum_c val_{VAT,c} * NAM_{VAT,C}$$

The shares of excise duties paid on each commodity are based on data from SARS on the fuel levy, duties on alcohol and tobacco and estimates of the *ad valorem* excise duties.

$$SAM_{EXCISE,c} = val_c \Big/ \sum_c val_{EXCISE,c} * NAM_{EXCISE,C}$$

SM8:1 *Commodity subsidies*. The control total is taken from the relevant submatrix of the NAM. The shares of subsidies on a commodity are based on the shares of net taxes paid by each industry as derived from data indicated as "V3 - Taxes Less Subsidies on Products" in the use table for 2000.

$$SAM_{SUBSIDY,c} = val_c \Big/ \sum_c val_{NETTAX,c} * NAM_{SUBSIDY,C}$$

SM8:2 *Production (activity) taxes and subsidies*. The control totals are taken from the relevant submatrices of the NAM. Net production taxes per SAM activity are available from the use table (SSA, 2003). The use table was compiled prior to the benchmarking process in 2004. No activity level taxes and subsidies were reported, only net tax. Updated tax figures were released for 10 economic sectors after completion of the benchmarking process (SSA, 2004a). Production taxes, subsidies (and therefore net taxes) became available per sector. The net taxes per sector were however different from the net taxes per sector as derived from the detailed 2000 use table. The proportionate net taxes per activity within a sector from the use table were used to split the sectoral values from the benchmarked data into activity level data. Estimation procedures (see section 9) were used to derive priors for activity level taxes and subsidies. The aim was to estimate all activity taxes and subsidies given the tax and subsidy constraints per sector as well as the proportionate net tax by activity within each sector. Aggregations to the ten-sector level were used to impose "macro" constraints on the activity data to be

estimated. Net taxes from the use table were introduced as a prior, but with the sign reversed. This allowed imposing a constraint that all column totals of activities must be zero, while the row totals of the tax-by-activity submatrix were set to be exactly the totals of taxes, subsidies and net tax respectively. Production tax and subsidy shares were derived from the set of data estimated with entropy estimation techniques. These shares were multiplied with the NAM control totals to derive the values for the detailed SAM.

$$SAM_{TAX,a} = val_a \Big/ \sum_a val_{NETTAX,a} * NAM_{TAX,A}$$

$$SAM_{SUBSIDY,a} = val_a \Big/ \sum_a val_{NETTAX,a} * NAM_{SUBSIDY,A}$$

SM8:2 *Production (activity) VAT refund*. For value added tax (VAT) refunds the share of VAT refunds received by each industry are based on the VAT data by industry reported by SARS. See section 3.9.

$$SAM_{VATREFUND,a} = val_a \Big/ \sum_a val_{VATREFUND,a} * NAM_{VATREFUND,A}$$

SM8:3 *Tax on GOS*. None reported.

SM8:4 *Tax on labour*. None reported.

SM8:5 *Tax on land*. None reported.

SM8:6 *Household income tax*. The control total is taken from the relevant submatrix of the NAM. Structural information for household income tax are based on direct taxes as reported in the IES 2000.

$$SAM_{GOVERNMENT,h} = val_h \Big/ \sum_h val_{GOVERNMENT,h} * NAM_{GOVERNMENT,H}$$

SM8:7 *Enterprise tax*. The value is taken from the relevant submatrix of the NAM.

5.1.9. General government row

SM9:6 *Transfers from households*. The control total is taken from the relevant submatrix of the NAM. To the knowledge of the authors no information are available from which coefficients can be derived. It was assumed that each household transfers an equal share.

SM9:7 *Transfers from enterprises*. The value is taken from the relevant submatrix of the NAM.

SM9:8 *Transfer from tax accounts to general government account*. The sum total of government tax income is calculated in the government tax row.

SM9:12 *Transfers from rest of the world*. The value is taken from the relevant submatrix of the NAM.

5.1.10. Capital row: Savings

SM10:3 *GOS savings*. The value is taken from the relevant submatrix of the NAM.

SM10:6 *Household savings*. The value is taken from the relevant submatrix of the NAM.

SM10:7 *Savings by enterprises*. The value is taken from the relevant submatrix of the NAM.

SM10:9 *Government savings*. The value is taken from the relevant submatrix of the NAM.

SM10:12 *Capital account balance*. The value is taken from the relevant submatrix of the NAM.

5.1.11. Capital row: Stock changes

SM11:10 *Stock changes*. The value is taken from the relevant submatrix of the NAM.

5.1.12. Rest of the World row

SM12:1 *Imports*. The control total is taken from the relevant submatrix of the NAM. The coefficients are derived from 2000 trade data for South Africa obtained from SARS. Refer to section 3.6 and PROVIDE Technical Paper 2004:2 (PROVIDE 2004) for details about mapping and organising the trade data for inclusion in the SAM.

$$SAM_{ROW,c} = val_c \Big/ \sum_c val_c * NAM_{ROW,C}$$

SM12:3 *Factor (GOS) payments to rest of world*. The value is taken from the relevant submatrix of the NAM.

SM12:4 *Factor (Labour) payments to rest of world*. The control total is taken from the relevant submatrix of the NAM. To the knowledge of the authors no information are available from which shares can be derived. It was assumed that each non-zero factor account receives an equal share.

$$SAM_{ROW,fl} = NAM_{ROW,FL} \big/ n$$

where *n* is the number labour accounts that record domestic labour income. Hence if no labour income is recorded for a specific labour account, payment from that account will also remain zero.

SM12:4 *Factor (land) payments to rest of world*. The value is taken from the relevant submatrix of the NAM.

SM12:6 *Household remittances*. The control total is taken from the relevant submatrix of the NAM. Structural information from total income by household as reported in the IES 2000. The distribution of foreign transfer payments is weighted according to each household's share of total (national) transfer payments, i.e. foreign transfers follow the same distribution pattern as domestic transfers.

$$SAM_{ROW,h} = val_h \Big/ \sum_h val_{ROW,h} * NAM_{ROW,H}$$

SM12:7 *Enterprise payments to rest of the world*. The value is taken from the relevant submatrix of the NAM.

SM12:9 *Government transfers to the rest of the world*. The value is taken from the relevant submatrix of the NAM.

SM12:12 *Current account balance*. The value is taken from the relevant submatrix of the NAM.

5.2. Deviations from commodity and activity accounts in published supply and use tables

Although the commodity and activity accounts reported in Statistics South Africa's supply and use tables were followed as closely as possible, it was deemed appropriate to deviate from their account structure in three cases.

- One additional account to record transactions by domestic services was created for both commodities and activities in order to allow for suitable treatment of domestic services from a modelling perspective.
- Crude oil was disaggregated from "other mining products" in the commodity accounts.
- The single agricultural commodity account was disaggregated into 20 different agricultural commodities, while the single agricultural activity account was disaggregated into seventy agricultural activities representing agricultural production in the nine provinces.

5.2.1. Treatment of domestic services

Payments to domestic services are recorded in the household surveys as direct payments by households to labour. Table 11 illustrates a 100 unit payment by households to factors.

Table 11: Factor payments by households

	Commodities	Activities	Factors	Households	Other	Total
Commodities						0
Activities						0
Factors				100		100
Households						0
Other						0
Total	0	0	0	100	0	

In order to treat the "selling" of domestic services to a household in a manner consistent with the treatment of other factors, the data in the SAM were rearranged. Two additional accounts were included in the SAM, a domestic services commodity and a domestic services activity for domestic services. The data was then rearranged as shown in Table 12. It is illustrated that the net effect of the incomes and expenditures for the accounts are the same as in Table 11. The domestic services activity is the only producer of the domestic services commodity. Furthermore, the only input used by this activity is labour.

Table 12: Factor payments by activities

	Commodities	Activities	Factors	Households	Other	Total
Commodities				100		100
Activities	100					100
Factors		100				100
Households						0
Other						0
Total	100	100	0	100	0	

Domestic services are not recorded explicitly in the supply and use tables compiled by Statistics South Africa. Throughout the best estimate programme to compile the micro SAM the domestic services accounts are treated separately from other labour accounts.

5.2.2. Disaggregation of crude oil

The PROVIDE SAM originally did not include specific accounting for crude oil. Following the SU-table commodity and activity categories (SSA, 2003), crude oil is included in the "other mining" category. However, this category also includes many other economically important but very different commodities, including iron ore, diamonds and mining of chemical substances. A study on price changes in crude oil motivated the separation of crude oil from the aggregate "other mining" category.

It was found that there exists a serious inconsistency between the SU-tables and other available information about the petroleum industry, namely that the use of petroleum is significantly understated. This section documents the procedure that was used to disaggregate the other mining commodity and adjust the data to address the inconsistency.

For most commodities in the SU-tables, it would be very difficult to make custom disaggregations unless additional supply and use data can be sourced for the proposed sub-commodities. However, in the case of crude oil virtually all of the imported crude oil is used solely by the petroleum refiners. Data from South African Revenue Service (SARS) on taxes indicate that there are no import taxes or any other taxes on crude oil before it reaches the refineries. It therefore stands to reason that the value of imported crude oil should equal the difference between the total use of crude oil by the petroleum activity and domestic production of crude oil. Since trade data are available from customs data supplied by SARS at a more disaggregated level, we can identify the portion of the aggregate commodity imports that relate to crude oil: 75% or R24.2bn[8]. South Africa does not export crude oil. However,

[8] There is some doubt as to the reliability of this figure (i.e. the Rand value of crude oil imports). Alternative figures we have been able to source include (Department of Minerals and Energy, 2000), which gives R12.8bn and the Department of Trade and Industry (DTI)'s online trade database, which reports the same figure as the SARS data and therefore probably derives from the same source. An attempt to derive our own estimates, using average annual international oil prices (Dubai benchmark) and import volumes from (South African Petroleum Industry Association, 2003), average annual exchange rates from the Reserve Bank and allowing an additional

the entire use of "other mining" (which *includes* crude oil) by the petroleum activity in the use table for 2000 is only R10.9bn (SSA, 2003). This is far too low and constitutes a serious discrepancy, therefore the relevant parts of the SU-tables are adjusted using the following assumptions:

- Trade. The value of crude oil imports is set to 75% of the original "other mining" category, which equates to R23.4bn, and the remainder of the "other mining" commodity (now called "other other mining") is set to account for the remainder of the original total for the aggregate. Exports are left unchanged, since there are no crude oil exports.

- Domestic crude oil production. While 2000 represents one of the early years for South African crude production, it was nevertheless well-established, with production at 689 thousand metric tons, or 3.5% of total crude oil used (South African Petroleum Industry Association, 2003). It is assumed that local crude oil has the same price as imported oil, giving a value of R850m. In actual fact, specific prices do depend on product grades, but actual differences are likely to be small. Domestic crude oil is produced by the *original* "other mining" activity; there is no crude oil activity[9].

- Taxes and margins. There are no product taxes on crude oil imports or production, hence the values for the original category are assumed to apply to the non-oil portion of the original category. Trade and transport margins are disaggregated using the same proportions as the column totals excluding margins for the two new commodities.

- Crude oil use. The entire supply of crude oil – the commodity's column total – is used by the petroleum industry. The resultant SAM therefore has only one user of crude oil, which becomes an important consideration in analysis.

- Other inputs to the petroleum industry. As mentioned, petroleum is produced from sources other than oil, including coal and gas. The values of these inputs are unknown, and crude oil cannot be subtracted from the original use of "other mining" to derive the sum of these, since crude oil use is now in fact much larger than the original "other mining" use. The best available information relates to the proportions of *output products* from different sources, actually the six different refinery complexes (See Table 13). The SASOL facilities produce oil from coal,

10% for overseas transport and insurance costs, gives a figure of R27.9bn. We opted to use the original SARS figure (i.e. R24.2bn) as the most reasonable at this stage.

9 Introducing a meaningful crude oil activity is not possible because we do not have data on the factor and intermediates inputs use by the crude oil producers.

the PetroSA facility produces oil from gas and the remainder are conventional crude refineries. The (strong) assumption is made that the *values of primary inputs* to these facilities are proportional to the *volumes of primary outputs*. Therefore coal and gas usage is set in order that coal represents 22.5% of primary inputs (i.e. R7.99bn) and gas 6.8%. As gas is still included in the "other other mining" category, an additional allowance is added for the non-gas inputs in this category to arrive at a total of R4.32bn for use of "other other mining" by the petroleum activity.

Table 13: Sources of Petroleum Products in South Africa

Facility	Output (bbl equiv / day)
Sapref (Durban)	180 000 (27.0%)
Enref (Durban)	115 000 (15.8%)
Calref (Cape Town)	100 000 (15.0%)
Natref (Sasolburg)	86 000 (12.9%)
Sasol II & III (Secunda)	150 000 (22.5%)
PetroSA (Mossel Bay)	45 000 (6.8%)

Source: South African Petroleum Industry Association, 2002 (2000 figures)

Using the SU-tables as a basis, the adjusted SU-tables and disaggregated crude oil commodity account was incorporated into the best estimate SAM. Finally, a new balanced SAM was estimated using estimation techniques (see section 9). In the process of making the mentioned adjustments, some fairly large *additional* (see below) imbalances are introduced into the best estimate SAM. Consistent with the information theoretic basis of the estimation techniques, the estimation process is allowed to resolve these (and existing) imbalances. This effectively means that the following apply.

a) Prior information needed to resolve these imbalances manually is not available. For example, the adjustments cause considerable expansion in primary input use by the petroleum industry, without a corresponding increase in receipts. This could be resolved by assuming that i) there is a corresponding increase in the output of the activity or ii) there is a corresponding decrease in non-primary inputs or iii) a combination of these[10]. The imposition of arbitrary facts is avoided by refraining to make such an adjustment.

b) There is allowance for errors in the adjustments.

[10] The other major unresolved imbalance flowing from the adjustment procedure is on "other other mining", where imports are lower than the original "other mining" category by a larger amount than the use of it has decreased. Put differently, there is still a large amount of exports (which includes *inter alia* diamonds and iron ore), for which production is inadequately accounted for.

It is believed that the adjustments for crude oil results in a SAM that arguably represents an improvement upon the previous version in terms of providing a more accurate reflection of the South African economy.

5.2.3. Disaggregation of agriculture, forestry and fishing

In order to obtain more detail on agriculture the single agricultural commodity and activity accounts are further disaggregated. The GDP data as well as the supply and use tables that are published by Statistics South Africa combine forestry and fishing with agriculture. The first step towards more detail on agriculture is therefore to disaggregate the single agriculture forestry and fishing activity account into three separate activity accounts, for agriculture, forestry and fishing respectively. The second step is to disaggregate the agricultural account. The disaggregation of the forestry and fishing activity accounts are discussed in this section, while the further disaggregation of the agricultural account is discussed in greater detail in the next section because it is one of the focus areas of the PROVIDE Project. The disaggregation of the agricultural accounts uses the single commodity and activity accounts for agriculture hereto estimated as control totals. Coefficients or share information to distribute the values amongst the agricultural commodities or activities are derived from the detailed data obtained from the census data for agriculture.

The remainder of this section describes the disaggregation of the single activity account into three separate accounts for agriculture, forestry and fishing respectively.

SM1:2 *Intermediate consumption:* The distributions of intermediate consumption across the three subcategories agriculture, forestry and fishing were based on the share of each in value added at basic prices as reported in Table 8 of report P0441 (SSA, 2004a).

SM2:1 *Supply:* The distributions of supply across the three subcategories agriculture, forestry and fishing were based on the share of each in value added at basic prices as reported in Table 8 of report P0441 (SSA, 2004a).

SM3:2 *GOS income:* The distribution of GOS income across the three subcategories agriculture, forestry and fishing was based on the share of each in value added at basic prices as reported in Table 8 of report P0441 (SSA, 2004a).

SM4:2 *Labour income:* Data on labour payments were obtained from the IES/LFS merged data set for 2000 since it contains agriculture, forestry and fishing as three separate activities.

SM5:2 *Income from land:* All income from land as production factor accrues to agriculture.

SM8:2 *Production taxes:* The distribution of production tax across the three subcategories agriculture, forestry and fishing was based on the share of each in value added at basic prices as reported in Table 8 of report P0441 (SSA, 2004a).The same distribution was used for production subsidies and VAT refunds.

6. Compiling a prior agricultural SAM for South Africa

6.1. Agricultural accounts

The disaggregation of the agricultural accounts takes place after the completion of the national SAM with a single agricultural commodity and activity account. The agricultural commodity account is disaggregated into twenty agricultural commodity accounts and the agricultural activity account into 70 agricultural activity accounts. The categories for both the commodity and the activities are selected based on information available in the 1993 and 2002 Agricultural Censuses. The commodity and activity accounts are listed in Table 16 and Table 17 in the appendix. The agricultural activity accounts represent agronomic regions that produce a combination of agricultural commodities and can therefore be viewed as multiproduct firms. The agricultural regions for purposes of the SAM are consistent with statistical regions for which there are data available in the Agricultural Census of 1993. The magisterial districts within each of the statistical regions are listed in

Table 28 in the appendix. Keeping the most detailed number of agricultural activities in the SAM allows flexibility in the choice of regions for case studies, because it is likely that aggregations will be used during modelling. The mapping between the statistical regions and the agricultural activities for a suggested aggregation containing 25 agricultural activities is listed in Table 29 in the appendix. Full disaggregation was however retained in the national SAM.

6.2. Disaggregation by submatrix

As mentioned in section 5.2.3 the values for agriculture in the RSA SAM with the single agricultural commodity and activity accounts supplied the control total for the disaggregated agricultural accounts. The detailed agricultural data and the computation of the share information are discussed in more detail in this section. The description of how the data were handled is carried out according to the rows of the SAM and the submatrices within each row. The same convention is thus followed as for the NAM presented in Table 7 and discussed in

section 4. Note that only the submatrices affected by the disaggregation are discussed here. This includes the commodity and activity rows and columns.

6.2.1. Commodity row

SM1:1 *Marketing margins*: No detailed information were available therefore the respective trade and transport margins were distributed across the agricultural commodities based on each commodity's share of total supply (SM2:1) as obtained from the Agricultural Census data.

SM1:2 *Intermediate consumption*: This is the only submatrix in which both activities and commodities had to be disaggregated. The disaggregation was done first for activities and then for commodities. Intermediate consumption by the 70 agricultural activities was estimated first. The 2000 use table for South Africa was used to provide information on which commodities (including a single agricultural commodity) were used as intermediate inputs by the agricultural industry. The distribution of this expenditure across the different agricultural activities was based on information on current expenditure reported in the 1993 and 2002 Census of Agriculture. See Table 30 in the appendix for the mapping of the current account expenditure items in the census to the SAM accounts. The distribution ratio indicates the share of the expenditure item allocated to each of the SAM commodities. There are three current expenditure items reported in the 2002 Census of Agriculture that were not included in the calculation of intermediate consumption, namely depreciation, licence fees and rates paid. These three items are not defined as intermediate consumption in the SAM framework.

The second stage of disaggregation was to estimate the intermediate consumption of agricultural commodities by the non-agricultural activities. The single agricultural commodity account provided the control total for intermediate use of agricultural commodities by non-agricultural activities. The agricultural commodities that are used by each of the non-agricultural activities were first identified. First estimates of the distributions of the value of intermediate use by each non-agricultural activity across the relevant agricultural commodities were based on the share of total income for that commodity. These initial estimates were then adjusted where better information existed. And the last stage of adjustment was carried out during various rounds of estimation (SAM balancing) as discussed in section 9. Results from the estimation process were used to identify peculiarities in the priors, and these were then individually addressed by adjusting the share of

intermediate consumption by each non-agricultural activity related to each agricultural commodity.

The last stage of the disaggregation was to estimate the intermediate consumption of agricultural commodities by the agricultural activities. Total expenditures on agricultural commodities by each agricultural activity were determined in the first stage of the disaggregation process for this submatrix. During this final stage the expenditures by each agricultural activity were distributed across each of the individual agricultural commodities. The ratios of distribution were based on the share of each agricultural commodity in total income.

SM1:6 *Final consumption expenditure by households:* Final consumption expenditures were derived from the Income and Expenditure Survey data for 2000 (Stats SA, 2002a). All expenditure items in the questionnaire that related to agricultural products were mapped to one of the 20 agricultural commodities. See Table 31 in the appendix for the mapping.

SM1:9 *Final consumption expenditure by general government*: Final consumption expenditure was zero for agriculture according to the use table for 2000 (Stats SA, 2004), therefore no adjustment was made.

SM1:10 *Investment*: Investment in agriculture was zero for agriculture according to the use table for 2000 (Stats SA, 2004), therefore no adjustment was made.

SM1:11 *Stock changes*: No consistent data on stock changes per commodity were available. Stock changes for winter cereals, summer cereals and oil seeds were derived from unpublished data obtained from the Bureau for Food and Agricultural Policy (BFAP, 2005). The remaining values of agricultural stock changes were distributed across livestock, animal fibres and game, which were subsequently adjusted as part of the estimation process.

SM1:12 *Exports of goods and services*: Exports of agricultural products were derived from the SARS data. SARS data are classified according to an eight digit Harmonised System (HS) code. For purposes of classifying trade data for inclusion in the SAM the data had to be mapped to Standard Industrial Classification (SIC) codes. An HS-SIC mapping was obtained from the Industrial Development Corporation (Kuhn, 1999). The mapping distinguishes between four agricultural categories, i.e. 1110 (Growing of Crops; Market Gardening; Horticulture), 1120 (Farming of Animals), 1220 (Forestry; Logging; Related Services) and 1310 (Fishing;

Operation of Fish Hatcheries and Fish Farms). In the 2000 trade data 356 HS codes relate to one of these four agricultural codes. Each of these codes was further mapped to one of the 20 agricultural commodities included in the SAM by reference to the HS code descriptions. For more details on the handling of trade data refer to PROVIDE Technical Paper 2004:2 (PROVIDE 2004).

6.2.2. Activity row

SM2:1 *Supply:* Supplies of commodities by the single agricultural activity were distributed across the 70 agricultural activities (regions) based on information obtained from the 1993 Census of Agriculture on each region's total income from each agricultural commodity. The supplies of agricultural commodities by non-agricultural activities were equally distributed across commodities for each activity, as these account for a relatively small amount of total supply. It was however assumed that forestry only produces forestry commodities and fisheries produces only fish products.

6.2.3. Factor row: Gross Operating Surplus (GOS)

SM3:2 *GOS income:* The GOS income for agriculture was distributed across all agricultural activities according to each activity's share in total income.

6.2.4. Factor row: Labour

SM4:2 *Labour income:* Income shares were used to distribute labour income across agricultural activities. The income shares were calculated from data contained in the IES 2000 and the 1993 and 2002 Agricultural Census reports. Labour incomes per labour category in the combined agricultural activity were derived from the IES 2000. Because labour categories were specified by location it was assumed that all labour incomes to labour in a specific province were generated from agricultural activities in that province. Hence estimates of labour income per province per labour category exist. Labour incomes were distributed across the agricultural activities within a province based on shares of income per race group per province as calculated from data in the 1993 Census of Agriculture. When calculating the shares no distinction per skill class was made in the priors.

6.2.5. Factor row: Land

SM5:2 *Income from land:* Income accrues to land as a production factor. Land as a production factor was included only for agricultural activities. The gross income and hectares per agricultural region were available to estimate the gross income per hectare. The 1993 Census of Agriculture was used to provide structural information by agricultural activity, while the 2002 Agricultural Census was used to provide control totals per province. The rental values of land per hectare were

then estimated using an extension officer's rule of thumb of three percent of gross income per hectare times 2.5. The rental value per hectare per region was multiplied by the number of hectares per region to obtain the total rental value per region for 2002. These values were deflated to reach values for 2000, which were used in the agricultural version of the SAM.

6.2.6. Government taxes row

SM8:1 *Commodity taxes:* Import duties on agricultural commodities and value added tax (VAT) on imported agricultural commodities are based on tariff revenue data obtained from SARS. Commodities are classified according to the Harmonised System (HS), therefore agricultural commodities were mapped to each of the agricultural commodity accounts in the SAM. For details see section 3.8. For lack of better information VAT on domestic goods is distributed across agricultural commodities based on each commodity's share of income.

SM8:1 *Commodity subsidies:* Due to lack of information subsidies are equally distributed across agricultural commodities.

SM8:2 *Production (activity) taxes:* The 1993 Agricultural Census provides information on licence fees and local authorities tax paid per agricultural region. These data were used to derive a first estimate of production taxes per agricultural activity.

SM8:2 *Production (activity) subsidies:* VAT refunds are included in this submatrix. The refunds are distributed across agricultural activities based on each activity's share in intermediate consumption. Due to lack of information subsidies are distributed equally across agricultural activities.

6.2.7. Rest of the World row

SM12:1 *Imports of goods and services*: Imports of agricultural products were derived from the SARS data. SARS data are classified according to an eight digit Harmonised System (HS) code. For purposes of the classifying trade data for inclusion in the SAM the data had to be mapped to Standard Industrial Classification (SIC) codes. An HS-SIC mapping was obtained from the Industrial Development Corporation (Kuhn, 1999). The mapping distinguishes between four agricultural categories, i.e. 1110 (Growing of Crops; Market Gardening; Horticulture), 1120 (Farming of Animals), 1220 (Forestry; Logging; Related Services) and 1310 (Fishing; Operation of Fish Hatcheries and Fish Farms). In the 2000 trade data 356 HS codes related to on e of these four agricultural codes. Each of these codes was further mapped to one of the 20 agricultural commodities included in the SAM by

reference to the HS code descriptions. For more details on the handling of trade data refer to PROVIDE Technical Paper 2004:2 (PROVIDE, 2004).

7. Compiling four prior regional SAMs for South Africa

The detailed agricultural SAM was used as starting point for the regional SAMs. Provincial information contained in the national agriculture SAM was included directly in the provincial SAMs. This includes some of the data on households, factors and agricultural activities. Where provincial data were not already available in the national agricultural SAM, the national agricultural SAM provided control totals for the disaggregation of various values into provincial/regional figures using provincial data to provide the shares for disaggregation. This method ensures that the totals of the submatrices of the prior multiregional SAM are consistent with those of the NAM and the national SAM. The main focus of the estimation process discussed in section 9 is to balance the disaggregated accounts and to estimate trade between the region and the rest of South Africa.

For the general structure of the regional SAMs refer to Table 3. For the descriptions of the submatrices refer to the SAM submatrix numbers of the NAM in Table 7. Deviations from the national SAM comprise the addition of the provincial government account and the Rest of South Africa account. The general government account in the national SAM (row and column account 9) is therefore split into the provincial government account (row and column 9a) and the consolidated government account (row and column 9b). The Rest of the World account in the national SAM (row and column 12) is split into a Rest of South Africa account (new row and column 12a) and the Rest of the World account (new row and column 12b).

7.1. Commodity row

SM1:1 *Marketing margins*. The margin supplies on market commodities are calculated at the same rate as in the national SAM. The margin demands on market commodities are balancing items (same magnitude, but opposite sign) and therefore dependent on the margin supplies.

SM1:2 *Intermediate consumption.* Intermediate input coefficients for agriculture in each province were taken directly from the national agricultural SAM (see section 6 for method of calculation). The intermediate input coefficients for the forestry and fishing activities are derived from wage shares per province in the forestry and fishing industries respectively. Wage data on forestry and fishing were obtained from the merged IES 2000 and LFS 2000:2 data. The total payments by each industry within each province were used to calculate the shares per province for each of the two industries. Provincial shares for mining were derived from the

1996 Census of Mining (SSA, 2001k). Estimation techniques (see section 9) were applied to estimate the missing information in order to obtain a set of suitable priors (by mining category and by province) that can be included in the SAM. Shares for manufacturing are based on provincial data on intermediate input use reported in the 1996 Census of Manufacturing (SSA, 2001a to 2000j). The same share per province was used for all commodities. No detailed information on a commodity level are available. For the tertiary sector the shares of value added at basic prices (Tables 29 to 35 in SSA, 2004a) were used. Data for seven main tertiary sector groups were available. The same shares were therefore applied to all tertiary activities within each of the seven groups.

SM1:6 *Final consumption expenditure by households.* Consumption expenditures were taken directly from the national SAM which records consumption per province.

SM1:9a *Final consumption expenditure by provincial government*. A distinction was made between provincial government expenditure and consolidated government expenditure by separating the provincial government expenditure from the consolidated expenditure based on the 2000/01 revised estimates reported in Table 7.1 on the division of revenue between the spheres of government (Annexure E of the Budget Review for 2001 (National Treasury, 2001)). Provincial government expenditures were then allocated to provinces based on the 2000/01 revised estimates reported in Table 7.3 on the total transfers to provinces (Annexure E of the Budget Review for 2001 (National Treasury, 2001)).

SM1:9b *Final consumption expenditure by consolidated government*. Consolidated government expenditure was separated from provincial government expenditure based on the 2000/01 revised estimates reported in Table 7.1 on the division of revenue between the spheres of government (Annexure E of the Budget Review for 2001 (National Treasury, 2001)). Consolidated government expenditure was distributed across provinces according to each province's value added as a share of total value added. Data on value added per province was obtained from Tables 29 to 35 in Statistical Release P0441 (SSA, 2004a).

SM1:10 *Investment*. For lack of more appropriate data investment was distributed across provinces based on each province's value added as a share of total value added. Data on value added per province was obtained from Tables 29 to 35 in Statistical Release P0441 (SSA, 2004a).

SM1:11 *Stock changes*. For agricultural commodities stock changes were distributed across provinces according to each province's share of provincial output for the relevant

agricultural commodity as reported in the 1993 Census of Agriculture (CSS, 1998). For all other commodities stock changes were distributed across provinces based on each province's value added as a share of total value added. Data on value added per province was obtained from Statistical Release P0441 (SSA, 2004a).

SM1:12a *Interregional exports of goods and services*. For the regional SAMs the commodity account residuals were used as a prior for net trade. Gross trade flows were derived with estimation techniques as discussed in section 9.

SM1:12b *International exports of goods and services*. SARS reports the custom's value of exports per province. The shares per provinces are derived from 2000 trade data for South Africa that includes data from SARS, Statistics South Africa and Global Insight. Refer to section 3.6 and PROVIDE Technical Paper 2004:2 (PROVIDE, 2004) for details about mapping and organising the trade data for inclusion in the SAM.

7.2. Activity row

SM2:1 *Supply of commodities by activities*. Supplies by agricultural activities were obtained directly from the national SAM. The intermediate input coefficients for the forestry and fishing activities were derived from wage shares per province in the forestry and fishing industries respectively. Wage data on forestry and fishing were obtained from the merged IES 2000 and LFS 2000:2 data. The total payments by each industry within each province were used to calculate the shares per province for each of the two industries. Provincial shares for mining were derived from the 1996 Census of Mining (SSA, 2001k). Estimation techniques (see section 9) were applied to estimate the missing information in order to obtain a set of suitable priors (by mining category and by province) that can be included in the SAM. All crude oil production takes place in the Western Cape. Shares for manufacturing were based on data from provincial data on intermediate input use reported in the 1996 Census of Manufacturing (SSA, 2001a to 2000j). The regional shares for the tertiary sector were based on value added at basic prices data for 2000 (Tables 29 to 35 in SSA, 2004a).

7.3. Factor row: Gross Operating Surplus (GOS)

SM3:2 *GOS incomes from activities*. GOS incomes for agriculture were obtained directly from the national SAM. The GOS incomes per region however had to be mapped to the new regional GOS accounts because the national SAM contains a single GOS account. GOS incomes for forestry and fishing are based on wage shares

obtained from the Labour Forces Survey (2001l). GOS incomes for other activities were derived from shares of value added at basic prices (Tables 29 to 35 in SSA, 2004a). Corrections were made in instances where there was no production activity in a particular region.

SM3:12a *GOS incomes from Rest of South Africa*. The priors for GOS incomes from the Rest of South Africa were set equal to the residual when calculating the difference in the row and column totals for the individual GOS accounts.

SM3:12b *GOS incomes from Rest of the World*. GOS incomes form the Rest of the World were assumed to be proportional to GOS income from activities per province.

7.4. Factor row: Labour

SM4:2 *Labour incomes from activities*. Labour incomes from activities were taken directly from the national SAM.

SM4:12a *Labour incomes from Rest of South Africa*. Labour incomes from the Rest of South Africa were assumed to be zero.

SM4:12b *Labour incomes from Rest of the World*. Labour incomes form the Rest of the World were taken directly from the national SAM.

7.5. Factor row: Land

SM5:2 *Incomes to land from activities*. Incomes to land were taken directly from the national SAM.

SM5:12a *Incomes to land from Rest of South Africa*. Incomes were assumed to be zero.

SM5:12b *Incomes to land from Rest of World*. Incomes were assumed to be zero.

7.6. Household row

SM6:3 *Incomes to households from non-incorporated business enterprises*. The incomes to households were obtained from the national SAM but they had to be assigned to each province's individual enterprise account.

SM6:4 *Incomes to households from labour*. Incomes to households from labour were taken directly from the national SAM.

SM6:5 *Incomes to households from land*. Incomes to households from land were taken directly from the national SAM.

SM6:6 *Interhousehold transfers*. Interhousehold transfers were obtained from the national SAM. Only intraregional transfers are recorded in this submatrix. The interregional transfers are recorded in the row and column for the Rest of South Africa (SM6:13 and SM13:6).

SM6:7 *Household incomes from incorporated business enterprises*. Household incomes from GOS were taken directly from the national SAM.

SM6:9b *Government transfers to households*. Transfers from the consolidated government account to households were taken directly from the national SAM.

SM6:12a *Household remittances from the Rest of South Africa*. Information was obtained from the interhousehold transfer matrix of the national SAM. All the interregional transfers (as opposed to intraregional transfers) in the national SAM are recorded in this submatrix.

SM6:12b *Household remittances from Rest of the World*. Remittances from the Rest of the World were taken directly from the national SAM.

7.7. Enterprise row

SM7:3 *Distribution of factor (GOS) income to enterprises*. The GOS income was split across provincial enterprise accounts in the same proportion as GOS income from activities per province.

SM7:5 *Distribution of factor (land) income to enterprises*. The values were obtained from the national SAM, which records incomes from land per province. Each provinces income from land was assigned to the relevant provincial enterprise account.

SM7:7 *Transfers to enterprises*. Transfers to enterprises were distributed across provinces according to shares of value added at basic prices per province derived from Tables 29 to 35 in Statistical Release P0441 (SSA, 2004a).

SM7:9b *Government transfers*. Transfers from the consolidated government account to enterprises were distributed across provinces according to shares of value added at basic prices per province derived from Tables 29 to 35 in Statistical Release P0441 (SSA, 2004a).

7.8. Government taxes row

SM8:1 *Commodity taxes and subsidies*. Tax and subsidy rates are calculated from the national SAM and then applied to regional level data to calculate the value of tax

for each commodity. Taxes on products are divided into import duties, VAT and excise duties.

SM8:2 *Production (activity) taxes, subsidies and VAT refunds*. The rates are calculated from the national SAM and applied to the regional data to calculate the values of the taxes, subsidies and VAT refunds.

SM8:6 *Household income tax*. Figures on household income tax were taken directly from the national SAM.

SM8:7 *Enterprise tax*. The tax rates were calculated form the national SAM and applied to the regional data to calculate the values of the tax revenue.

7.9. Provincial government row

SM9a:9b *Transfers from consolidated government to provincial government.* The transfers were set equal to provincial expenditure based on the 2000/01 revised estimates reported in Table 7.3 on the total transfers to provinces (Annexure E of the Budget Review for 2001 (National Treasury, 2001)).

7.10. Consolidated government row

SM9b:6 *Transfers from households to consolidated government*. Transfers to consolidated government were taken directly from the national SAM.

SM9b:7 *Transfers from enterprises to consolidated government*. Transfers to consolidated government were distributed across provinces according to shares of value added at basic prices per province derived from Tables 29 to 35 in Statistical Release P0441 (SSA, 2004a).

SM9b:8 *Transfer from tax accounts to consolidated government*. Transfers to consolidated government were calculated as the sum total of the government tax revenue in the government tax row.

SM9b:12b *Transfers from Rest of the World to consolidated government*. Transfers were distributed equally across provinces.

7.11. Capital row: Savings

SM10:3 *Depreciation*. For each region the depreciation was calculated as a share of total GOS income. The shares are the same as calculated from the data in the national SAM.

SM10:6 *Household savings*. Household savings were taken directly from the national SAM.

SM10:7 *Savings by enterprises*. For each region the enterprise savings were calculated as a share of total enterprise income. The shares are the same as calculated from the data in the national SAM.

SM10:9b *Government savings*. Government savings for each region were calculated as the residual of the particular region's consolidated government account.

SM10:12a *Capital account balance with Rest of South Africa*. The capital account balances for each region were calculated as the residual of the particular region's Rest of South Africa account.

SM10:12b *Capital account balance*. The capital account balances for each region were calculated as the residual of the particular region's capital account.

7.12. Capital row: Stock changes

SM11:10 *Stock changes*. Total stock changes (payment from capital account to stock changes account) were calculated by summing over the inventory changes for all the commodities.

7.13. Rest of South Africa row

SM12a:1 *Interregional imports of goods and services*. For the regional SAMs the commodity account residuals were used as a prior for net trade. Gross trade flows were derived with estimation techniques as discussed in section 9.

SM12a:3 *GOS payments to the rest of South Africa*. GOS account residuals were used as the priors for GOS payments to the rest of South Africa.

SM12a:6 *Remittances to the Rest of South Africa*. Information were obtained from the interhousehold transfer matrix of the national SAM. All the interregional transfers (as opposed to intraregional transfers) in the national SAM are recorded in this submatrix.

SM12a:7 *Enterprise payments to the Rest of South Africa*. Enterprise account residuals were used as the priors for enterprise payments to the rest of South Africa.

7.14. Rest of the World row

SM12b:1 *International imports of goods and services*. SARS reports the custom's value of imports per province. The shares per provinces are derived from 2000 trade data for South Africa that includes data from SARS, Statistics South Africa and Global Insight. Refer to section 3.6 and PROVIDE Technical Paper 2004:2 for details about mapping and organising the trade data for inclusion in the SAM.

SM12b:3 *Factor (GOS) payments to Rest of World*. GOS payments were distributed across the provincial GOS accounts according to value added share per province.

SM12b:4 *Factor (Labour) payments to Rest of World*. Factor payments were taken directly from the national SAM.

SM12b:4 *Factor (Land) payments to Rest of World*. Factor payments were taken directly from the national SAM.

SM12b:6 *Household remittances*. Household remittances were taken directly from the national SAM.

SM12b:7 *Enterprise payments to Rest of World*. Enterprise payments to Rest of World were distributed across provinces according to shares of value added at basic prices per province derived from Tables 29 to 35 in Statistical Release P0441 (SSA, 2004a).

SM12b:9 *Government transfers to the Rest of World*. Central government transfers were distributed equally between provinces.

SM12b:12b *Current account balance*. The current account balance was distributed equally between provinces.

8. Compiling a prior multiregional SAM for South Africa

In the multiregional SAM detailed accounts for each of the four regions appear. Compared to the regional SAM, there is no "Rest of South Africa" account. The interregional trade flows depict the trade between the individual regions. Regional information from the regional SAMs are retained for the commodity, activity, factor, household, provincial government and Rest of the World (international trade) accounts. The method of compilation of the priors for these accounts is discussed in section 7. The accounts for enterprises, consolidated government, capital and stock changes present national level information as derived from the national SAM (refer to sections 5 and 6). The multiregional SAM has 624 accounts as listed in Table 25 in the appendix. For the structure of the multiregional SAM refer to in Table 4.

The most important feature of the multiregional SAM is the detailed interregional trade flow accounts that indicate the trade between the different regions. To the knowledge of the authors no consistent data on interregional trade exist. The trade flows were estimated using estimation techniques, the method of which is discussed in section 9.5.

9. Estimation of balanced SAMs using Cross Entropy

As described, the process of compiling the prior SAM results in a matrix of priors for transactions values in the national SAM, but the SAM does not meet the necessary accounting constraints of a SAM, e.g. that each account must balance, that is receipts and expenditures must equal. This is a common problem in SAM database building, and a specialised field and varying techniques exists to transform the unbalanced priors into a balanced SAM that can be used for modelling. Due to the size and complexity of the problem and the nature of the available data, it was decided not to make use of either *ad hoc* adjustments to the data or a mechanical bi-proportional balancing method commonly used called RAS. Specifically, the prior data are:

- at differing levels of quality;
- at differing levels of aggregation;
- at differing orders of magnitude numerically (very large and very small transactions mixed).

Hence, it was recognised that a more flexible approach is required. One such approach, fairly novel in the field, derives from information-theoretic literature, making use of an information metric termed *entropy* to numerically estimate the best fitting SAM given the prior data and the necessary constraints. Building on existing work[11], substantial development of a method that can be applied to a large SAM such as the present one has been done by the PROVIDE project. Specifically, the method takes into account the computational complexity of the problem (which caused simpler approaches to fail to deliver a valid solution), the need for sensible data organisation (with explicit recognition of the fact that source data are at different levels of aggregation) and the need to apply the method in a way that is consistent and compatible with the underlying information theoretic principles. To implement the method, and to reduce the set-up costs associated with organising available data into a model that can be solved to deliver estimated SAMs in future a software package was developed. This contains a framework model in GAMS software for solving this type of problem, along with user friendly tools for configuration and evaluation of results. The cross entropy theory,

[11] See e.g. Golan, Judge and Robinson (1994), Golan Judge and Miller (1996) (especially chapter 6), McDonald and Robinson (1998), Robinson and El-Said (2000), Robinson, Cattaneo and El-Said (2001) and McDonald and Robinson (2004). More references are provided in PROVIDE Technical Paper 2006:2.

the method and the software components are described in detail in PROVIDE Technical Paper 2006:2 (PROVIDE, 2006), therefore only a brief non-technical description is provided here.

9.1. Theoretical overview of the Cross Entropy SAM estimation method

9.1.1. The Generalised Cross Entropy Method

Numerous methods exist to derive balanced SAM estimates from an unbalanced set of priors. In all of these, the objective is to determine a SAM that meets the necessary accounting constraints that is as close as possible to the prior data. Different methods differ because they measure the "distance" between the estimated and the prior data differently[12].

The generalised cross entropy method (GCE) (Golan, *et al.*, 1996), which forms the basis of the method we use, explicitly assumes that we are trying to estimate some data for which we have measurements, but the measurements are subject to various kinds of (unspecified) measurement error. This is in fact an accurate reflection of the reality we face, where one can think of a theoretical SAM that *accurately* reflects all of the transactions in a given economic system over a specified period of time, which one wished to estimate, but the source data that are available reflects information about this SAM imperfectly, because of sampling errors, *e.g.* in survey data, estimation errors, *e.g.* in estimated macroeconomic data, mapping errors between datasets using alternative categorisations, time-period mismatches, non-recorded (missing) transactions, and various other statistical errors. The GCE method makes use not only of a prior for each magnitude being estimated, but also for characteristics of the measurement error generating process, so as to explain the existing measurements against the estimates. The estimation process then proceeds by estimating error distributions that can explain the measured values against the estimated "actual" values, which are implicitly determined in the process. A benefit of this method is that detailed prior information regarding the measurement process can be incorporated into the estimates, allowing the database builder not only to specify the magnitude in the SAM, but also influence how these are treated by the estimation procedure. Typically, this functionality is utilised to incorporate a measure of accuracy of the prior data in the process, so that better quality data are given more weight than lower quality data[13]. The GCE method is inherently flexible, and not bound to any particular form, e.g. a SAM. Subject to the assumption of independent measurement, any number of additional priors can be added to the problem, and these can relate to other magnitudes in the system in arbitrary ways. This functionality is used to add prior information

[12] Not all methods explicitly measure the difference, but for those that do not, an equivalent method that does minimise a difference measure always exists. For example, the common RAS method's implicit difference measure has been shown to be equivalent to a specific formulation that is based on cross entropy.

[13] It is also possible to incorporate data characteristics such as error skewness and kurtosis, although we did not make use of this for the PROVIDE SAM.

about row and column totals and various "macro" aggregates, which should improve the accuracy of the estimation. The method is also flexible in allowing coherent estimations from *little* data – for example it does not require "known" account totals such as the common RAS method, which minimises the need to include "made up" data[14].

9.1.2. *Sequential disaggregation*

The primary innovation introduced during the construction is to develop a semi-formalised method of top-down SAM estimation, whereby a balanced NAM is used as a starting point, and the problem is divided into phases that each effect a degree of disaggregation. Each subsequent phase introduces additional prior data, which cannot affect any estimations from previous phases. While the top-down method is not usually regarded as ideal in the estimation of national accounting data, it was intentionally adopted for the estimation of the PROVIDE SAMs for a number of reasons:

- Gaps in the micro-level data constrain estimation of macro aggregates using a bottom-up method.
- The method provides a means to separate some prior data from others in the estimation process. This is useful because it can be used to "isolate" data believed to be of relatively low quality, and also to separate data that derives from common measurement processes, which may otherwise violate the assumption of independent measurement inherent in the cross entropy technique.
- Some of the micro-level data are of low quality, particularly so in the detailed agricultural accounts, and aggregate data are used to deliver more plausible results[15]. This fits the approach of using macro data as "control totals" and using micro data to derive structural coefficients rather than actual transaction values.
- In the cross-entropy estimation, a bottom-up, single-step approach proved computationally unfeasible for various reasons. As utilised, the top down sequential disaggregation method allows a large computational problem to be split into manageable smaller parts.
- The method delivers a SAM that is consistent with existing data at national accounting level. Though this does not necessarily constitute a model for optimal accuracy[16], it has the distinct advantage that results based on the SAMs are more comparable to other published work, and hence more acceptable generally.

[14] Still, a minimum of prior data is required to *identify* the estimated SAM to ensure a unique solution. This is taken to be a complete set of base-SAM transaction value priors.

[15] But, of course, there is no guarantee that the quality of the macro-level data is necessarily superior.

[16] Note however that the 'accuracy' of economic analyses based on SAM data depends fundamentally upon the extent to which the SAM captures economic interdependence. This is represented by the relative magnitudes of the entries in the columns of the SAM not the absolute magnitudes of transactions (see Pyatt, 1988).

Ultimately this amounts to a decision to "trust" the macro data from the South African Reserve Bank (SARB), which are used as the basis for our estimation and are also (amongst others) used by Statistics South Africa for benchmarking their own data[17]. This is not ideal, since the process by which the SARB data is estimated remains unpublished and unknown, but it is the only feasible outcome given the quality and extent of publicly available data sources, also taking into consideration available resources which precludes gathering primary data.

The sequential disaggregation approach starts by delineating the structure of a "system of SAMs", which is the basic "bottom-level" SAM that we wish to estimate along with a number of aggregations of it, and mappings between the accounts of these SAMs. This data structure is used during the estimation process as a basis for sequential disaggregation, but at the same time it provides a useful means of organising prior data at differing levels of aggregation. At the same time, the *phases* into which the process is to be split are also specified, each consisting of two SAMs that are two adjacent steps in the series of defined SAMs, a "macro" and a "micro" SAM at each level. Following the definitions is a process of configuration, which involves specifying how the prior data is to be entered into the structure, and then specifying the model's constraints (e.g. balancing constraints), *targets* and their characteristics. A target is a generalised unit of prior data to be reflected as part of the problem's objective function, the entropy divergence function. When configuration is complete the program can be invoked to solve the constrained maximisation problems set up in each phase. Following successful completion, a balanced SAM will have been produced along with a plethora of additional information about the estimation process that can help to evaluate the resultant SAM.

9.2. Implementing the Cross Entropy Method for the national SAM

9.2.1. Prior Data

The prior data to be used in the estimation of the national SAM consists of:

- a 25 account NAM derived using SARB data;
- partial supply-use data at 9-sector level that are consistent with the NAM; and
- the main 558 account national SAM.

While the first two sets of data are mutually consistent, the detailed SAM is not fully consistent with them because of the adjustments made in terms of crude oil usage. Aggregated

[17] While Statistics South Africa uses SARB data to provide 'control' totals they also include balancing items for each account in the supply and use tables; these balancing items indicate the extent to which the Statistics South Africa and SARB data diverge.

data from the detailed SAM is used to "flesh out" the 9 sector data into a full (but unbalanced) SAM (see next subsection).

9.2.2. SAM and phase configuration

This subsection describes the structure of the SAMs and phases in their relation to the "system of SAMs" data structure used by the estimation process. The final/bottom-level SAM in the system is the full PROVIDE SAM. At the top of the system is the 25 account NAM, followed by an expanded version of this NAM based on 9 sectors in the next phase. Subsequently there is an aggregated 234 account version of the PROVIDE SAM, followed by eight further phases of progressive disaggregation (described in detail below). A summary is given in Table 14 and a complete listing of mappings that involve disaggregation is given in Table 32 in the appendix.

Table 14: Phase and SAM configuration for estimation of the PROVIDE SAM

Phase	Macro SAM	Micro SAM	Macro Constraints	Description
PhaseA	25 Account NAM	41 Account 9 Sector SAM	Std Error 2% of priors	Estimates a 9 sector SAM using a combination of data from the 9 sector SU data and aggregated data from 558 account detailed prior SAM as the micro SAM, and the 25 account NAM as the macro SAM.
PhaseB	41 Account 9 Sector SAM	234 Account SAM	Std Error 5% of priors	Estimates a SAM with 97 activities (1 agricultural), 97 commodities (1 agricultural), 9 labour factors, 1 land factor and 9 households.
PhaseC1	234 Account SAM	261 Account SAM	No Error	Disaggregates labour and households for Western Cape
PhaseC2	261 Account SAM	296 Account SAM	No Error	Disaggregates labour and households for Eastern Cape
PhaseC3	296 Account SAM	326 Account SAM	No Error	Disaggregates labour and households for Free State and Northern Cape
PhaseC4	326 Account SAM	369 Account SAM	No Error	Disaggregates labour and households for KwaZulu-Natal
PhaseC5	369 Account SAM	410 Account SAM	No Error	Disaggregates labour and households for Limpopo and North West
PhaseC6	410 Account SAM	446 Account SAM	No Error	Disaggregates labour and households for Gauteng
PhaseC7	446 Account SAM	466 Account SAM	No Error	Disaggregates labour and households for Mpumalanga
PhaseD	466 Account SAM	558 account MICRO prior SAM	No Error	Disaggregates agricultural commodities and activities, and land into 9 land factors (1 per province)

The strategy is essentially to estimate a balanced 234 account SAM during the first two phases (described below), and then to use it as the basis for sequential disaggregation during the remaining 8 phases. The first two phases (and the structure of the first three SAMs) therefore correspond to available prior data, while the remainder are structured according to the disaggregations en route to the final SAM.

Phases C1 to C7 disaggregate household and factor accounts region by region. Due to the regional disaggregation that is already present (by province) in the 234 account SAM, the further disaggregations do not involve any interaction (i.e. transactions) between the disaggregated accounts of different provinces. As a result, the precise ordering of the disaggregations is immaterial[18], as long as a given province's accounts are disaggregated in the same phase. It is therefore possible to obtain maximum computational simplification from the sequential disaggregation process by splitting up the problem into smaller problems without affecting the results. While the problem will solve as a single phase, the combined execution time of the seven phases is less than for the single phase. In the final phase, the agricultural accounts are disaggregated.

9.2.3. Compiling the prior database

The phase configuration above defines relationships between macro and micro SAMs for each phase. This subsection describes the process of entering the available prior data into the data structure used by the model framework.

A central feature of the application framework that has been developed is a database of priors organised as a single square matrix, called the master multi-SAM database, or MasterSAM for short. MasterSAM is used for both prior and posterior data and it is used for both micro SAM and macro SAMs from all phases. At the same time, it is fairly small: for the PROVIDE SAM (with 10 phases and 558 accounts in the final SAM), it has 641 accounts. This is made possible by sharing accounts between SAMs.

The database is constructed by entering prior values for all of the SAMs in all of the phases – in reverse order, beginning with the micro SAM of the final phase, which is of course the prior 558 account SAM. The intermediate SAMs are simply aggregations of the prior 558 account SAM. Missing values of the 9-sector SAM for the first phase are derived similarly. Upon execution, after each phase, the solved micro SAM is replaced into the master multi-SAM database, so that subsequent phases can read priors from it. We have also implemented a procedure that scales submatrices of the micro SAM priors so that the priors satisfy the macro constraints.

9.2.4. Configuration of targets

This subsection describes the process of configuration of the SAM estimation procedure within the estimation framework that has been developed, using the given prior data in the MasterSAM data structure. The first part of the configuration is fairly trivial, namely to

[18] The relevant parts of the objective function are *separable*.

specify the SAM constraints that each account in each phase must balance after the solution. The remainder of the configuration involves specifying how *targets* are to be treated.

Targets are generally values directly from the SAM or derivatives from it, such as aggregates. In theory, many other types of targets can also be added, such as various ratios and arbitrary aggregates, but for the PROVIDE SAM only cell values (including row and column totals) for the micro and macro SAMs in each phase were used. This allows a neat categorisation of micro and macro targets respectively. Targets are used as the basis for selecting both *constraints*, representing measurements without error, and elements to be included in the objective function for the constrained optimisation problem of each phase, representing measurements with error. Targets can also be left "not implemented", in which case they are effectively ignored during estimation (but are still useful for reporting purposes). The estimation problem is then to estimate a SAM that is consistent with all the constraints while minimising the cross entropy divergence between the targets with error and their prior values.

Configuration amounts to specification of whether and how "targets" are to be implemented. For targets with error, characteristics such as the standard error coefficient must be configured, which is essentially a measure of the quality of the data – better quality data having smaller coefficients[19]. This measure is itself a subjective prior. Our approach is to use a default value for a given context, coupled with higher or lower values where the quality of the data is judged to be worse or better than average.

Following the sequential disaggregation approach, where we wish to force a micro SAM to conform exactly to a pre-existing macro SAM in a particular phase, the macro targets would be implemented without error and the micro targets with error. However, this approach is not fully adopted in all of the phases we have configured for the PROVIDE SAM. Specifically, in the first two phases, we allow small margins of error. Consequently, the method is technically a "hybrid" where strict top-down methodology is only used for the final 8 phases and the first two SAMs (25 and 41 account respectively) will not be fully consistent with the remainder. Put differently, elements of bottom-up methodology are used in the first two phases. The reason for this is twofold; first for the smaller SAMs being estimated at this stage, the concerns regarding the bottom-up methodology are less problematic, and second

[19] The framework makes use of a symmetric normal-like, discrete, three-term error distribution, although others can also be configured. In addition to the standard error coefficient, in the framework it is also necessary to establish whether to use additive or multiplicative errors. Additive errors are in the form $\hat{X} = \bar{X} + E(\bar{e}_X)$, which means that the estimated value is the prior value plus (by convention, technically it should be subtracted) the expected measurement error, while multiplicative errors are in the form $\hat{X} = \bar{X}.\exp(E(\bar{e}_X))$. For the PROVIDE SAM, additive errors were used exclusively due to computational considerations. See PROVIDE Technical Paper 2006:2 (PROVIDE, 2006) for details.

there are certain inconsistencies in the macro SAM in each case to be resolved. In the first phase, the inconsistencies are minor unexplained inaccuracies (possible rounding errors) between two otherwise fully consistent SAMs and in the second phase we have introduced an inconsistency by modifying the micro-level data to correct for crude oil usage (see section 5.2.2) but not the macro-level data. In both cases, the cross entropy method itself is used to "iron out" these inconsistencies[20]. For the remainder, the sequential disaggregation approach is applied strictly, resulting in a series of progressively disaggregated SAMs that are strictly consistent with the 234 account SAM, which can therefore be viewed as the "top-level" SAM in this sense.

The remainder of this subsection details the rules used to set error coefficient priors. Error coefficients represent the standard deviation of the error distribution from which the measurement errors are considered to be drawn, as a percentage of the prior's magnitude. For example, for a prior value of 10, an error coefficient of 0.2 means that the error distribution prior is a normal-like distribution with a mean of zero and a standard deviation of 2. Most rules for assigning error coefficients refer to blocks of cells in macro or micro SAMs of *all* phases simultaneously. Not all rules are necessarily applicable to all phases, for example rules referring to an account that does not appear in a given phase will not affect that phase. Rules are applied in the order listed, so that later rules take precedence when two or more rules refer to the same target in the same phase. Rules are enumerated below for convenience; the numbers have no further significance.

Micro targets

Rule 1: The default error coefficient is 0.25. This includes all cells, including row and column totals, of the micro SAMs in each phase. These values are in many cases overwritten by more specific rules below.

Rule 2: The "total-of-totals" cell, i.e. where the row and column account totals accounts overlap, is de-implemented (effectively removed from the relevant objective functions).

Rule 3: The error coefficients are adjusted upwards to 0.45 (signifying data of lower quality) for payments from labour and land factors to the rest of the world account. The priors are considered to be of low reliability because many of these transactions may not be captured accurately.

[20] In the first phase, the minor discrepancies are repaired and in the second phase similar adjustments to those made in the micro data are made implicitly to the macro SAM.

Rule 4: The error coefficients are adjusted upwards to 0.35 (signifying data of lower quality) for the following:

- (Negative) Payments from commodities to SSALSUB (subsidies on products);
- Payments from activities to land factors (factor use payments);
- Payments from land to households (land income distribution);
- Payments from land to enterprises (land income distribution);
- Inter-household transfers;
- Payments from households to the rest of the world (transfers to foreigners).

Rule 5: The error coefficients are adjusted upwards to 0.45 (signifying data of lower quality) for payments from the rest of the world account to labour factors and to households.

Rule 6: The error coefficients are adjusted downwards to 0.15 (signifying data of higher quality) for the following, but only in micro-level priors from phase C1 onwards. Payments from the capital factor account (GOS) to:

- Enterprises (income distribution);
- Savings;
- The rest of the world account (foreign factor payments).

Rule 7: The error coefficients are adjusted downwards to 0.15 (signifying data of higher quality) for the following:

- Payment from enterprises to enterprises, a residual total representing aggregated inter-enterprise transfers.
- Payments from enterprises to DDIRTAX (direct taxes), GGOVT (transfers to government), DDSTOC (stock changes), KKAP (savings) in the micro-level data only.
- Payments from enterprises to the rest of the world account.
- Payments to the general government account by the tax accounts SSALSUB (subsidies on products), IINDTAX (production taxes), IINDSUB (production subsidies), DDIRTAX (direct taxes) in the micro-level data only. These payments reflect the transfer of the balances from the tax accounts to the general government account.
- Payments from the general government account to commodities (consumption), enterprises (transfers), savings and the rest of the world account (transfers to foreigners).
- Payments from the rest of the world account to capital factors (foreign factor income).

- Transfers from foreigners to government.
- Foreign savings.

Rule 8: Error coefficients for a selected number of cells involving crude oil usage are adjusted downwards to 0.05. In this case, the adjustment is made to prevent the corrections made to the prior data (see section 5.2.2) from being undone by the cross entropy procedure. This rule does not affect macro-level data at the 1 or 9 sector level. The specific cells are:

- (A4, C4a), usage of crude oil by the petroleum products activity;
- (RROW, C4a), imports of crude oil;
- (RROW, C4b), imports of "other mining" commodities excluding crude oil.

Rule 9: The error coefficient is adjusted upwards to 0.3 (signifying data of lower quality) for all transactions involving the detailed agricultural activity and commodity accounts. The effects of this rule are limited to those accounts that are introduced in the final phase, which generally derive from data from the agricultural census, where fairly serious data problems exist. However, this rule specifically *excludes* any transactions between agricultural commodities and the rest of the world account, since these are informed by trade data, which are from different data sources.

Rule 10: De-implement all row total targets, but leave column total targets implemented. This reflects a belief that the payments structure for accounts is better represented in the data than the receipts structure.

Rule 11: For activity accounts, re-implement row total targets but de-implement column total targets. This reflects a belief that that for activity accounts, the receipts structure is better reflected, which in this case amounts to production / supply data.

Rule 12: Any micro target of zero is implemented as without error, i.e. as a hard constraint. This reflects the fact that zeroes indicate the non-existence of a particular transaction rather than a missing value (which are not catered for at this stage)[21].

[21] In actual fact, this is merely an optimisation, since implementing an error distribution with zero standard deviation (a nonzero coefficient multiplied by zero) would not allow any deviation between the prior and estimated value in any case.

Macro targets

Rule 13: By default, all macro targets are implemented with no error. This is the basis of the sequential disaggregation approach and will deliver an estimated SAM that is fully consistent with the macro SAM. However, the estimation will fail if the starting macro SAM is not balanced.

Rule 14: All macro targets in phase A are implemented with error, and an error coefficient of 0.02. This reflects the fact that there are some very small discrepancies between the NAM and the 9 sector data used to construct the 9 sector SAM. This rule partially overrides Rule 13.

Rule 15: All macro targets in phase B are implemented with error, and an error coefficient of 0.05. This reflects the fact that in this phase, the micro SAM has been modified to adjust crude oil usage while the macro SAM has not been so modified. This rule partially overrides Rule 13.

Rule 16: The "total-of-totals" cell, i.e. where the two row and column total accounts overlap, is de-implemented.

Rule 17: The following cells are de-implemented at the macro-level data, allowing them to move freely without penalty to the objective function. This rule affects the first two phases only.

- (HALL, HALL), inter-household transfers. The aggregate has no meaning in the macro SAMs except to allow account totals to be consistent with corresponding micro-level account totals.
- (CALL, DSALL), stock changes per commodity. This is used as a balancing item.
- (SALL, DSALL), the total balance of stock changes being transferred to the savings account. Changes in this value mirrors changes in the individual changes allowed by the previous item.
- (IMALL, IMALL), an otherwise meaningless cell which is used to record the trade balance. Since this figure is not important in the SAM, it is allowed to float freely.

Rule 18: The error coefficients are adjusted upwards to 0.20 (signifying data of lower quality) for macro targets involving trade and transport margins, since these do not derive from the NAM. The rule only affects the first phase. The affected cells are:

- (CALL, MALL), the aggregate for all margin usage.

- (MALL, CALL), the mirror item of the above.
- (TTOTAL, MALL), the column total, which again simply reflects the total margin usage.

Rule 19: All row total targets are de-implemented, leaving column total targets implemented.

Rule 20: All targets with a zero value are de-implemented. While this could be used to let missing values – with corresponding entries in the micro SAM – be handled gracefully, there are no such cases in the PROVIDE prior data[22]. Instead, this merely removes superfluous targets, since the corresponding micro targets will be constrained to zero in any case.

During initialisation, these rules are used to construct a series of tables containing settings for each cell of each micro and macro SAM in each phase. These are then used during execution when the constrained optimisation problems are set up.

9.2.5. Execution

The application allows execution of the phases one-by-one or automatically in sequence. This is useful as it allows changes to the configuration of later phases without the need to re-run all of the phases. Prior to each phase, an option to scale submatrices in the micro SAM to equal the corresponding macro SAM target is invoked, again following the top down method.

Execution time is variable and it is not always clear what factors influence it. The current version of the configuration takes about 4 to 5 hours on a Pentium 4 3Ghz[23] for all of the phases.

It is interesting to note the extent of the computational simplification introduced as a result of the sequential disaggregation approach. In the final phase, the most computationally intensive, a total of 44 470 constraints were configured, which is equal to the number of cells in the final SAM, plus one for each account row/sum total. However, since the macro SAM for that phase was enforced exactly, 35 438 of these cells (and totals) could be fixed, leaving only 9 032 to be estimated, a saving of 80%. Furthermore, a total of 35 864 macro constraints were imposed (cells and row/column totals of the macro SAM), all without error. However, as most of these refer to fixed cells, and could therefore be dropped, only 326 were left to implement. These correspond to the adding-up constraints for the accounts being disaggregated, i.e. cells in the macro SAM that do not appear in the micro SAM.

[22] It was found that checking for such cases is a very useful way to verify that the configuration (especially mappings) is correct.

[23] Earlier versions (which made more aggressive use of phases) completed in as little as an hour.

These numbers also provide a measure of the reduction in computational complexity due to the use of the progressive disaggregation method, since the complexity of the unoptimised last phase, as configured, corresponds to the complexity of an equivalent single-phase method's. For each of the constraints, three nonlinear elements (corresponding to the three-term error's weights) are added to the numerical optimisation problem's objective function, along with three linear equations. The method therefore allows a substantial computational simplification, as the difficulty of obtaining a solution increases faster than linearly with the amount of equations and variables in the system. In our experience, the solution algorithms we employed could not completely solve the single-phase problem, suggesting that the phased approach allows much larger SAMs to be estimated than is otherwise possible[24].

9.3. Evaluating the resulting SAM

The logic of the method was validated in the sense that a fully balanced SAM has been produced, which is fully consistent with every other SAM in the last 8 phases. However, the ultimately goal is to have a SAM that accurately reflects known economic relationships in the entire economy, both at macro and at micro level. There is therefore a need to evaluate the quality of the resultant SAM in economic terms. If the SAM is found to be inconsistent with available economic information, there are grounds for amendment of the priors or the method.

There is little clear guidance on how a systematic SAM evaluation could be done, given that differences between prior and posterior outcomes in themselves are not necessarily indications that that the resultant SAM is inaccurate, merely that the prior information contains inconsistencies. Nevertheless, it is useful to use such differences as a starting point for judgemental analysis. Such an evaluation is made difficult by the vast amount of economic information embodied in the SAM.

A reporting system that was developed as part of the evaluation process reports on each "target". Targets include all active constraints, such as micro, row/column totals and macro, as well as additional user-defined targets in the form of ratios, such as row/column coefficients, various shares and tax rates[25]. Each target is evaluated against the prior value for the phase, and it is possible to identify areas where the solution SAM differs appreciably from the prior values.

[24] More aggressive use of sequential disaggregation would have allowed even greater savings – i.e. the last phase could have been split into two or more phases. However, since there are interactions between the relevant accounts this may have lead to spurious top down restrictions on the solution, which we chose to avoid in this case because the problem was already computationally tractable. There is a potential three-way trade-off between computational tractability, potential spurious hierarchical restrictions on the solution and time and effort spent analysing the effects of such restrictions and identifying which ones are more appropriate.

[25] A total of 967 923 targets are currently being reported on for all 10 phases for the PROVIDE SAM.

The results suggest that an acceptable SAM has been produced. Significant differences between priors are generally restricted to parts of the SAM where the data are known to be problematic, for example the agricultural accounts. This indicates one of the advantages of the sequential approach, in that it is assured that the problematic data have been "isolated" by only introducing it at the last phase. Moreover, the SAM appears to accord with known economic relationships, especially at an aggregate level. Further refinements are likely to be adopted in the future.

9.4. Implementing the Stochastic Entropy Procedure for the regional SAMs

The problem of estimating four regional SAMs has been structured so that the sequential disaggregation method could be used with little modification. Conceptually, splitting the national SAM into regions is just a special case of disaggregation with the basis for disaggregation being regional rather than, say, by product categories, household characteristics, etc. The advantage of this is that we are assured not only of internal consistency in each regional SAM (balanced accounts) but also of perfect consistency between the national SAM and the four regional SAMs. This is manifested in two particular senses, namely that the sum of the four regional sub-accounts corresponding to an account in the national SAM sums to the national account[26], and that the trade and other external balances between the four regional SAMs are consistent, i.e. total imports and total exports on any account are balanced.

Section 7 documents how the priors for the four regional SAMs were formed. Each account in the national SAM is split into four regional accounts according to available information. To facilitate estimation of all four SAMs in a single step, a multi-SAM matrix is formed, which is essentially all four SAMs, each with their own accounts, pasted on a single large matrix[27], which can then be mapped to the national SAM. In terms of the sequential disaggregation framework, (a somewhat aggregated version of) the national SAM is then regarded as the "macro" SAM and the multi-SAM matrix as the "micro" SAM. The mapping between the national SAM and the regional SAMs is not entirely seamless, due to the inclusion of the rest of South Africa trade accounts that have no equivalent in the national SAM. For most accounts, the rest of South Africa accounts are only used as balancing accounts – they record the differences between payments and receipts for a particular account within a region that are due to interregional trade. For example, if (say) a particular commodity CX is exclusively produced in region A (RA) and consumed in region B (RB), these regions will have matching, opposite entries on their rest of South Africa accounts to

[26] Technically any class of transaction involving the account sums as described; accounts themselves cannot sum of course.

[27] This differs from the multiregional SAM illustrated in Table 4 in that there is no interaction between accounts from different regions except through the rest of South Africa accounts.

balance the respective CX accounts (RA-CX and RB-CX) within each SAM. In these cases, it is possible to assign a value of zero to the CX entry on the national SAM's rest of South Africa account; when the relevant entries of the CX accounts over regions are summed, the zero overall balance is obtained. This is also used as a constraint during the balancing process to ensure inter-regional trade balance consistency[28]. An additional requirement is that a particular region's rest of South Africa account imbalances sum to zero, so that, for example, a region that consumes CX but does not produce it, must somehow balance this, for example by producing CY and not consuming it, or by receiving transfers, or some combinations of opposing imbalances. This is automatically achieved because of the requirement that all column entries on rest of South Africa accounts remain zero (only net balances are recorded rather than both import and export values, hence the rows are sufficient for this) and the rest of South Africa accounts must balance.

As an exception, inter-household transfers are explicitly recorded in the national SAM, including transfers between households in different regions. As a result, there are inherent imbalances on these accounts in the regional SAMs, which are also recorded on the RSA accounts. However, since these accounts are mapped one-to-one to accounts in the national SAM, these imbalances also exist in the national SAM and there are no accounts against which the imbalances can be resolved. These entries therefore appear as non-zero entries in the national ("macro") SAM on household accounts during the estimation process. In effect, the simplification introduced on other accounts, namely that interregional payments are only due to imbalances that are introduced when national accounts are split into regional accounts, is too stringent to accommodate the existing, richer, data on inter-households transfers. This does not interfere with the estimation because the household data are already fully regionalised in the national SAM, hence there is nothing to estimate for them at this stage.

The only other step taken to ensure consistency between the national and regional SAMs during the estimation is to increase the row and column totals of the government account to include the newly introduced inter-governmental transfers (from national to provincial government accounts).

As above, the rules determining the treatment of targets for the estimation of the regional SAMs are enumerated here. Keep in mind that "micro" refers to the multiregional SAM matrix and "macro" refers to the (slightly modified as described) national SAM.

[28] Rest of South Africa account entries in the macro SAM is enforced without error even when they are zero. This constitutes a slight modification of the process since usually macro targets of zero are not de-implemented (ignored).

Micro targets

Rule 1: The default error coefficient is 0.5. This includes all cells, including row and column totals, of the micro SAMs. These values are in many cases overwritten by more specific rules below.

Rule 2: Multiplicative (instead of the default additive) errors are introduced for transactions involving the accounts R2A6, R4A67_72 and R4A32 (see Note: Region 1 (R1) refers to Western Cape and Northern Cape, R2 to Eastern Cape and KwaZulu-Natal, R3 to North West, Gauteng and Free State and R4 to Limpopo and Mpumalanga.

Table 25 in appendix for account description). This was considered necessary because of undesired large movements otherwise[29].

Rule 3: The "total-of-totals" cell, i.e. where the row and column account totals accounts overlap, is de-implemented (effectively removed from the relevant objective functions).

Rule 4: Targets for payments from regional government accounts to regional capital accounts (national government savings to the provincial account) are de-implemented. These are residuals.

Rule 5: Targets for payments to regional rest of South Africa accounts are de-implemented. This allows the rest of South Africa accounts to act as balancing accounts as described.

Rule 6: Targets for payments from regional rest of the world accounts to regional capital accounts are de-implemented, as these are balancing items.

Rule 7: Targets for payments from regional capital accounts to regional stock changes accounts are de-implemented. These are residuals.

Rule 8: Error coefficients for all targets related to stock changes accounts are increased to 2.

Rule 9: De-implement all row total targets, but leaves column total targets implemented. This reflects a belief that the payments structure for accounts is better represented in the data than the receipts structure.

[29] In general, additive errors are used due to computational efficiency, whereas multiplicative errors have better properties. See PROVIDE Technical Paper 2006:2 (PROVIDE, 2006).

Rule 10: Any micro target of zero is implemented as without error, i.e. as a hard constraint.

Macro targets

Rule 11: By default, all macro targets are implemented with no error.

Rule 12: The "total-of-totals" cell, i.e. where the two row and column Total accounts overlap, is de-implemented.

Rule 13: All row total targets are de-implemented, leaving column total targets implemented.

Rule 14: By default, all macro targets with a zero value are de-implemented.

Rule 15: Re-implement any targets involving the national rest of South Africa account. This is so that these will be implemented (without error) despite having prior values of zero. This enforces the balancing constraint that regional rest of South Africa accounts must sum to zero and also enforces the correct non-zero values for household accounts, as described.

The single step estimation results in a total of 17 646 configured targets with error, and 12 730 nonzero targets without error, corresponding to entries of the national SAM (including the 134 rest of South Africa account entries). Following optimisation, 15 174 targets with error remained, as well as 10 258 macro targets without error. While the scope for optimisation is clearly limited by the fact that the entire estimation for all four SAMs is done in a single step, the resulting problem is still easily solved. The multi-SAM matrix can be evaluated as a whole using the tools developed as part of the software framework. Generally the tight consistency between the national SAM and the regional SAMs imply that the quality of the regional SAMs is dependent on the national SAM. The additional aspects that remain to be evaluated relate to the way in which the national accounts were divided into regional components – the balancing process itself generally appears to maintain the prior assumptions that were used, and it is likely that the majority of changes made by the entropy process represent improvements on the priors. Following estimation of the multi-SAM matrix, it is trivial to extract the four separate regional SAMs, and the multi-SAM matrix is also useful as a basis for further estimation of inter-regional trade flows, as described in the next section.

9.5. Implementing the Stochastic Entropy Procedure for the multiregional SAM

While the regional SAMs estimated as described in the previous section include trade balances on each account for each region that are consistent between regions and with the

national SAM, the information stops short of what would be required to conduct full-scale mutiregional trade modelling. Specifically, the trade balances do not give complete information on inter-industry trade in the same account and trade is anonymous: each region's trade balance is not apportioned between the other three regions. This section seeks to address these shortcomings by further extending the datasets with cross entropy estimation of missing values.

A note of caution is in order: interregional trade data in South Africa are not generally available, and consequently the priors have been synthesised using a few simple rules, combined with the now familiar consistency conditions, i.e. that total RSA imports and exports for each account must balance. The aim is therefore not to deliver accurate results, but rather maximally plausible *estimates*, that can serve as a basis for tentative modelling and further data development. In keeping with the Bayesian spirit underlying the method, if (when) it becomes apparent that something in the data is wrong, or additional information becomes available, it can be incorporated into the process directly to deliver a better result. By similar reasoning, the results should be at least as good as that produced by any *informal* estimation method: they are constrained indirectly by the data and constraints that produced the national and regional SAMs, constrained directly by *known* accounting constraints, and informed by further plausible assumptions.

The extension of the multi-SAM matrix to include trade flows consists of two parts, first to determine total trade flows for each commodity and second to apportion this to actual regions. While the second part amounts to further disaggregation of the data, the results can be accommodated in the same account structure as the multi-SAM matrix, using previously unused "off-diagonal-block" entries between commodities from different regions (see Table 4). Furthermore, there is no need to distinguish between "macro" and "micro" targets, because all necessary targets can be defined in terms of a single SAM. Hence, the sequential disaggregation framework is used somewhat differently in this case. In particular, no "macro" SAM is used, so that the problem reduces to ordinary cross entropy SAM estimation[30]. By manipulating targets, it is possible to cause a "shift" from the aggregated rest of South Africa accounts (where only trade totals are recorded) to the detailed trade transactions (where full trade flows are estimated), effectively also a disaggregation.

From the regional SAMs estimation, we "know" the trade balance, but not the trade totals, so the first part of the problem amounts to forming priors on the amount of trade each region has for each commodity. This is done by adding an amount to both imports and exports for the commodity, a so-called "expansion". The amount to expand the totals by depends on the

[30] Since the framework requires "micro" and "macro" SAMs as well as mappings for each phase, configuration of this requires a little trick, which is to define both micro and macro SAMs to the same set of accounts, with mappings from each account to itself, and furthermore to disable all macro targets.

outcome of a set of rules, partly inspired by so-called gravity models of trade, where large producers will tend to export to large consumers (and with relatively more trade between geographically close entities). In our derivation, we assume that the expansion will be relatively low if the region's trade balance is a large share of absorption (for net importers) or a large share of production (for net exporters). This implies that a region that produces a little of something but consumes a lot will tend not to export it, and a region that produces a lot but consumes very little will tend not to import it. The algorithm starts with one of these ratios (net imports/absorption or net exports/production), *R*, and calculates a coefficient $S = MAX(0.4 - (R/2), 0)$, which effectively rules out expansion completely if the relevant ratio is higher than 0.8 and sets an upper limit of 0.4 on the coefficient. The coefficient *S* is then multiplied by the maximum of absorption and production, and the rest of the world component is subtracted (imports for net exporters and exports for net importers) to arrive at the amount by which rest of South Africa trade is to be expanded[31]. Finally, any regional import or export that is not matched by at least one opposing trade in another region is removed.

The second part of generating trade flow priors is to divide the imports and exports priors calculated above to the different regions. A simple matrix of distance based trade flow priors is first constructed by assigning a basic factor of 100 to possible trades (similar commodities from different regions). This factor is then increased to 130 for trade that is with the central region (both imports and exports) and reduced to 50 for trade between region 1 (Western Cape and Eastern Cape) and region 4 (Limpopo and Mpumalanga), on the basis that they are the only two of the four regions that are not adjacent. This matrix of basic relative magnitudes is then scaled to match the total interregional trade implied by import and export priors calculated above[32].

The matrix of trade flow priors is then inserted into the matrix to be estimated by cross entropy, the rest of South Africa account balances are set to zero and account totals are increased by the amount of inflation. All of these magnitudes (except the zeroed rest of South Africa account balances) are free to adjust during the estimation process. The estimation is done in a single step, and the results are again fully consistent with previous national and regional SAMs, in particular the net trade balances in the regional SAMs are enforced.

The rules used during estimation are fairly simple, because very few cells – only commodity trade flows – are allowed to adjust. A very large error coefficient is used (1000) for trade flows and somewhat smaller coefficients (2.5) for commodity account totals. A set of balancing transactions (rest of South Africa account to rest of South Africa account) is left

[31] If the rest of world account component exceeds this value, no expansion is done.

[32] Trade flows for which there are no matching imports or exports form a region are removed first.

entirely free to adjust, along with the rest of South Africa account totals. As mentioned, there are no "macro" targets. All other cells, including notably the commodity trade balances that have been set to zeroes, are held fixed. This effectively forces the values that previously were in the trade balance entries to be distributed to the relevant interregional trade flow transactions.

The solution is obtained very easily, as the optimisation problem is fully separable between non-like commodities – the only interactions are within the 4x4 trade flow submatrices for each commodity, along with a number of trivial balancing items. While the solution meets the requirements set by the process, it has not been economically evaluated thus far.

10. Outstanding issues

10.1. Main deficiencies

The treatment of value added tax (VAT) in the national SAM remains a challenge, but at the same time it is also an important step in attempting to improve the structure of the SAM in order to allow appropriate tax policy analysis using computable general equilibrium (CGE) models. The main challenge for future SAM development is to refine the way in which VAT payments recorded by activity are mapped to VAT payments by commodity for inclusion in the SAM. It is anticipated that it will remain a contentious issue because it is unlikely that VAT payments will ever be clearly recorded by commodity. The mapping therefore will continue to be fairly subjective. Another constraint that arises from including gross VAT payments by commodity and VAT refunds by activity in the national SAM is that it is inconsistent with the way in which the System of national Account (SNA), and hence Statistics South Africa, treats VAT. Supply and use tables and other key indicators published by Statistics South Africa incorporate net VAT. This implies an inconsistency between the control totals from Statistics South Africa used for the PROVIDE SAM and the micro data that was adjusted as part of the treatment of VAT. The treatment used to develop this SAM was influenced by considerations relating to CGE modelling of VAT. One consequence is that there is a departure form the SNA standard of recording intermediate input purchases at purchaser prices net of un-rebated VAT; this was done to simplifying the modelling of commodity specific VAT rates and activity specific VAT rebates. Consideration is being given to revising this approach for subsequent SAMs and resolving the modelling issues in the CGE model.

The inconsistency in various trade data sets and the related information such as import duties is an obstacle that would probably be best addressed by SARS officials. The researchers are however grateful for receiving access to the data, which are not widely published or distributed, as well as assistance from the SARS officials.

Agricultural data should be viewed critically as the disaggregation of the agricultural sector was one of the focus areas of the PROVIDE SAMs. At the commencement of the PROVIDE project it was anticipated that the magisterial district level data from the 2002 Census of Agriculture would be available for use in the 2000 SA SAM. Unfortunately the data had not been released at the time of finalising the version of the 2000 SAMs recorded in this report. The majority of the regional data for the disaggregation of the agricultural sector were therefore based on the 1993 Census of Agriculture, which was the most comprehensive dataset on agriculture at the time of finalising the SAMs. During the estimation (balancing) of the SAM it became apparent that some of the known significant shifts in production in South African agriculture between 1993 and 2000 were indeed adjusted in the right direction by the estimation process as a result of the inclusion of more recent figures elsewhere in the SAM. The reported national data from the 2002 Census of Agriculture were used as control totals where possible. For many of the needed data points on agriculture there were no published information available and assumptions had to be made in this regard. These data points should be refined as more appropriate data becomes available. One of the benefits of SAM development is that it highlights the areas where data are lacking. An attempt should be made to incorporate additional questions in future census and survey questionnaires.

10.2. Qualifications

The 2000 SA SAM has unique features worth highlighting. The vast number of accounts included in the SAM allows for more detailed analysis of specific issues than is typically found in this type of research. The detailed number of household and factor accounts, and the submatrix that records factor payments to households, ensures a suitable database for microsimulation. The detailed number of tax accounts makes the database especially suitable for fiscal policy analysis. The disaggregation of crude oil increased the level of detail in the SAM and highlighted a data error that would otherwise have remained hidden in more aggregated datasets.

The estimation procedures used to derive missing information for the SAM, and hence to balance the SAM, have improved significantly over the past ten years. Computing capacity is therefore no longer the binding constraint when deciding on the number of accounts to be included in the SAM. The introduction of step-wise estimation that was used as part of the SAM development is the first of its kind and has proved to be very useful. The limitations of the RAS balancing procedures could therefore be avoided.

11. References

BFAP (2005). Unpublished data used in the SA Partial Equilibrium model. Bureau for Food and Agricultural Policy. University of Pretoria. Pretoria.

CSS (1993). SIC Standard Industrial Classification of all Economic Activities. Report 09-90-02. Pretoria: Central Statistical Services.

CSS (1998). Census of Agriculture 1993, Provincial Statistics. CSS Report Series No 11-02-01 to No 11-02-10 (1993). Pretoria: Central Statistical Services.

Global Insight (2004). Regional Economic Focus Data. Centurion: Global Insight.

Golan, A., Judge, G. and Miller, D., (1996). Maximum Entropy Econometrics: Robust Estimation with Limited Data. New York: John Wiley & Sons.

Golan, A., Judge, G. and Robinson, S. (1994). Recovering Information from Incomplete or Partial Multisectoral Economic Data. Review of Economics and Statistics, 76, 1994: 541–49.

Kuhn, G. (1999). Mapping of HS codes to SIC codes. Industrial Development Corporation, Johannesburg. Personal communications.

McDonald, S. and Robinson, S., (1998). Developing a Social Accounting Matrix for South Africa. ESRC Development Economics Study Group Annual Conference. University of Reading, July.

McDonald, S. and Robinson, S., (2004). A General Information-Theoretic Approach to Estimating Disaggregated National Accounts, Including Input-output and SAM Accounts. International Conference on Input-Output Techniques, Brussels, September.

National Treasury (2001). Budget Review 2001. Pretoria: National Treasury.

PROVIDE (2003). Social Accounting Matrices and Economic Modelling. PROVIDE Background Paper 2003:4. Elsenburg, Western Cape.

PROVIDE (2004). The Organising of Trade Data for inclusion in a Social Accounting Matrix. PROVIDE Technical Paper 2004:2. Elsenburg, Western Cape.

PROVIDE (2005a). Creating a 2000 IES-LFS Database in STATA. PROVIDE Technical Paper 2005:1. Elsenburg, Western Cape.

PROVIDE (2005b). Forming representative household and factor groups for a South African SAM. PROVIDE Technical Paper 2005:2. Elsenburg, Western Cape.

PROVIDE (2006). A Framework for SAM estimation using Cross Entropy and Sequential Disaggregation. PROVIDE Technical Paper 2006:2. Elsenburg, Western Cape. Forthcoming.

Pyatt, G. (1988). The SAM approach to modelling, *Journal of Policy Modelling*, 10(3), pp 327-352.

Robinson, S. Cattaneo, A. and El-Said, M. (2001). Estimating a Social Accounting Matrix Using Cross Entropy Methods. Economic Systems Research, Vol 13 No 1, pp 47-64.

Robinson, S. and El-Said, M., (2000). 'GAMS Code for Estimating A Social Accounting Matrix (SAM) Using Cross Entropy (CE) Methods', TMD Discussion Paper No 64. IFPRI: Washington.

South African Petroleum Industry Association (2002). Sapia Annual Report 2001.

South African Petroleum Industry Association (2003). Sapia Annual Report 2002.

SARB (2004). South Africa Reserve Bank Quarterly Bulletin. December 2004 Pretoria: South African Reserve Bank.

SARS (2000a). 2000 Excise duty data. Pretoria: South African Revenue Service.

SARS (2000b). 2000 Import and Export data. Pretoria: South African Revenue Service.

SARS (2000c). 2000 Tariff revenue data. Pretoria: South African Revenue Service.

SARS (2000d). 2000 Value added tax data. Pretoria: South African Revenue Service.

SARS (2003). Vendors and Employers Trade Classification Guide: VAT/EMP 403. Pretoria: South African Revenue Service.

SSA (2001a). Census of Manufacturing, 1996. Principal Statistics: RSA. Report No. 30-01-01 (1996). Pretoria: Statistics South Africa.

SSA (2001b). Census of Manufacturing, 1996. Principal Statistics on a regional basis: Western Cape. Report No. 30-01-04 (1996). Pretoria: Statistics South Africa.

SSA (2001c). Census of Manufacturing, 1996. Principal Statistics on a regional basis: Eastern Cape. Report No. 30-01-05 (1996). Pretoria: Statistics South Africa.

SSA (2001d). Census of Manufacturing, 1996. Principal Statistics on a regional basis: Northern Cape. Report No. 30-01-06 (1996). Pretoria: Statistics South Africa.

SSA (2001e). Census of Manufacturing, 1996. Principal Statistics on a regional basis: Free State. Report No. 30-01-07 (1996). Pretoria: Statistics South Africa.

SSA (2001f). Census of Manufacturing, 1996. Principal Statistics on a regional basis: KwaZulu-Natal. Report No. 30-01-08 (1996). Pretoria: Statistics South Africa.

SSA (2001g). Census of Manufacturing, 1996. Principal Statistics on a regional basis: North West. Report No. 30-01-09 (1996). Pretoria: Statistics South Africa.

SSA (2001h). Census of Manufacturing, 1996. Principal Statistics on a regional basis: Gauteng. Report No. 30-01-10 (1996). Pretoria: Statistics South Africa.

SSA (2001i). Census of Manufacturing, 1996. Principal Statistics on a regional basis: Mpumalanga. Report No. 30-01-11 (1996). Pretoria: Statistics South Africa.

SSA (2001j). Census of Manufacturing, 1996. Principal Statistics on a regional basis: Limpopo. Report No. 30-01-12 (1996). Pretoria: Statistics South Africa.

SSA (2001k). Census of Mining, 1996. Report No. 20-01-01 (1996). Pretoria: Statistics South Africa.

SSA (2001l). Labour Force Survey, September 2000. Pretoria: Statistics South Africa.

SSA (2002a). Income and Expenditure of Households, 2000. Pretoria: Statistics South Africa.

SSA (2002b). Report on Survey of Large and Small Scale Agriculture, 2000. Pretoria: Statistics South Africa.

SSA (2003). 2000 Supply and Use matrices for South Africa, Report No. 04-04-01 (2000). Pretoria: Statistics South Africa.

SSA (2004a). Statistical Release P0441. Gross Domestic Product, Annual Estimates 1993 – 2003, Annual estimates per region 1995 – 2003. Third Quarter 2004. November 2004. Pretoria: Statistics South Africa.

SSA (2004b). Census of Commercial Agricultural 2002 (Summary). Statistical Release P1101. Pretoria: Statistics South Africa.

Van Seventer, D.E.N., (2001). The estimation of a system of provincial input-output tables for South Africa. Journal of Studies in Economics and Econometrics, Vol. 23, No. 3.

12. Appendix

12.1. Accounts for the Social Accounting Matrix for South Africa

Table 15: Commodity and Activity Accounts

No.	Commodity and Activity Accounts	No.	Commodity and Activity Accounts	No.	Commodity and Activity Accounts
1	Agricultural products	33	Basic chemical products	65	Household appliances
2	Coal and lignite products	34	Fertilizers	66	Office machinery
3	Gold and uranium ore products	35	Primary plastic products	67	Electric motors
4	Other mining products	36	Pesticides	68	Electricity apparatus
5	Meat products	37	Paints	69	Wire and cable products
6	Fish products	38	Pharmaceutical products	70	Accumulators
7	Fruit and vegetables products	39	Soap products	71	Lighting equipment
8	Oils and fats products	40	Other chemical products	72	Other electrical products
9	Dairy products	41	Rubber tyres	73	Radio and television products
10	Grain mill products	42	Other rubber products	74	Optical instruments
11	Animal feeds	43	Plastic products	75	Motor vehicles
12	Bakery products	44	Glass products	76	Motor vehicles parts
13	Sugar products	45	Ceramic ware	77	Other transport products
14	Confectionary products	46	Ceramic products	78	Furniture
15	Other food products	47	Cement	79	Jewellery
16	Beverages and tobacco prod's	48	Other non-metallic products	80	Other manufacturing
17	Textile products	49	Iron and steel products	81	Electricity
18	Made-up textile products	50	Non-ferrous metals	82	Water
19	Carpets	51	Structural metal products	83	Buildings
20	Other textile products	52	Treated metal products	84	Other constructions
21	Knitting mill products	53	General hardware products	85	Trade services
22	Wearing apparel	54	Other fabricated metal products	86	Accommodation
23	Leather products	55	Engines	87	Transport services
24	Handbags	56	Pumps	88	Communications
25	Footwear	57	Gears	89	FSIM[33]
26	Wood products	58	Lifting equipment	90	Insurance services
27	Paper products	59	General machinery	91	Real estate services
28	Containers of paper	60	Agricultural machinery	92	Other business services
29	Other paper products	61	Machine-tools	93	General Government services
30	Published and printed products	62	Mining machinery	94	Health and social work
31	Recorded media products	63	Food machinery	95	Other services / activities
32	Petroleum products	64	Other special machinery	96	Domestic services

[33] There is no Financial Services Indirectly Measured (FSIM) account for activities

Table 16: Agricultural Commodity Accounts

No.	Agricultural Commodity Accounts	No.	Agricultural Commodity Accounts
1	Summer Cereals	11	Other Horticulture
2	Winter Cereals	12	Livestock
3	Oilseeds	13	Milk and Cream
4	Sugarcane	14	Animal Fibres
5	Other Field Crops	15	Poultry
6	Potatoes and Vegetables	16	Game
7	Wine grapes	17	Fish
8	Citrus fruit	18	Other Animals
9	Subtropical fruit	19	Forestry
10	Deciduous fruit	20	Wild Flowers, Compost and Firewood

Table 17: Agricultural Activity Accounts

No.	Agricultural Activity Accounts[1]	No.	Agricultural Activity Accounts
1	Western Cape areas 1 to 9	6	Free State areas 1 to 8
2	Northern Cape areas 1 to 8	7	Gauteng areas 1 to 7
3	Eastern Cape areas 1 to 10	8	Mpumalanga areas 1 to 6
4	KwaZulu-Natal areas 1 to 11	9	Limpopo areas 1 to 6
5	North West areas 1 to 5		**Total number of accounts: 70**

[1] For a description of each agricultural area see Table 28.

Table 18: Household Accounts

No.	Household accounts	No.	Household accounts
	Western Cape Households		**Free State Households (cont)**
1	African, Female, Lower Secondary and lower	82	African, Female, Lower Secondary
2	African, Male, Primary and lower	83	African, Female, Upper Secondary and higher
3	African, Male, Lower Secondary	84	African, Male, None
4	African, Upper Secondary and higher	85	African, Male, Primary, Low-income
5	Asian & Coloured, Female, Primary and lower	86	African, Male, Primary, High-income
6	Asian & Coloured, Female, Lower Secondary	87	African, Male, Lower Secondary, Low-income
7	Asian & Coloured, Female, Upper Sec. and higher	88	African, Male, Lower Secondary, High-income
8	Asian & Coloured, Male, Primary and lower	89	African, Male, Upper Sec and higher, Low-income
9	Asian & Coloured, Male, Lower Secondary	90	African, Male, Upper Sec and higher, High-income
10	Asian & Coloured, Male, Upper Secondary and higher, Low-income	91	Asian & Coloured
11	Asian & Coloured, Male, Upper Secondary and higher, High-income	92	White, Lower Secondary and lower
12	White, Lower Secondary and lower	93	White, Upper Secondary
13	White, Upper Secondary, Low-income	94	White, Tertiary
14	White, Upper Secondary, High-income		**North West Households**
15	White, Tertiary, Low-income	95	African, Agricultural
16	White, Tertiary, High-income	96	African, Female, None
	Northern Cape Households	97	African, Female, Primary
17	African, Primary and lower	98	African, Female, Lower Secondary
18	African, Lower Secondary and higher	99	African, Female, Upper Secondary and higher
19	Coloured & Asian, Lower Secondary and lower	100	African, Male, None, Low-income
20	Coloured & Asian, Upper Secondary and higher	101	African, Male, None, High-income
21	White	102	African, Male, Primary, Low-income
	Eastern Cape Households	103	African, Male, Primary, High-income
22	African, Agricultural	104	African, Male, Lower Secondary, Low-income
23	African, Homeland, Female, None	105	African, Male, Lower Secondary, High-income
24	African, Homeland, Female, Primary	106	African, Male, Upper Sec and higher, Low-income
25	African, Homeland, Female, Lower Secondary	107	African, Male, Upper Sec and higher, High-income
26	African, Homeland, Female, Upper Secondary and higher, Low-income	108	Asian & Coloured
27	African, Homeland, Female, Upper Secondary and higher, High-income	109	White, Lower Secondary and lower
28	African, Homeland, Male, None	110	White, Upper Secondary and higher
29	African, Homeland, Male, Primary		**Gauteng Households**
30	African, Homeland, Male, Lower Secondary	111	African, Agricultural
31	African, Homeland, Male, Upper Secondary and higher, Low-income	112	African, Non-Homeland, Female, None
32	African, Homeland, Male, Upper Secondary and higher, High-income	113	African, Non-Homeland, Female, Primary
33	African, Non-Homeland, Female, None	114	African, Female, Lower Secondary
34	African, Non-Homeland, Female, Primary	115	African, Non-Homeland, Female, Upper Secondary, Low-income
35	African, Non-Homeland, Female, Lower Secondary	116	African, Non-Homeland, Female, Upper Secondary, High-income
36	African, Non-Homeland, Female, Upper Secondary and higher	117	African, Non-Homeland, Female, Tertiary
37	African, Non-Homeland, Male, None	118	African, Non-Homeland, Male, None
38	African, Non-Homeland, Male, Primary	119	African, Non-Homeland, Male, Primary
39	African, Non-Homeland, Male, Lower Secondary	120	African, Non-Homeland, Male, Lower Secondary
40	African, Non-Homeland, Male, Upper Secondary and higher	121	African, Non-Homeland, Male, Upper Secondary

No.	Household accounts
41	Asian & Coloured, Primary and lower
42	Asian & Coloured, Lower Secondary
43	Asian & Coloured, Upper Secondary and higher
44	White, Lower Secondary and lower
45	White, Upper Secondary
46	White, Tertiary
	KwaZulu-Natal Households
47	African, Agricultural, Homeland
48	African, Agricultural, Non-Homeland, Low-inc
49	African, Agricultural, Non-Homeland, High-inc
50	African, Homeland, Female, None
51	African, Homeland, Female, Primary
52	African, Homeland, Female, Lower Secondary
53	African, Homeland, Female, Upper Sec & higher
54	African, Homeland, Male, None
55	African, Homeland, Male, Primary
56	African, Homeland, Male, Lower Secondary
57	African, Homeland, Male, Upper Sec & higher
58	African, Non-Homeland, Female, None
59	African, Non-Homeland, Female, Primary
60	African, Non-Homeland, Female, Lower Sec
61	African, Non-Homeland, Female, Upper Secondary and higher, Low-income
62	African, Non-Homeland, Female, Upper Secondary and higher, High-income
63	African, Non-Homeland, Male, None
64	African, Non-Homeland, Male, Primary
65	African, Non-Homeland, Male, Lower Secondary, Low-income
66	African, Non-Homeland, Male, Lower Secondary, High-income
67	African, Non-Homeland, Male, Upper Secondary and higher, Low-income
68	African, Non-Homeland, Male, Upper Secondary and higher, High-income
69	Asian, Female, Lower Secondary and lower
70	Asian, Male, Lower Sec and lower, Low-income
71	Asian, Male, Lower Sec and lower, High-income
72	Asian, Male, Upper Sec and higher, Low-income
73	Asian, Male, Upper Sec and higher, High-income
74	Coloured
75	White, Lower Secondary and lower
76	White, Upper Secondary, Low-income
77	White, Upper Secondary, High-income
78	White, Tertiary
	Free State Households
79	African, Agricultural
80	African, Female, None
81	African, Female, Primary
122	African, Non-Homeland, Male, unknown
123	African, Non-Homeland, Male, Tertiary, Low-inc
124	African, Non-Homeland, Male, Tertiary, High-inc
125	Coloured, Lower Secondary and lower
126	Coloured, Upper Secondary and higher
127	Asian, Lower Secondary and lower
128	Asian, Upper Secondary and higher
129	White, Lower Secondary and lower, Low-income
130	White, Lower Secondary and lower, High-income
131	White, Upper Secondary, Low-income
132	White, Upper Secondary, High-income
133	White, Tertiary, Low-income
134	White, Tertiary, High-income
	Mpumalanga Households
135	African, Agricultural
136	African, Female, None
137	African, Female, Primary
138	African, Female, Lower Secondary
139	African, Female, Upper Secondary and higher
140	African, Male, None
141	African, Male, Primary, Low-income
142	African, Male, Primary, High-income
143	African, Male, Lower Secondary, Low-income
144	African, Male, Lower Secondary, High-income
145	African, Male, Upper Secondary and higher, Low-income
146	African, Male, Upper Secondary and higher, High-income
147	Asian & Coloured
148	White
	Limpopo Households
149	African, Agricultural
150	African, Female, Non & pre-Primary
151	African, Female, Primary
152	African, Female, Lower Secondary
153	African, Female, Upper Sec and higher, Low-inc
154	African, Female, Upper Sec and higher, High-inc
155	African, Male, None
156	African, Male, Primary, Low-income
157	African, Male, Primary, High-income
158	African, Male, Lower Secondary
159	African, Male, Upper Sec and higher, Low-income
160	African, Male, Upper Sec and higher, High-income
161	Asian & Coloured
162	White

Table 19: Factor Accounts

No.	Factor accounts
1	Gross operating surplus
	Land
2	Western Cape Land
3	Northern Cape Land
4	North West Land
5	Free State Land
6	Eastern Cape Land
7	KwaZulu-Natal Land
8	Mpumalanga Land
9	Limpopo Land
10	Gauteng Land
	Free State Labour
11	African high- & skilled
12	African semi-skilled
13	African unskilled
14	Coloured & Asian high- & skilled
15	Coloured & Asian semi- & unskilled
16	White high- & skilled
17	White semi- & unskilled
	North West Labour
18	African high- & skilled
19	African semi-skilled
20	African unskilled
21	Coloured & Asian high- & skilled
22	Coloured & Asian semi- & unskilled
23	White high- & skilled
24	White semi- & unskilled
	Gauteng Labour
25	African high-skilled
26	African clerks
27	African service & shops
28	African craft & trade
29	African machine & plant operators
30	African elementary occupations
31	African domestic workers, agriculture & forestry
32	Coloured high- & skilled
33	Coloured semi- & unskilled
34	Asian high- & skilled
35	Asian semi- & unskilled
36	White high-skilled
37	White skilled
38	White semi- & unskilled
	Western Cape Labour
39	African skilled & high-skilled
40	African semi-skilled
41	African unskilled
42	Coloured & Asian high-skilled
43	Coloured & Asian clerks
44	Coloured & Asian service & shops
50	White skilled
51	White semi- & unskilled
	Eastern Cape Labour
52	African high-skilled
53	African skilled
54	African agriculture & fishery
55	African craft & trade
56	African machine & plan operators
57	African elementary occupations
58	African domestic workers
59	African unspecified
60	Coloured & Asian high-skilled & skilled
61	Coloured & Asian semi- & unskilled
62	White high- & skilled
63	White semi- & unskilled
	Northern Cape Labour
64	African high- & skilled
65	African semi- & unskilled
66	Coloured & Asian high- & skilled
67	Coloured & Asian semi- & unskilled
68	White high-skilled & skilled
69	White semi- & unskilled
	KwaZulu-Natal Labour
70	African high-skilled
71	African skilled
72	African agriculture & fisheries
73	African craft & trade
74	African machine & plant operators
75	African elementary occupations
76	African domestic workers & unspecified
77	Coloured high- & skilled
78	Coloured semi- & unskilled
79	Asian high-skilled & skilled
80	Asian semi- & unskilled
81	White high-skilled & skilled
82	White semi- & unskilled
	Mpumalanga Labour
83	African high-skilled
84	African skilled
85	African semi-skilled
86	African unskilled
87	Coloured & Asian high- & skilled
88	Coloured & Asian semi- & unskilled
89	White high- & skilled
90	White semi- & unskilled
	Limpopo Labour
91	African high-skilled
92	African skilled
93	African semi-skilled

No.	Factor accounts	No.	Factor accounts
45	Coloured & Asian craft & trade	94	African unskilled
46	Coloured & Asian machine & plant operators	95	Coloured & Asian high- & skilled
47	Coloured & Asian elementary occupations	96	Coloured & Asian semi- & unskilled
48	Coloured & Asian agriculture & domestic workers	97	White high- & skilled
49	White high-skilled	98	White semi- & unskilled

Table 20: Other SAM Accounts

No.	Other Accounts	No.	Other Accounts (continued)
1	Import duties	10	Production subsidies
2	Export taxes	11	Production refunds or VAT
3	Value added tax on imports	12	Factor taxes
4	Value added tax on domestic goods	13	Direct income taxes
5	Excise duty	14	Government
6	Sales taxes	15	Business Enterprises
7	Sales subsidies	16	Savings
8	Net taxes on commodities	17	Stock Changes
9	Production taxes	18	Rest of the World

12.2. Accounts for the Regional Social Accounting Matrices

Table 21: Accounts for Western Cape and Northern Cape Regional SAM

No.	Account	No.	Account
	Commodities		**Activities (cont.)**
1	Summer Cereals	78	Wood paper media
2	Winter Cereals	79	Petroleum
3	Other Field Crops	80	Chemicals
4	Potatoes and Vegetables	81	Rubber plastic
5	Wine grapes	82	Non-metallic
6	Citrus	83	Iron and steel
7	Subtropical	84	Special purpose machinery
8	Deciduous	85	Electrical
9	Other Horticulture	86	Audiovisual
10	Livestock Sales	87	Transport equipment
11	Milk and Cream	88	Other manufacturing
12	Poultry	89	Electricity water
13	Other Animals	90	Construction
14	Forestry and fishing	91	Trade and accommodation
15	Other agriculture	92	Transport and communication
16	Coal and lignite products	93	Business services
17	Gold and uranium ore products	94	Government health social
18	Crude oil	95	Activities services
19	Other mining	96	Domestic services
20	Meat products		**Factors**
21	Fish products	97	Western Cape GOS
22	Fruit and vegetables products	98	Northern Cape GOS
23	Oils and fats products	99	Western Cape Land
24	Dairy products	100	Northern Cape Land
25	Grain mill products	101	Western Cape African, High-skilled & Skilled
26	Confectionary products	102	Western Cape African, Semi & unskilled
27	Other food products	103	Western Cape Coloured & Asian, High-skilled
28	Beverages and tobacco products	104	Western Cape Coloured & Asian, Clerks
29	Textile products	105	Western Cape Coloured & Asian, Services and sales
30	Wood paper media products	106	Western Cape Coloured & Asian, Craft and trade
31	Petroleum products	107	Western Cape Coloured & Asian, Machine and plant operators
32	Chemical products	108	Western Cape Coloured & Asian, Elementary
33	Rubber plastic products	109	Western Cape Coloured & Asian, Agriculture and fisheries & Domestic workers & Unspecified
34	Non-metallic products	110	Western Cape White, High-skilled
35	Iron and steel products	111	Western Cape White, Skilled
36	Special purpose machinery	112	Western Cape White, Semi- & Unskilled
37	Electrical products	113	Northern Cape African
38	Audiovisual products	114	Northern Cape Coloured & Asian, High-skilled & Skilled
39	Transport products	115	Northern Cape Coloured & Asian, Semi- & Unskilled
40	Other manufacturing	116	Northern Cape White, High-skilled & Skilled
41	Electricity water	117	Northern Cape White, Semi- & Unskilled
42	Construction		**Households**
43	Trade and accommodation	118	Western Cape African, Female, Lower Secondary and lower
44	Transport and communication	119	Western Cape African, Male, Lower Secondary
45	Business services	120	Western Cape African, Upper Secondary and higher
46	Government health social	121	Western Cape Asian & Coloured, Female, Primary and

No.	Account	No.	Account
			lower
47	Other services	122	Western Cape Asian & Coloured, Female, Lower Secondary
48	Domestic services	123	Western Cape Asian & Coloured, Female, Upper Secondary and higher
	Margins	124	Western Cape Asian & Coloured, Male, Primary and lower
49	Trade margin	125	Western Cape Asian & Coloured, Male, Lower Secondary
50	Transport margin	126	Western Cape Asian & Coloured, Male, Upper Secondary and higher
	Activities[1]	127	Western Cape White, Lower Secondary and lower
51	Western Cape 1	128	Western Cape White, Upper Secondary
52	Western Cape 2	129	Western Cape White, Tertiary
53	Western Cape 3	130	Northern Cape African, Primary and lower
54	Western Cape 4	131	Northern Cape African, Lower Secondary and higher
55	Western Cape 59	132	Northern Cape Coloured & Asian, Lower Secondary and lower
56	Western Cape 6	133	Northern Cape Coloured & Asian, Upper Secondary and higher
57	Western Cape 7	134	Northern Cape White
58	Western Cape 8		**Government**
59	Northern Cape 1	135	Import duties
60	Northern Cape 2_3	136	Value added tax on imports
61	Northern Cape 4	137	Value added tax on domestic go
62	Northern Cape 5	138	Excise duty
63	Northern Cape 6	139	Sales subsidies
64	Northern Cape 7	140	Production taxes
65	Northern Cape 8	141	Production subsidies
66	Forestry fishing	142	Production refunds or VAT
67	Other mining	143	Direct income taxes
68	Meat	144	Provincial Government
69	Fish	145	Central Government
70	Fruit	146	Business Enterprises
71	Oils		**Capital**
72	Dairy	147	Savings
73	Grain mills	148	Stock Changes
74	Confectionery		**Trade**
75	Other food	149	Rest of South Africa
76	Beverages and tobacco	150	Rest of the World
77	Textiles		

[1] For a description of each agricultural area see Table 28.

Table 22: Accounts for Eastern Cape and KwaZulu-Natal Regional SAM

No.	Account	No.	Account
	Commodities		**Activities (cont.)**
1	Summer Cereals	81	Petroleum
2	Winter Cereals	82	Chemicals
3	Other Field Crops	83	Rubber plastic
4	Potatoes and Vegetables	84	Non-metallic
5	Wine grapes	85	Iron and steel
6	Citrus	86	Special purpose machinery
7	Subtropical	87	Electrical
8	Deciduous	88	Audiovisual
9	Other Horticulture	89	Transport equipment
10	Livestock Sales	90	Other manufacturing
11	Milk and Cream	91	Electricity water
12	Poultry	92	Construction
13	Other Animals	93	Trade and accommodation
14	Forestry and fishing	94	Transport and communication
15	Other agriculture	95	Business services
16	Coal and lignite products	96	Government health social
17	Gold and uranium ore products	97	Activities services
18	Crude oil	98	Domestic services
19	Other mining		**Factors**
20	Meat products	99	Eastern Cape GOS
21	Fish products	100	KwaZulu-Natal GOS
22	Fruit and vegetables products	101	Eastern Cape Land
23	Oils and fats products	102	KwaZulu-Natal Land
24	Dairy products	103	Eastern Cape African, High-skilled
25	Grain mill products	104	Eastern Cape African, Skilled
26	Confectionary products	105	Eastern Cape African, Agriculture fisheries domestic elementary unspecified
27	Other food products	106	Eastern Cape African, Craft trade operators
28	Beverages and tobacco products	107	Eastern Cape Coloured & Asian, High-skilled & Skilled
29	Textile products	108	Eastern Cape Coloured & Asian, Semi- & Unskilled
30	Wood paper media products	109	Eastern Cape White, skilled
31	Petroleum products	110	Eastern Cape White, Semi- & Unskilled
32	Chemical products	111	Kwazulu-Natal African, High-skilled
33	Rubber plastic products	112	Kwazulu-Natal African, Skilled
34	Non-metallic products	113	KwaZulu-Natal African, Agriculture and fisheries
35	Iron and steel products	114	KwaZulu-Natal African, Craft trade operators
36	Special purpose machinery	115	KwaZulu-Natal African, Elementary, Domestic
37	Electrical products	116	Kwazulu-Natal Coloured
38	Audiovisual products	117	Kwazulu-Natal Asian, High-skilled & Skilled
39	Transport products	118	Kwazulu-Natal Asian, Semi- & Unskilled
40	Other manufacturing	119	Kwazulu-Natal White, High-skilled & Skilled
41	Electricity water	120	Kwazulu-Natal White, Semi- & Unskilled
42	Construction		**Households**
43	Trade and accommodation	121	Eastern Cape African, Agricultural
44	Transport and communication	122	Eastern Cape African, Homeland, Primary
45	Business services	123	Eastern Cape African, Homeland, Secondary
46	Government health social	124	Eastern Cape African, Non-Homeland, Primary
47	Other services	125	Eastern Cape African, Non-Homeland, Secondary
48	Domestic services	126	Eastern Cape Asian & Coloured, Lower
	Margins	127	Eastern Cape Asian & Coloured, Upper Secondary and higher

No.	Account	No.	Account
49	Trade margin	128	Eastern Cape White, Lower Secondary and lower
50	Transport margin	129	Eastern Cape White, upper
	Activities[1]	130	KwaZulu-Natal African, Agricultural, Homeland
51	Eastern Cape 1	131	KwaZulu-Natal African, Agricultural, Non-Homeland
52	Eastern Cape 2	132	KwaZulu-Natal African, Homeland, Primary
53	Eastern Cape 3	133	KwaZulu-Natal African, Homeland, Secondary
54	Eastern Cape 4	134	KwaZulu-Natal African, Non-Homeland, Primary
55	Eastern Cape 5	135	KwaZulu-Natal African, Non-Homeland, Secondary
56	Eastern Cape 690	136	KwaZulu-Natal Asian, Female, Lower Secondary and lower
57	Eastern Cape 7	137	KwaZulu-Natal Asian, Male, Lower Secondary and lower
58	Eastern Cape 8	138	KwaZulu-Natal Asian, Male, Upper Secondary and higher
59	Kwazulu-Natal 14	139	KwaZulu-Natal Coloured
60	Kwazulu-Natal 25	140	KwaZulu-Natal White, Upper Secondary
61	Kwazulu-Natal 3	141	KwaZulu-Natal White, Tertiary
62	Kwazulu-Natal 6		**Government**
63	Kwazulu-Natal 7	142	Import duties
64	Kwazulu-Natal 8	143	Value added tax on imports
65	Kwazulu-Natal 9	144	Value added tax on domestic go
66	Kwazulu-Natal 10_11	145	Excise duty
67	Forestry fishing	146	Sales subsidies
68	Coal	147	Production taxes
69	Other mining	148	Production subsidies
70	Meat	149	Production refunds or VAT
71	Fish	150	Direct income taxes
72	Fruit	151	Provincial Government
73	Oils	152	Central Government
74	Dairy	153	Business Enterprises
75	Grain mills		**Capital**
76	Confectionery	154	Savings
77	Other food	155	Stock Changes
78	Beverages and tobacco		**Trade**
79	Textiles	156	Rest of South Africa
80	Wood paper media	157	Rest of the World

[1] For a description of each agricultural area see Table 28.

Table 23: Accounts for North West, Free State and Gauteng Regional SAM

No.	Account	No.	Account
	Commodities		**Activities (cont.)**
1	Summer Cereals	89	Transport equipment
2	Winter Cereals	90	Other manufacturing
3	Other Field Crops	91	Electricity water
4	Potatoes and Vegetables	92	Construction
5	Wine grapes	93	Trade and accommodation
6	Citrus	94	Transport and communication
7	Subtropical	95	Business services
8	Deciduous	96	Government health social
9	Other Horticulture	97	Activities services
10	Livestock Sales	98	Domestic services
11	Milk and Cream		**Factors**
12	Poultry	99	North West GOS
13	Other Animals	100	Free State GOS
14	Forestry and fishing	101	Gauteng GOS
15	Other agriculture	102	North West Land
16	Coal and lignite products	103	Free State Land
17	Gold and uranium ore products	104	Gauteng Land
18	Crude oil	105	Free State African, High-skilled & Skilled
19	Other mining	106	Free State African, Semi-skilled
20	Meat products	107	Free State African, Unskilled
21	Fish products	108	Free State Coloured & Asian
22	Fruit and vegetables products	109	Free State White, High-skilled & Skilled
23	Oils and fats products	110	Free State White, Semi- & Unskilled
24	Dairy products	111	North West African, High-skilled & Skilled
25	Grain mill products	112	North West African, Semi-skilled
26	Confectionary products	113	North West African, Unskilled
27	Other food products	114	North West Coloured & Asian
28	Beverages and tobacco products	115	North West White, High-skilled & Skilled
29	Textile products	116	North West White, Semi- & Unskilled
30	Wood paper media products	117	Gauteng African, High-skilled
31	Petroleum products	118	Gauteng African, Clerks
32	Chemical products	119	Gauteng African, Services and sales
33	Rubber plastic products	120	Gauteng African, Craft and trade
34	Non-metallic products	121	Gauteng African, Machine and plant operators
35	Iron and steel products	122	Gauteng African, Elementary
36	Special purpose machinery	123	Gauteng African, Domestic workers & Agriculture and fisheries & Unspecified
37	Electrical products	124	Gauteng Coloured
38	Audiovisual products	125	Gauteng Asian
39	Transport products	126	Gauteng White, High-skilled
40	Other manufacturing	127	Gauteng White, Skilled
41	Electricity water	128	Gauteng White, Semi- & Unskilled
42	Construction		**Households**
43	Trade and accommodation	129	Free State African, Agricultural
44	Transport and communication	130	Free State African, Female, Lower Secondary
45	Business services	131	Free State African, Female, Upper Secondary and higher
46	Government health social	132	Free State African, Male, Primary
47	Other services	133	Free State African, Male, Lower Secondary
48	Domestic services	134	Free State Asian & Coloured
	Margins	135	Free State White, Lower Secondary and lower

No.	Account	No.	Account
49	Trade margin	136	Free State White, Upper Secondary
50	Transport margin	137	Free State White, Tertiary
	Activities[1]	138	North West African, Agricultural
51	North West 1	139	North West African, Female, Primary
52	North West 2	140	North West African, Female, Lower Secondary
53	North West 3	141	North West African, Male, Primary
54	North West 4_5	142	North West African, Male, Lower Secondary
55	Free State 1	143	North West Asian & Coloured
56	Free State 2	144	North West White, Lower Secondary and lower
57	Free State 37	145	North West White, Upper Secondary and higher
58	Free State 4	146	Gauteng African, Agricultural
59	Free State 58	147	Gauteng African, Female, Lower Secondary
60	Free State 6	148	Gauteng African, Non-Homeland, Female, Upper Secondary
61	Gauteng 157	149	Gauteng African, Non-Homeland, Male, Lower Secondary
62	Gauteng 2	150	Gauteng African, Non-Homeland, Male, Upper Secondary
63	Gauteng 3	151	Gauteng Coloured, Lower Secondary and lower
64	Gauteng 4	152	Gauteng Coloured, Upper Secondary and higher
65	Gauteng 6	153	Gauteng Asian, Lower Secondary and lower
66	Forestry fishing	154	Gauteng Asian, Upper Secondary and higher
67	Coal	155	Gauteng White, Lower Secondary and lower
68	Gold	156	Gauteng White, Upper Secondary
69	Other mining	157	Gauteng White, Tertiary
70	Meat		**Government**
71	Fish	158	Import duties
72	Fruit	159	Value added tax on imports
73	Oils	160	Value added tax on domestic goods
74	Dairy	161	Excise duty
75	Grain mills	162	Sales subsidies
76	Confectionery	163	Production taxes
77	Other food	164	Production subsidies
78	Beverages and tobacco	165	Production refunds or VAT
79	Textiles	166	Direct income taxes
80	Wood paper media	167	Provincial Government
81	Petroleum	168	Central Government
82	Chemicals	169	Business Enterprises
83	Rubber plastic		**Capital**
84	Non-metallic	170	Savings
85	Iron and steel	171	Stock Changes
86	Special purpose machinery		**Trade**
87	Electrical	172	Rest of South Africa
88	Audiovisual	173	Rest of the World

[1] For a description of each agricultural area see Table 28.

Table 24: Accounts for Mpumalanga and Limpopo Regional SAM

No.	Account	No.	Account
	Commodities		**Activities (cont.)**
1	Summer Cereals	74	Textiles
2	Winter Cereals	75	Wood paper media
3	Other Field Crops	76	Petroleum
4	Potatoes and Vegetables	77	Chemicals
5	Wine grapes	78	Rubber plastic
6	Citrus	79	Non-metallic
7	Subtropical	80	Iron and steel
8	Deciduous	81	Special purpose machinery
9	Other Horticulture	82	Electrical
10	Livestock Sales	83	Audiovisual
11	Milk and Cream	84	Transport equipment
12	Poultry	85	Other manufacturing
13	Other Animals	86	Electricity water
14	Forestry and fishing	87	Construction
15	Other agriculture	88	Trade and accommodation
16	Coal and lignite products	89	Transport and communication
17	Gold and uranium ore products	90	Business services
18	Crude oil	91	Government health social
19	Other mining	92	Activities services
20	Meat products	93	Domestic services
21	Fish products		**Factors**
22	Fruit and vegetables products	94	Mpumalanga GOS
23	Oils and fats products	95	Limpopo GOS
24	Dairy products	96	Mpumalanga Land
25	Grain mill products	97	Limpopo Land
26	Confectionary products	98	Mpumalanga African, High-skilled
27	Other food products	99	Mpumalanga African, Skilled
28	Beverages and tobacco products	100	Mpumalanga African, Semi-skilled
29	Textile products	101	Mpumalanga African, Unskilled
30	Wood paper media products	102	Mpumalanga Coloured & Asian
31	Petroleum products	103	Mpumalanga White, High-skilled & Skilled
32	Chemical products	104	Mpumalanga White, Semi- & Unskilled
33	Rubber plastic products		**Households**
34	Non-metallic products	105	Limpopo African, High-skilled
35	Iron and steel products	106	Limpopo African, Skilled
36	Special purpose machinery	107	Limpopo African, Semi-skilled
37	Electrical products	108	Limpopo African, Unskilled
38	Audiovisual products	109	Limpopo Coloured & Asian
39	Transport products	110	Limpopo White, High-skilled & Skilled
40	Other manufacturing	111	Limpopo White, Semi- & Unskilled
41	Electricity water	112	Mpumalanga African, Agricultural
42	Construction	113	Mpumalanga African, Female, Primary
43	Trade and accommodation	114	Mpumalanga African, Female, Lower Secondary
44	Transport and communication	115	Mpumalanga African, Male, None
45	Business services	116	Mpumalanga African, Male, Primary
46	Government health social	117	Mpumalanga African, Male, Lower Secondary
47	Other services	118	Mpumalanga African, Male, Upper Secondary and higher
48	Domestic services	119	Mpumalanga Asian & Coloured
	Margins	120	Mpumalanga White
49	Trade margin	121	Limpopo African, Agricultural

No.	Account	No.	Account
50	Transport margin	122	Limpopo African, Female, Primary
	Activities[1]	123	Limpopo African, Female, Lower Secondary
51	Mpumalanga 1	124	Limpopo African, Male, Primary
52	Mpumalanga 2	125	Limpopo African, Male, Upper Secondary and higher
53	Mpumalanga 3	126	Limpopo Asian & Coloured
54	Mpumalanga 4	127	Limpopo White
55	Mpumalanga 5		**Government**
56	Mpumalanga 6	128	Import duties
57	Limpopo 1_2	129	Value added tax on imports
58	Limpopo 3	130	Value added tax on domestic go
59	Limpopo 4	131	Excise duty
60	Limpopo 5	132	Sales subsidies
61	Limpopo 6	133	Production taxes
62	Forestry fishing	134	Production subsidies
63	Coal	135	Production refunds or VAT
64	Gold	136	Direct income taxes
65	Other mining	137	Provincial Government
66	Meat	138	Central Government
67	Fruit	139	Business Enterprises
68	Oils		**Capital**
69	Dairy	140	Savings
70	Grain mills	141	Stock Changes
71	Confectionery		**Trade**
72	Other food	142	Rest of South Africa
73	Beverages and tobacco	143	Rest of the World

[1] For a description of each agricultural area see Table 28.

12.3. Accounts for the Multiregional Social Accounting Matrix

Note: Region 1 (R1) refers to Western Cape and Northern Cape, R2 to Eastern Cape and KwaZulu-Natal, R3 to North West, Gauteng and Free State and R4 to Limpopo and Mpumalanga.

Table 25: Accounts for the Multiregional Social Accounting Matrix

R1C1a	Summer Cereals	R3C1h	Citrus
R1C1b	Winter Cereals	R3C1i	Subtropical
R1C1c_e	Other Field Crops	R3C1j	Deciduous
R1C1f	Potatoes and Vegetables	R3C1k	Other Horticulture
R1C1g	Wine grapes	R3C1l	Livestock Sales
R1C1h	Citrus	R3C1m	Milk and Cream
R1C1i	Subtropical	R3C1o	Poultry
R1C1j	Deciduous	R3C1pr	Other Animals
R1C1k	Other Horticulture	R3C1qs	Forestry and fishing
R1C1l	Livestock Sales	R3C1nt	Other agriculture
R1C1m	Milk and Cream	R3C2	Coal and lignite products
R1C1o	Poultry	R3C3	Gold and uranium ore products
R1C1pr	Other Animals	R3C4a	Crude oil
R1C1qs	Forestry and fishing	R3C4b	Other mining
R1C1nt	Other agriculture	R3C5	Meat products
R1C2	Coal and lignite products	R3C6	Fish products
R1C3	Gold and uranium ore products	R3C7	Fruit and vegetables products
R1C4a	Crude oil	R3C8	Oils and fats products
R1C4b	Other mining	R3C9	Dairy products
R1C5	Meat products	R3C10_12	Grain mill products
R1C6	Fish products	R3C13_14	Confectionary products
R1C7	Fruit and vegetables products	R3C15	Other food products
R1C8	Oils and fats products	R3C16	Beverages and tobacco products
R1C9	Dairy products	R3C17_25	Textile products
R1C10_12	Grain mill products	R3C26_31	Wood paper media products
R1C13_14	Confectionary products	R3C32	Petroleum products
R1C15	Other food products	R3C33_40	Chemical products
R1C16	Beverages and tobacco products	R3C41_43	Rubber plastic products
R1C17_25	Textile products	R3C44_48	Non-metallic products
R1C26_31	Wood paper media products	R3C49_59	Iron and steel products
R1C32	Petroleum products	R3C60_66	Special purpose machinery
R1C33_40	Chemical products	R3C67_72	Electrical products
R1C41_43	Rubber plastic products	R3C73_74	Audiovisual products
R1C44_48	Non-metallic products	R3C75_77	Transport products
R1C49_59	Iron and steel products	R3C78_80	Other manufacturing
R1C60_66	Special purpose machinery	R3C81_82	Electricity water
R1C67_72	Electrical products	R3C83_84	Construction
R1C73_74	Audiovisual products	R3C85_86	Trade and accommodation
R1C75_77	Transport products	R3C87_88	Transport and communication
R1C78_80	Other manufacturing	R3C89_92	Business services
R1C81_82	Electricity water	R3C93_94	Government health social

R1C83_84	Construction
R1C85_86	Trade and accommodation
R1C87_88	Transport and communication
R1C89_92	Business services
R1C93_94	Government health social
R1C95	Other services
R1C96	Domestic services
R1M1	Trade margin
R1M2	Transport margin
R1AWC1	Western Cape 1
R1AWC2	Western Cape 2
R1AWC3	Western Cape 3
R1AWC4	Western Cape 4
R1AWC59	Western Cape 59
R1AWC6	Western Cape 6
R1AWC7	Western Cape 7
R1AWC8	Western Cape 8
R1ANC1	Northern Cape 1
R1ANC2_3	Northern Cape 2_3
R1ANC4	Northern Cape 4
R1ANC5	Northern Cape 5
R1ANC6	Northern Cape 6
R1ANC7	Northern Cape 7
R1ANC8	Northern Cape 8
R1A1b_c	Forestry fishing
R1A4	Other mining
R1A5	Meat
R1A6	Fish
R1A7	Fruit
R1A8	Oils
R1A9	Dairy
R1A10_12	Grain mills
R1A13_14	Confectionery
R1A15	Other food
R1A16	Beverages and tobacco
R1A17_25	Textiles
R1A26_31	Wood paper media
R1A32	Petroleum
R1A33_40	Chemicals
R1A41_43	Rubber plastic
R1A44_48	Non-metallic
R1A49_59	Iron and steel
R1A60_66	Special purpose machinery
R1A67_72	Electrical
R1A73_74	Audiovisual
R1A75_77	Transport equipment
R1A78_80	Other manufacturing
R1A81_82	Electricity water
R1A83_84	Construction
R1A85_86	Trade and accommodation
R1A87_88	Transport and communication

R3C95	Other services
R3C96	Domestic services
R3M1	Trade margin
R3M2	Transport margin
R3ANW1	North West 1
R3ANW2	North West 2
R3ANW3	North West 3
R3ANW4_5	North West 4_5
R3AFS1	Free State 1
R3AFS2	Free State 2
R3AFS37	Free State 37
R3AFS4	Free State 4
R3AFS58	Free State 58
R3AFS6	Free State 6
R3AGT157	Gauteng 157
R3AGT2	Gauteng 2
R3AGT3	Gauteng 3
R3AGT4	Gauteng 4
R3AGT6	Gauteng 6
R3A1b_c	Forestry fishing
R3A2	Coal
R3A3	Gold
R3A4	Other mining
R3A5	Meat
R3A6	Fish
R3A7	Fruit
R3A8	Oils
R3A9	Dairy
R3A10_12	Grain mills
R3A13_14	Confectionery
R3A15	Other food
R3A16	Beverages and tobacco
R3A17_25	Textiles
R3A26_31	Wood paper media
R3A32	Petroleum
R3A33_40	Chemicals
R3A41_43	Rubber plastic
R3A44_48	Non-metallic
R3A49_59	Iron and steel
R3A60_66	Special purpose machinery
R3A67_72	Electrical
R3A73_74	Audiovisual
R3A75_77	Transport equipment
R3A78_80	Other manufacturing
R3A81_82	Electricity water
R3A83_84	Construction
R3A85_86	Trade and accommodation
R3A87_88	Transport and communication
R3A89_91	Business services
R3A92_93	Government health social
R3A94	Activities services

R1A89_91	Business services	R3A95	Domestic services
R1A92_93	Government health social	R3GNW	North West GOS
R1A94	Activities services	R3GFS	Free State GOS
R1A95	Domestic services	R3GGT	Gauteng GOS
R1GWC	Western Cape GOS	R3FNNW	North West Land
R1GNC	Northern Cape GOS	R3FNFS	Free State Land
R1FNWC	Western Cape Land	R3FNGT	Gauteng Land
R1FNNC	Northern Cape Land	R3FFS1	Free State African, High-skilled & Skilled
R1FWC1	Western Cape African, High-skilled & Skilled	R3FFS2	Free State African, Semi-skilled
R1FWC2_3	Western Cape African, Semi & unskilled	R3FFS3	Free State African, Unskilled
R1FWC4	Western Cape Coloured & Asian, High-skilled	R3FFS4_5	Free State Coloured & Asian
R1FWC5	Western Cape Coloured & Asian, Clerks	R3FFS6	Free State White, High-skilled & Skilled
R1FWC6	Western Cape Coloured & Asian, Services and sales	R3FFS7	Free State White, Semi- & Unskilled
R1FWC7	Western Cape Coloured & Asian, Craft and trade	R3FNW1	North West African, High-skilled & Skilled
R1FWC8	Western Cape Coloured & Asian, Machine and plant operators	R3FNW2	North West African, Semi-skilled
R1FWC9	Western Cape Coloured & Asian, Elementary	R3FNW3	North West African, Unskilled
R1FWC10	Western Cape Coloured & Asian, Agriculture and fisheries & Domestic workers & Unspecified	R3FNW4_5	North West Coloured & Asian
R1FWC11	Western Cape White, High-skilled	R3FNW6	North West White, High-skilled & Skilled
R1FWC12	Western Cape White, Skilled	R3FNW7	North West White, Semi- & Unskilled
R1FWC13	Western Cape White, Semi- & Unskilled	R3FGT1	Gauteng African, High-skilled
R1FNC1_2	Northern Cape African	R3FGT2	Gauteng African, Clerks
R1FNC3	Northern Cape Coloured & Asian, High-skilled & Skilled	R3FGT3	Gauteng African, Services and sales
R1FNC4	Northern Cape Coloured & Asian, Semi- & Unskilled	R3FGT4	Gauteng African, Craft and trade
R1FNC5	Northern Cape White, High-skilled & Skilled	R3FGT5	Gauteng African, Machine and plant operators
R1FNC6	Northern Cape White, Semi- & Unskilled	R3FGT6	Gauteng African, Elementary
R1HWC1	Western Cape African, Female, Lower Secondary and lower	R3FGT7	Gauteng African, Domestic workers & Agriculture and fisheries & Unspecified
R1HWC2_3	Western Cape African, Male, Lower Secondary	R3FGT8_9	Gauteng Coloured
R1HWC4	Western Cape African, Upper Secondary and higher	R3FGT10_11	Gauteng Asian
R1HWC5	Western Cape Asian & Coloured, Female, Primary and lower	R3FGT12	Gauteng White, High-skilled
R1HWC6	Western Cape Asian & Coloured, Female, Lower Secondary	R3FGT13	Gauteng White, Skilled
R1HWC7	Western Cape Asian & Coloured, Female, Upper Secondary and higher	R3FGT14	Gauteng White, Semi- & Unskilled
R1HWC8	Western Cape Asian & Coloured, Male, Primary and lower	R3HFS1	Free State African, Agricultural
R1HWC9	Western Cape Asian & Coloured, Male, Lower Secondary	R3HFS2_4	Free State African, Female, Lower Secondary

R1HWC10_11	Western Cape Asian & Coloured, Male, Upper Secondary and higher	R3HFS5	Free State African, Female, Upper Secondary and higher
R1HWC12	Western Cape White, Lower Secondary and lower	R3HFS6_8	Free State African, Male, Primary
R1HWC13_14	Western Cape White, Upper Secondary	R3HFS9_12	Free State African, Male, Lower Secondary
R1HWC15_16	Western Cape White, Tertiary	R3HFS13	Free State Asian & Coloured
R1HNC1	Northern Cape African, Primary and lower	R3HFS14	Free State White, Lower Secondary and lower
R1HNC2	Northern Cape African, Lower Secondary and higher	R3HFS15	Free State White, Upper Secondary
R1HNC3	Northern Cape Coloured & Asian, Lower Secondary and lower	R3HFS16	Free State White, Tertiary
R1HNC4	Northern Cape Coloured & Asian, Upper Secondary and higher	R3HNW1	North West African, Agricultural
R1HNC5	Northern Cape White	R3HNW2_3	North West African, Female, Primary
R1IMPTAX	Import duties	R3HNW4_5	North West African, Female, Lower Secondary
R1VATM	Value added tax on imports	R3HNW6_9	North West African, Male, Primary
R1VATD	Value added tax on domestic go	R3HNW10_13	North West African, Male, Lower Secondary
R1ECTAX	Excise duty	R3HNW14	North West Asian & Coloured
R1SALSUB	Sales subsidies	R3HNW15	North West White, Lower Secondary and lower
R1INDTAX	Production taxes	R3HNW16	North West White, Upper Secondary and higher
R1INDSUB	Production subsidies	R3HGT1	Gauteng African, Agricultural
R1INDREF	Production refunds or VAT	R3HGT2_4	Gauteng African, Female, Lower Secondary
R1DIRTAX	Direct income taxes	R3HGT5_7	Gauteng African, Non-Homeland, Female, Upper Secondary
R1GOVP	Provincial Government	R3HGT8_10	Gauteng African, Non-Homeland, Male, Lower Secondary
R1GOVT	Central Government	R3HGT11_14	Gauteng African, Non-Homeland, Male, Upper Secondary
R1ENT	Business Enterprises	R3HGT15	Gauteng Coloured, Lower Secondary and lower
R1KAP	Savings	R3HGT16	Gauteng Coloured, Upper Secondary and higher
R1DSTOC	Stock Changes	R3HGT17	Gauteng Asian, Lower Secondary and lower
R1RSA	Rest of South Africa	R3HGT18	Gauteng Asian, Upper Secondary and higher
R1ROW	Rest of the World	R3HGT19_20	Gauteng White, Lower Secondary and lower
R2C1a	Summer Cereals	R3HGT21_22	Gauteng White, Upper Secondary
R2C1b	Winter Cereals	R3HGT23_24	Gauteng White, Tertiary
R2C1c_e	Other Field Crops	R3IMPTAX	Import duties
R2C1f	Potatoes and Vegetables	R3VATM	Value added tax on imports
R2C1g	Wine grapes	R3VATD	Value added tax on domestic go
R2C1h	Citrus	R3ECTAX	Excise duty
R2C1i	Subtropical	R3SALSUB	Sales subsidies
R2C1j	Deciduous	R3INDTAX	Production taxes

R2C1k	Other Horticulture
R2C1l	Livestock Sales
R2C1m	Milk and Cream
R2C1o	Poultry
R2C1pr	Other Animals
R2C1qs	Forestry and fishing
R2C1nt	Other agriculture
R2C2	Coal and lignite products
R2C3	Gold and uranium ore products
R2C4a	Crude oil
R2C4b	Other mining
R2C5	Meat products
R2C6	Fish products
R2C7	Fruit and vegetables products
R2C8	Oils and fats products
R2C9	Dairy products
R2C10_12	Grain mill products
R2C13_14	Confectionary products
R2C15	Other food products
R2C16	Beverages and tobacco products
R2C17_25	Textile products
R2C26_31	Wood paper media products
R2C32	Petroleum products
R2C33_40	Chemical products
R2C41_43	Rubber plastic products
R2C44_48	Non-metallic products
R2C49_59	Iron and steel products
R2C60_66	Special purpose machinery
R2C67_72	Electrical products
R2C73_74	Audiovisual products
R2C75_77	Transport products
R2C78_80	Other manufacturing
R2C81_82	Electricity water
R2C83_84	Construction
R2C85_86	Trade and accommodation
R2C87_88	Transport and communication
R2C89_92	Business services
R2C93_94	Government health social
R2C95	Other services
R2C96	Domestic services
R2M1	Trade margin
R2M2	Transport margin
R2AEC1	Eastern Cape 1
R2AEC2	Eastern Cape 2
R2AEC3	Eastern Cape 3
R2AEC4	Eastern Cape 4
R2AEC5	Eastern Cape 5
R2AEC690	Eastern Cape 690
R2AEC7	Eastern Cape 7
R2AEC8	Eastern Cape 8
R2AKZ14	Kwazulu-Natal 14
R2AKZ25	Kwazulu-Natal 25

R3INDSUB	Production subsidies
R3INDREF	Production refunds or VAT
R3DIRTAX	Direct income taxes
R3GOVP	Provincial Government
R3GOVT	Central Government
R3ENT	Business Enterprises
R3KAP	Savings
R3DSTOC	Stock Changes
R3RSA	Rest of South Africa
R3ROW	Rest of the World
R4C1a	Summer Cereals
R4C1b	Winter Cereals
R4C1c_e	Other Field Crops
R4C1f	Potatoes and Vegetables
R4C1g	Wine grapes
R4C1h	Citrus
R4C1i	Subtropical
R4C1j	Deciduous
R4C1k	Other Horticulture
R4C1l	Livestock Sales
R4C1m	Milk and Cream
R4C1o	Poultry
R4C1pr	Other Animals
R4C1qs	Forestry and fishing
R4C1nt	Other agriculture
R4C2	Coal and lignite products
R4C3	Gold and uranium ore products
R4C4a	Crude oil
R4C4b	Other mining
R4C5	Meat products
R4C6	Fish products
R4C7	Fruit and vegetables products
R4C8	Oils and fats products
R4C9	Dairy products
R4C10_12	Grain mill products
R4C13_14	Confectionary products
R4C15	Other food products
R4C16	Beverages and tobacco products
R4C17_25	Textile products
R4C26_31	Wood paper media products
R4C32	Petroleum products
R4C33_40	Chemical products
R4C41_43	Rubber plastic products
R4C44_48	Non-metallic products
R4C49_59	Iron and steel products
R4C60_66	Special purpose machinery
R4C67_72	Electrical products
R4C73_74	Audiovisual products
R4C75_77	Transport products
R4C78_80	Other manufacturing
R4C81_82	Electricity water
R4C83_84	Construction

R2AKZ3	Kwazulu-Natal 3
R2AKZ6	Kwazulu-Natal 6
R2AKZ7	Kwazulu-Natal 7
R2AKZ8	Kwazulu-Natal 8
R2AKZ9	Kwazulu-Natal 9
R2AKZ10_11	Kwazulu-Natal 10_11
R2A1b_c	Forestry fishing
R2A2	Coal
R2A4	Other mining
R2A5	Meat
R2A6	Fish
R2A7	Fruit
R2A8	Oils
R2A9	Dairy
R2A10_12	Grain mills
R2A13_14	Confectionery
R2A15	Other food
R2A16	Beverages and tobacco
R2A17_25	Textiles
R2A26_31	Wood paper media
R2A32	Petroleum
R2A33_40	Chemicals
R2A41_43	Rubber plastic
R2A44_48	Non-metallic
R2A49_59	Iron and steel
R2A60_66	Special purpose machinery
R2A67_72	Electrical
R2A73_74	Audiovisual
R2A75_77	Transport equipment
R2A78_80	Other manufacturing
R2A81_82	Electricity water
R2A83_84	Construction
R2A85_86	Trade and accommodation
R2A87_88	Transport and communication
R2A89_91	Business services
R2A92_93	Government health social
R2A94	Activities services
R2A95	Domestic services
R2GEC	Eastern Cape GOS
R2GKZ	KwaZulu-Natal GOS
R2FNEC	Eastern Cape Land
R2FNKZ	KwaZulu-Natal Land
R2FEC1	Eastern Cape African, High-skilled
R2FEC2	Eastern Cape African, Skilled
R2FEC367	Eastern Cape African, Agriculture fisheries domestic elementary unspec
R2FEC4_5	Eastern Cape African, Craft trade operators
R2FEC8	Eastern Cape Coloured & Asian, High-skilled & Skilled
R2FEC9	Eastern Cape Coloured & Asian, Semi- & Unskilled

R4C85_86	Trade and accommodation
R4C87_88	Transport and communication
R4C89_92	Business services
R4C93_94	Government health social
R4C95	Other services
R4C96	Domestic services
R4M1	Trade margin
R4M2	Transport margin
R4AMP1	Mpumalanga 1
R4AMP2	Mpumalanga 2
R4AMP3	Mpumalanga 3
R4AMP4	Mpumalanga 4
R4AMP5	Mpumalanga 5
R4AMP6	Mpumalanga 6
R4ALP1_2	Limpopo 1_2
R4ALP3	Limpopo 3
R4ALP4	Limpopo 4
R4ALP5	Limpopo 5
R4ALP6	Limpopo 6
R4A1b_c	Forestry fishing
R4A2	Coal
R4A3	Gold
R4A4	Other mining
R4A5	Meat
R4A7	Fruit
R4A8	Oils
R4A9	Dairy
R4A10_12	Grain mills
R4A13_14	Confectionery
R4A15	Other food
R4A16	Beverages and tobacco
R4A17_25	Textiles
R4A26_31	Wood paper media
R4A32	Petroleum
R4A33_40	Chemicals
R4A41_43	Rubber plastic
R4A44_48	Non-metallic
R4A49_59	Iron and steel
R4A60_66	Special purpose machinery
R4A67_72	Electrical
R4A73_74	Audiovisual
R4A75_77	Transport equipment
R4A78_80	Other manufacturing
R4A81_82	Electricity water
R4A83_84	Construction
R4A85_86	Trade and accommodation
R4A87_88	Transport and communication
R4A89_91	Business services

R2FEC10_11	Eastern Cape White, skilled	R4A92_93	Government health social
R2FEC12	Eastern Cape White, Semi- & Unskilled	R4A94	Activities services
R2FKZ1	Kwazulu-Natal African, High-skilled	R4A95	Domestic services
R2FKZ2	Kwazulu-Natal African, Skilled	R4GMP	Mpumalanga GOS
R2FKZ3	KwaZulu-Natal African, Agriculture and fisheries	R4GLP	Limpopo GOS
R2FKZ4_5	KwaZulu-Natal African, Craft trade operators	R4FNMP	Mpumalanga Land
R2FKZ6_7	KwaZulu-Natal African, Elementary, Domestic	R4FNLP	Limpopo Land
R2FKZ8_9	Kwazulu-Natal Coloured	R4FMP1	Mpumalanga African, High-skilled
R2FKZ10	Kwazulu-Natal Asian, High-skilled & Skilled	R4FMP2	Mpumalanga African, Skilled
R2FKZ11	Kwazulu-Natal Asian, Semi- & Unskilled	R4FMP3	Mpumalanga African, Semi-skilled
R2FKZ12	Kwazulu-Natal White, High-skilled & Skilled	R4FMP4	Mpumalanga African, Unskilled
R2FKZ13	Kwazulu-Natal White, Semi- & Unskilled	R4FMP5_6	Mpumalanga Coloured & Asian
R2HEC1	Eastern Cape African, Agricultural	R4FMP7	Mpumalanga White, High-skilled & Skilled
R2HEChp	Eastern Cape African, Homeland, Primary	R4FMP8	Mpumalanga White, Semi- & Unskilled
R2HEChs	Eastern Cape African, Homeland, Secondary	R4FLP1	Limpopo African, High-skilled
R2HECnhp	Eastern Cape African, Non-Homeland, Primary	R4FLP2	Limpopo African, Skilled
R2HECnhs	Eastern Cape African, Non-Homeland, Secondary	R4FLP3	Limpopo African, Semi-skilled
R2HEC20_21	Eastern Cape Asian & Coloured, Lower	R4FLP4	Limpopo African, Unskilled
R2HEC22	Eastern Cape Asian & Coloured, Upper Secondary and higher	R4FLP5_6	Limpopo Coloured & Asian
R2HEC23_24	Eastern Cape White, Lower Secondary and lower	R4FLP7	Limpopo White, High-skilled & Skilled
R2HEC25	Eastern Cape White, upper	R4FLP8	Limpopo White, Semi- & Unskilled
R2HKZ1	KwaZulu-Natal African, Agricultural, Homeland	R4HMP1	Mpumalanga African, Agricultural
R2HKZ2_3	KwaZulu-Natal African, Agricultural, Non-Homeland	R4HMP2_3	Mpumalanga African, Female, Primary
R2HKZhp	KwaZulu-Natal African, Homeland, Primary	R4HMP4_5	Mpumalanga African, Female, Lower Secondary
R2HKZhs	KwaZulu-Natal African, Homeland, Secondary	R4HMP6	Mpumalanga African, Male, None
R2HKZnhp	KwaZulu-Natal African, Non-Homeland, Primary	R4HMP7_8	Mpumalanga African, Male, Primary
R2HKZnhs	KwaZulu-Natal African, Non-Homeland, Secondary	R4HMP9_10	Mpumalanga African, Male, Lower Secondary
R2HKZ23	KwaZulu-Natal Asian, Female, Lower Secondary and lower	R4HMP11_12	Mpumalanga African, Male, Upper Secondary and higher
R2HKZ24_25	KwaZulu-Natal Asian, Male, Lower Secondary and lower	R4HMP13	Mpumalanga Asian & Coloured
R2HKZ26_27	KwaZulu-Natal Asian, Male, Upper Secondary and higher	R4HMP14	Mpumalanga White
R2HKZ28	KwaZulu-Natal Coloured	R4HLP1	Limpopo African, Agricultural
R2HKZ29_31	KwaZulu-Natal White, Upper Secondary	R4HLP2_3	Limpopo African, Female, Primary

R2HKZ32	KwaZulu-Natal White, Tertiary	R4HLP4_6	Limpopo African, Female, Lower Secondary
R2IMPTAX	Import duties	R4HLP7_9	Limpopo African, Male, Primary
R2VATM	Value added tax on imports	R4HLP10_12	Limpopo African, Male, Upper Secondary and higher
R2VATD	Value added tax on domestic go	R4HLP13	Limpopo Asian & Coloured
R2ECTAX	Excise duty	R4HLP14	Limpopo White
R2SALSUB	Sales subsidies	R4IMPTAX	Import duties
R2INDTAX	Production taxes	R4VATM	Value added tax on imports
R2INDSUB	Production subsidies	R4VATD	Value added tax on domestic go
R2INDREF	Production refunds or VAT	R4ECTAX	Excise duty
R2DIRTAX	Direct income taxes	R4SALSUB	Sales subsidies
R2GOVP	Provincial Government	R4INDTAX	Production taxes
R2GOVT	Central Government	R4INDSUB	Production subsidies
R2ENT	Business Enterprises	R4INDREF	Production refunds or VAT
R2KAP	Savings	R4DIRTAX	Direct income taxes
R2DSTOC	Stock Changes	R4GOVP	Provincial Government
R2RSA	Rest of South Africa	R4GOVT	Central Government
R2ROW	Rest of the World	R4ENT	Business Enterprises
R3C1a	Summer Cereals	R4KAP	Savings
R3C1b	Winter Cereals	R4DSTOC	Stock Changes
R3C1c_e	Other Field Crops	R4RSA	Rest of South Africa
R3C1f	Potatoes and Vegetables	R4ROW	Rest of the World
R3C1g	Wine grapes	TOTAL	Account totals

12.4. Classification mappings

Table 26: Mapping of LFS 2000:2 activity accounts to 94 activity accounts in the SAM

SAM Code	Description	SIC codes	LFS code	Disaggregation
A1	Agricultural products	100-199	1	100%
A2	Coal and lignite products	210	2	100%
A3	Gold and uranium ore products	230	3	100%
A4	Other mining products	221,240,241,242,250,251,252,253,290	4	100%
A5	Meat products	301	5	35%
A6	Fish products			16%
A7	Fruit and vegetables products			33%
A8	Oils and fats products			16%
A9	Dairy products	302	9	100%
A10	Grain mill products	303	10	72%
A11	Animal feeds			28%
A12	Bakery products	304	11	34%
A13	Sugar products			17%
A14	Confectionary products			18%
A15	Other food products			30%
A16	Beverages and tobacco products	305, 306	16	100%
A17	Textile products	310, 311	17	100%
A18	Made-up textile products	312	18	61%
A19	Carpets			14%
A20	Other textile products			25%
A21	Knitting mill products	313	21	100%
A22	Wearing apparel	314	22	100%
A23	Leather products	315	23	100%
A24	Handbags	316	24	100%
A25	Footwear	317	25	100%
A26	Wood products	321, 322	26	100%
A27	Paper products	323	27	36%
A28	Containers of paper			42%
A29	Other paper products			22%
A30	Published and printed products	324, 325, 326	30	99%
A31	Recorded media products			1%
A32	Petroleum products	331, 332, 333	32	100%
A33	Basic chemical products	334	33	100%
A34	Fertilizers	335, 336	34	6%
A35	Primary plastic products			14%
A36	Pesticides			4%
A37	Paints			11%
A38	Pharmaceutical products			24%
A39	Soap products			23%
A40	Other chemical products			18%
A41	Rubber tyres	337	41	74%
A42	Other rubber products			26%
A43	Plastic products	338	43	100%
A44	Glass products	341	44	100%
A45	Ceramicware	342	45	5%

SAM Code	Description	SIC codes	LFS code	Disaggregation
A46	Ceramic products			34%
A47	Cement			16%
A48	Other non-metallic products			44%
A49	Iron and steel products	351, 353	49	100%
A50	Non-ferrous metals	352	50	100%
A51	Structural metal products	354	51	100%
A52	Treated metal products	355	52	22%
A53	General hardware products			14%
A54	Other fabricated metal products			65%
A55	Engines	356	55	10%
A56	Pumps			16%
A57	Gears			10%
A58	Lifting equipment			19%
A59	General machinery			45%
A60	Agricultural machinery	357	60	10%
A61	Machine-tools			9%
A62	Mining machinery			33%
A63	Food machinery			5%
A64	Other special machinery			43%
A65	Household appliances	358	65	100%
A66	Office machinery	359	66	100%
A67	Electric motors	360, 361	67	100%
A68	Electricity apparatus	362	68	100%
A69	Wire and cable products	363	69	100%
A70	Accumulators	364	70	100%
A71	Lighting equipment	365	71	100%
A72	Other electrical products	366	72	100%
A73	Radio and television products	371, 372, 273	73	100%
A74	Optical instruments	374, 375, 376	74	100%
A75	Motor vehicles	381	75	100%
A76	Motor vehicles parts	382, 383	76	100%
A77	Other transport products	384, 385, 386, 387	77	100%
A78	Furniture	391	78	100%
A79	Jewellery	392, 395	79	31%
A80	Other manufacturing			69%
A81	Electricity	410, 411, 412	81	100%
A82	Water	413, 420	82	100%
A83	Buildings	500, 501, 502	83	100%
A84	Other constructions	503, 504	84	100%
A85	Trade services	505, 610-635	85	100%
A86	Accommodation	641, 642, 643	86	100%
A87	Transport services	710-741	87	100%
A88	Communications	750, 751, 752	88	100%
A89	Insurance services	810-832	89	100%
A90	Real estate services	840-842	90	100%
A91	Other business services	850-899	91	100%
A92	General Government services	910-920	92	100%
A93	Health and social work	930-940	93	100%
A94	Other services / activities	950-990	94	100%

Table 27: Mapping of industries reported in VAT data to SAM activities

VAT code	VAT industry	SAM code	SAM activity
0105	Livestock farming	A1	Agricultural products
0110	Crop farming	A1	Agricultural products
0115	Production of milk	A1	Agricultural products
0120	Mixed farming (no more than 50% in any of the above)	A1	Agricultural products
0125	Poultry farming	A1	Agricultural products
0130	Breeding of non-food producing animals (including horses)	A1	Agricultural products
0135	Agricultural services (excluding veterinary services)	A1	Agricultural products
0140	Market gardening	A1	Agricultural products
0145	Fruit farming	A1	Agricultural products
0150	Flower and seed growing	A1	Agricultural products
0155	Forestry and logging	A1	Agricultural products
0160	Fishing	A1	Agricultural products
0165	Other	A1	Agricultural products
0205	Coal	A2	Coal and lignite products
0240	Gold and uranium	A3	Gold and uranium ore products
0210	Crude petroleum and natural gas production	A4	Other mining products
0215	Iron ore	A4	Other mining products
0220	Chrome	A4	Other mining products
0225	Copper	A4	Other mining products
0230	Manganese	A4	Other mining products
0235	Patinum	A4	Other mining products
0245	Other metal ore mining	A4	Other mining products
0250	Diamond mining	A4	Other mining products
0255	Stone quarrying, clay and sand-pits	A4	Other mining products
0260	Chemical and fertilizer mineral mining	A4	Other mining products
0265	Other mining not specified	A4	Other mining products
0305	Slaughtering, preparing and preserving meat	A5	Meat products
0320	Canning, preserving and processing of fish and related products	A6	Fish products
0315	Canning and preserving of fruits and vegetables	A7	Fruit and vegetables products
0325	Vegetable and animal oils and fats	A8	Oils and fats products
0310	Dairy products (except processing of milk for retail sale, see Dairies - 2204)	A9	Dairy products
0330	Grain mill products	A10	Grain mill products
0350	Prepared animal feeds	A11	Animal feeds
0335	Bakery products	A12	Bakery products
0340	Sugar factories and refineries	A13	Sugar products
0345	Cocoa, chocolate and sugar confectionery	A14	Confectionery products
0355	Food products and industries not elsewhere specified	A15	Other food products
0360	Brewing and malting	A16	Beverages and tobacco products
0365	Soft drinks	A16	Beverages and tobacco products
0370	Spirit distilling and compounding	A16	Beverages and tobacco products
0375	Wine (including blending)	A16	Beverages and tobacco products
0380	Tobacco products	A16	Beverages and tobacco products
0405	Spinning, weaving and finishing of textiles	A17	Textile products
0410	Made-up textile goods (except clothing)	A18	Made-up textile products
0420	Carpets and rugs	A19	Carpets
0425	Rope, twine, net and related products	A20	Other textile products

VAT code	VAT industry	SAM code	SAM activity
0430	Textiles not elsewhere	A20	Other textile products
0415	Hosiery and other knitted goods	A21	Knitting mill products
0505	Men's and boys' clothing	A22	Wearing apparel
0510	Women's and girls' clothing	A22	Wearing apparel
0515	Tailoring	A22	Wearing apparel
0520	Furriers	A22	Wearing apparel
0525	Millinery	A22	Wearing apparel
0605	Leather, fur (tanning and dressing) and fellmongery	A23	Leather products
0610	Travel goods (including goods of plastic and imitation leather)	A23	Leather products
0620	Other leather goods (including imitation leather)	A23	Leather products
0615	handbags (including handbags of plastic and imitation leather)	A24	Handbags
0530	Footwear	A25	Footwear
0705	Sawmills and other wood mills	A26	Wood products
0710	Wood and cane containers	A26	Wood products
0715	Other miscellaneous wood and cork manufacturing	A26	Wood products
0805	Pulp, paper and board	A27	Paper products
0810	Packaging products of paper, board and associated materials	A28	Containers of paper
0815	Manufactured stationery	A29	Other paper products
0820	Manufacture of paper and board not elsewhere specified	A29	Other paper products
0825	Printing and publishing of newspapers	A30	Published and printed products
0830	Printing and publishing of periodicals	A30	Published and printed products
0835	publishing of books	A30	Published and printed products
0840	Prints and reproductions	A30	Published and printed products
0845	Bookbinding	A30	Published and printed products
0850	Other printing and services for printers	A30	Published and printed products
		A31	Recorded media products
1005	Manufactured fuel	A32	Petroleum products
1010	Mineral oil refining	A32	Petroleum products
1015	Lubricating oils and greases	A32	Petroleum products
1020	Other petroleum and coal products	A32	Petroleum products
905	Industrial chemicals (except fertilizers)	A33	Basic chemical products
910	Fertilizers	A34	Fertilizers
920	Synthetic resins and plastic materials	A35	Primary plastic products
915	Pesticides	A36	Pesticides
925	Paint	A37	Paints
930	Medicinal and pharmaceutical preparations	A38	Pharmaceutical products
935	Soap and detergents	A39	Soap products
940	Perfumes, cosmetics and other toilet preparations	A39	Soap products
960	Other chemical industries not elsewhere specified	A40	Other chemical products
945	Tyres and tubes (including retreading)	A41	Rubber tyres
950	Other rubber products (including synthetic rubber)	A42	Other rubber products
955	Plastic products not elsewhere specified	A43	Plastic products
1110	Glass and glass products	A44	Glass products
1105	Ceramics	A45	Ceramicware
		A46	Ceramic products

VAT code	VAT industry	SAM code	SAM activity
1120	Cement	A47	Cement
1115	Bricks, tiles and refractory goods	A48	Other non-metallic products
1125	Abrasives and building materials not elsewhere specified	A48	Other non-metallic products
1205	Iron and steel	A49	Iron and steel products
1210	Steel tubes	A49	Iron and steel products
1215	Iron castings, etc	A49	Iron and steel products
1220	Aluminium and aluminium alloys	A50	Non-ferrous metals
1225	Copper, brass and other copper alloys	A50	Non-ferrous metals
1230	Other base metals	A50	Non-ferrous metals
1235	Precious metals	A50	Non-ferrous metals
1320	Prefabricated steel buildings	A51	Structural metal products
1325	Boiler manufacture	A51	Structural metal products
		A52	Treated metal products
1305	Cutlery, hand tools and general hardware	A53	General hardware products
1315	Building hardware	A53	General hardware products
1330	Sheet metal products	A53	General hardware products
1408	Metal and woodworking machinery	A53	General hardware products
1310	Furniture and fixtures primarily of metal	A54	Other fabricated metal products
1335	Bolts, nuts, screws, rivets, etc	A54	Other fabricated metal products
1340	Cables, wire, wire products and gates	A54	Other fabricated metal products
1345	Tinware	A54	Other fabricated metal products
1350	Electroplating, galvanizing, enamelling, etc	A54	Other fabricated metal products
1355	Metal products not elsewhere specified	A54	Other fabricated metal products
1404	Industrial engines	A55	Engines
1360	Engineering workshops (excluding specialised automotive engineering work-shops working primarily for the motor trade, see 1525)	A55	Engines
1402	Pumps, valves and compressors	A56	Pumps
		A57	Gears
		A58	Lifting equipment
1410	Textile machinery and accessories	A59	General machinery
1406	Agricultural machinery (except tractors)	A60	Agricultural machinery
		A61	Machine-tools
		A62	Mining machinery
		A63	Food machinery
1412	Construction and earth moving equipment	A64	Other special machinery
1418	Refrigerators, washing machines, stoves and ovens	A64	Other special machinery
1422	Air conditioning and ventilation machinery	A64	Other special machinery
1424	Other specialised machinery and parts for specific industries	A64	Other special machinery
1426	Other machinery and machine spares for general purposes	A64	Other special machinery
		A65	Household appliances
		A66	Office machinery
		A67	Electric motors
1428	Electrical machinery and apparatus for generation and control (including electric motors)	A68	Electricity apparatus
		A69	Wire and cable products
		A70	Accumulators
1414	Mechanical handling equipment	A71	Lighting equipment
1416	Computers and office, calculating and accounting machinery	A71	Lighting equipment

VAT code	VAT industry	SAM code	SAM activity
1420	Other electric appliances primarily for domestic use	A72	Other electrical products
		A73	Radio and television products
		A74	Optical instruments
1505	Motor vehicles	A75	Motor vehicles
1510	Caravans, trailers and vehicles bodies	A75	Motor vehicles
1515	Tractors	A75	Motor vehicles
1520	Motor vehicle parts and accessories (excluding tyres and tubes, glass and electrical equipment)	A76	Motor vehicles parts
1525	Specialised automotive engineering workshops working primarily for the motor trade	A76	Motor vehicles parts
1605	Ship and boat building and repairs	A77	Other transport products
1610	Locomotives	A77	Other transport products
1615	Railway carriages and wagons	A77	Other transport products
1620	Motor cycles, pedal cycles and relevant parts	A77	Other transport products
1625	Aircraft manufacture and repairs	A77	Other transport products
1630	Transport equipment not elsewhere specified	A77	Other transport products
720	Home furniture (except primarily of metal)	A78	Furniture
725	Office Furniture (except primarily of metal)	A78	Furniture
1805	Jewellery and related articles	A79	Jewellery
1810	Musical instruments	A80	Other manufacturing
1815	Sporting and athletic equipment	A80	Other manufacturing
1820	Toys and games	A80	Other manufacturing
1825	Brushes and brooms	A80	Other manufacturing
1830	Miscellaneous stationers' goods (eg crayons, pens and pencils)	A80	Other manufacturing
1835	Signs and advertising displays	A80	Other manufacturing
1840	Other miscellaneous manufacturing industries (including number plates) lamps, paper patterns, engraving, rubber stamps, novelties and umbrellas	A80	Other manufacturing
1705	Scientific, laboratory and industrial instruments and systems	A80	Other manufacturing
1710	Orthopaedic appliances and supplies	A80	Other manufacturing
1715	Surgical, medical and dental instruments and appliances	A80	Other manufacturing
1720	Photographic, optical and document copying equipment	A80	Other manufacturing
1725	Watches and clocks	A80	Other manufacturing
1905	Electricity generation and distribution	A81	Electricity
1910	Gas manufacture and distribution	A81	Electricity
1915	Water collection, purification and distribution	A82	Water
2002	Home builders engaged in family housing	A83	Buildings
2004	Other building construction by general contractors	A83	Buildings
2006	Painters and decorators	A84	Other constructions
2008	Plumbers	A84	Other constructions
2010	Electrical contractors	A84	Other constructions
2012	Joiners and carpenters	A84	Other constructions
2014	Shop fittings	A84	Other constructions
2016	Roofing contractors	A84	Other constructions
2018	Plastering contractors	A84	Other constructions
2020	Glazing contractors	A84	Other constructions

VAT code	VAT industry	SAM code	SAM activity
2022	Demolition contractors	A84	Other constructions
2024	Heating and ventilating	A84	Other constructions
2026	Asphalt and tar spraying contractors	A84	Other constructions
2028	Plant hiring with operators (see 2574)	A84	Other constructions
2030	Flooring contractors	A84	Other constructions
2032	Insulating specialists	A84	Other constructions
2034	Suspended ceiling specialists	A84	Other constructions
2036	Wall and floor tiling specialists	A84	Other constructions
2038	Specialists not elsewhere specified	A84	Other constructions
2040	Civil engineering contractors	A84	Other constructions
2042	Swimming pool and similar contractors	A84	Other constructions
2044	Other contractors	A84	Other constructions
2046	Paving	A84	Other constructions
2102	Fresh meat	A85	Trade services
2104	Fresh fruit and vegetables	A85	Trade services
2106	Dairy products	A85	Trade services
2108	Bakery products	A85	Trade services
2110	Alcoholic drink (including bottling but excluding blending)	A85	Trade services
2112	Other food and drink	A85	Trade services
2114	Tobacco	A85	Trade services
2116	Agricultural and pastoral products (including livestock)	A85	Trade services
2118	Textiles, rugs and carpets	A85	Trade services
2120	Clothing	A85	Trade services
2122	Footwear	A85	Trade services
2124	Furniture and household requisites	A85	Trade services
2126	Electrical goods 9including household appliances)	A85	Trade services
2128	Books	A85	Trade services
2130	Stationery	A85	Trade services
2132	Office and ship equipment	A85	Trade services
2134	Jewellery	A85	Trade services
2136	Industrial and heavy chemicals	A85	Trade services
2138	Pharmaceuticals	A85	Trade services
2140	Toiletries	A85	Trade services
2142	Construction and building materials	A85	Trade services
2144	Petroleum products	A85	Trade services
2146	Mining, industrial and agricultural machinery and equipment	A85	Trade services
2148	Computers (including leasing and repairs)	A85	Trade services
2150	General wholesalers	A85	Trade services
2152	Motor vehicles and accessories	A85	Trade services
2154	Scrap and waste merchants (including collection and distribution)	A85	Trade services
2156	Other goods	A85	Trade services
2202	Butchers	A85	Trade services
2204	Dairies and dairy products	A85	Trade services
2206	Greengrocers and fruiterers	A85	Trade services
2208	Fishmongers	A85	Trade services
2210	Bakers and confectioners (solely for sale on the premises)	A85	Trade services
2212	Grocers	A85	Trade services
2214	Bottle stores	A85	Trade services
2216	Men’s outfitters	A85	Trade services

VAT code	VAT industry	SAM code	SAM activity
2218	Ladies' outfitters	A85	Trade services
2220	General outfitters	A85	Trade services
2222	Household textiles	A85	Trade services
2224	Shoe stores	A85	Trade services
2226	Domestic furniture and household appliances	A85	Trade services
2228	Antique dealers, second-hand furniture shops, art dealers, picture framers and dealers in stamps and coins	A85	Trade services
2230	Books stores and stationers	A85	Trade services
2232	Jewellery, watch and clock retailers and repairers	A85	Trade services
2234	Chemists	A85	Trade services
2236	Photographic shops	A85	Trade services
2238	Building material and hardware merchants	A85	Trade services
2240	Bicycle dealers	A85	Trade services
2242	Fuel and coal merchants (excluding petrol filling stations)	A85	Trade services
2234	Garages, filling stations and workshops	A85	Trade services
2246	Used motor vehicles	A85	Trade services
2248	Caravans and trailers	A85	Trade services
2250	Motor cycle dealers	A85	Trade services
2252	Spares and accessories dealers	A85	Trade services
2254	Motor scrap-yards	A85	Trade services
2256	Retail tyre dealers	A85	Trade services
2258	Sport and recreational equipment	A85	Trade services
2260	Department stores and general dealers	A85	Trade services
2262	Florists and garden shops (except growers, see 0150)	A85	Trade services
2264	Pet and pet food shops	A85	Trade services
2266	Dealers in radio, TV and electrical goods (excluding radio and TV rental)	A85	Trade services
2268	Radio and TV shops	A85	Trade services
2270	Dealers in miscellaneous goods	A85	Trade services
2305	Bars and beer gardens	A86	Accommodation
2310	Restaurants or tearooms selling food for consumption mainly on the premises	A86	Accommodation
2315	Caterers	A86	Accommodation
2320	Fish and chips shops, sandwich and snack bars and other establishments selling foods for consumption mainly off the premises	A86	Accommodation
2325	Registered hotels and motels	A86	Accommodation
2330	Boarding houses	A86	Accommodation
2335	Caravan Parks	A86	Accommodation
2340	Other accommodation, eg (furnished flats (holiday), rooms without meals, caravans and mobile homes	A86	Accommodation
2405	Railway transport and services	A87	Transport services
2410	Bus transport (excluding taxis)	A87	Transport services
2415	Taxis	A87	Transport services
2420	Renting of trucks, cars, trailers and containers (except caravans)	A87	Transport services
2425	Road haulage	A87	Transport services
2430	Sea transport and supporting services	A87	Transport services
2435	Air transport and supporting services	A87	Transport services
2440	Renting of aircraft	A87	Transport services

VAT code	VAT industry	SAM code	SAM activity
2445	Shipping, clearing and forwarding agents	A87	Transport services
2450	Travel agents	A87	Transport services
2455	Operation of car parks and toll roads	A87	Transport services
2460	Storage and warehousing	A87	Transport services
2465	Other miscellaneous transport and supporting services	A87	Transport services
2470	Postal services and telecommunications	A88	Communications
2502	Discount houses	A89	Insurance services
2310	Commercial banks	A89	Insurance services
2506	Building Societies	A89	Insurance services
2508	Merchant banks	A89	Insurance services
2510	Hire-purchase, savings and general banks	A89	Insurance services
2512	Land and Agricultural Bank of South Africa	A89	Insurance services
2514	Stockbrokers	A89	Insurance services
2516	Unit trust schemes	A89	Insurance services
2518	Other financial institutions (including buying associations)	A89	Insurance services
2520	Financial services	A89	Insurance services
2522	Long-term insurance (including retirement annuity and benefit funds)	A89	Insurance services
2524	Short-term insurance	A89	Insurance services
2526	Registered pension / provident funds	A89	Insurance services
2528	Medical benefit / aid societies	A89	Insurance services
2530	Insurance brokers and other insurance services (including insurance agents on commission basis	A89	Insurance services
2532	Property letting : business premises	A90	Real estate services
2534	Property letting : residential accommodation	A90	Real estate services
2436	Township developers	A90	Real estate services
2538	Estate agencies	A90	Real estate services
2540	Rent collectors, appraisers and valuers	A90	Real estate services
2542	Attorneys, notaries and conveyancers	A91	Other business services
2544	Advocates	A91	Other business services
2546	Registered accountants and auditors	A91	Other business services
2548	Cost and management accountants	A91	Other business services
2550	Bookkeeping services	A91	Other business services
2552	Programming and data processing services	A91	Other business services
2554	Consulting engineers	A91	Other business services
2556	Constructional engineers	A91	Other business services
2558	Architects	A91	Other business services
2560	Quantity surveyors	A91	Other business services
2562	Land surveyors	A91	Other business services
2564	Geological and prospecting services	A91	Other business services
2566	Tracers and draughtsmen	A91	Other business services
2568	Advertising and market research services	A91	Other business services
2570	Security services	A91	Other business services
2572	Other business services	A91	Other business services
2574	Renting or leasing of machinery and equipment without operators (excluding computers)	A91	Other business services
2605	Government departments	A92	General Government services
2610	Provincial administrations	A92	General Government services
2615	Regional and local authorities	A92	General Government services
2815	Medical and veterinary	A93	Health and social work
2905	Medical practitioners and specialists	A93	Health and social work

VAT code	VAT industry	SAM code	SAM activity
2910	Dentists and specialist dentists	A93	Health and social work
2915	Dental mechanics	A93	Health and social work
2920	Optometrists (including optical dispensers)	A93	Health and social work
2925	Other supplementary health services or para-medical personnel	A93	Health and social work
2930	Nursing services	A93	Health and social work
2935	Physiotherapists	A93	Health and social work
2940	Chiropractors	A93	Health and social work
2945	Other health services	A93	Health and social work
2950	General hospitals	A93	Health and social work
2955	Maternity homes	A93	Health and social work
2960	Psychiatric hospitals	A93	Health and social work
2965	Other hospitals	A93	Health and social work
2970	Veterinarians	A93	Health and social work
2975	Veterinary services (including kennels)	A93	Health and social work
3005	Welfare organisations	A93	Health and social work
2705	Pre-primary schools and créches	A94	Other services and activities
2710	Primary schools	A94	Other services and activities
2715	Secondary schools	A94	Other services and activities
2720	Schools for special education	A94	Other services and activities
2725	Technical colleges and technikons	A94	Other services and activities
2730	Teachers' training colleges	A94	Other services and activities
2735	Universities	A94	Other services and activities
2740	Correspondence and private colleges	A94	Other services and activities
2745	Other educational services (including driving schools, ballet and music teachers	A94	Other services and activities
2805	General (eg: CSIR)	A94	Other services and activities
2810	Agricultural and livestock	A94	Other services and activities
3010	Trade unions	A94	Other services and activities
3015	Industrial councils	A94	Other services and activities
3020	Business and professional organisations / associations	A94	Other services and activities
3025	Religious organisations	A94	Other services and activities
3030	Political organisations	A94	Other services and activities
3035	Societies and associations formed for their members' common cultural interest	A94	Other services and activities
3040	Other social and community services, eg automobile associations, etc	A94	Other services and activities
3105	Motion picture production	A94	Other services and activities
3110	Motion picture distribution and projection	A94	Other services and activities
3115	Radio and television broadcasting	A94	Other services and activities
3120	Theatrical productions and entertainment services	A94	Other services and activities
3125	Authors, composers of music and independent artists	A94	Other services and activities
3130	Libraries, museums, botanical and zoological gardens and other cultural services	A94	Other services and activities
3135	Professional sports promotion	A94	Other services and activities
3140	Turf clubs (horse racing)	A94	Other services and activities
3145	Dancing studios	A94	Other services and activities
3150	Sport and games clubs	A94	Other services and activities
3155	Amusement and recreational services not elsewhere specified	A94	Other services and activities
3205	Laundries, laundry services and cleaning and dyeing plants	A94	Other services and activities

VAT code	VAT industry	SAM code	SAM activity
3210	Hairdressing saloons	A94	Other services and activities
3215	Photographic studios (including commercial photography)	A94	Other services and activities
3220	Undertakers and crematoriums	A94	Other services and activities
3225	Gardening services	A94	Other services and activities
3230	Personal services not elsewhere specified, eg massage parlours, weight control studios, etc	A94	Other services and activities
3305	Typewriters and other office equipment	A94	Other services and activities
3110	Agricultural machinery and implements and farm tractors	A94	Other services and activities
3315	Other repair services rendered to business	A94	Other services and activities
3320	Footwear and other leather goods	A94	Other services and activities
3325	Servicing and installation of electrical and non-electrical household and personal appliances	A94	Other services and activities
3330	Panel beaters and spray-painters	A94	Other services and activities
3335	Other specialised automotive repair services (including towing services and motor vehicle washing and cleaning services)	A94	Other services and activities
3405	Auctioneers	A94	Other services and activities
3410	Market agents	A94	Other services and activities
3415	Representatives of manufacturing and trading establishments on commission basis	A94	Other services and activities
3420	Indent and foreign agents	A94	Other services and activities
3425	Hide and skin brokers	A94	Other services and activities
3430	Wool and mohair brokers	A94	Other services and activities
3435	Sanitation, garbage and sewage disposal	A94	Other services and activities
3440	Cleaning (buildings), exterminating, fumigating, disinfecting and similar services	A94	Other services and activities
3445	Agricultural control boards	A94	Other services and activities
3450	Bookmakers and betting	A94	Other services and activities
3455	Other agencies and services	A94	Other services and activities

12.5. Account mappings and descriptions for agricultural activities and commodities

Table 28: Magisterial districts and statistical regions per province

GAMS name & (Statistical region number)	Magisterial districts in statistical regions	GAMS name & (Statistical region number)	Magisterial districts in statistical regions
WESTERN CAPE		WC5 (5)	Oudtshoorn
WC1 (1)	Cape		Calitzdorp
	Wynberg		Ladismith
	Simon's Town		Uniondale
	Goodwood		---
	Bellville	WC6 (6)	Worcester
	Mitchells Plain		Ceres
	---		Tulbagh
WC2 (2)	Stellenbosch		Robertson
	Kuils River		Montagu
	Somerset West		---
	Strand	WC7 (7)	Malmesbury
	Paarl		Hopefield
	Wellington		Piketberg
	---		Vredenburg
WC3 (3)	Caledon		Moorresburg
	Hermanus		---
	Bredasdorp	WC8 (8)	Clanwilliam
	Swellendam		Vredendal
	Heidelberg (Cape)		Vanrhynsdorp
	---		---
WC4 (4)	Knysna	WC9 (9)	Beaufort West
	George		Laingsburg
	Mossel Bay		Murraysburg
	Riversdale		Prince Albert
	---		---
EASTERN CAPE			
EC1 (35)	Lady Grey	EC5 (39)	Albany
	Aliwal North		Alexandria
	Albert		Bathurst
	Venterstad		Fort Beaufort
	Steynsburg		Adelaide
	Hofmeyr		Bedford
	---		Somerset East
EC2 (36)	Barkly East		Kirkwood
	Wodehouse		---
	Indwe	EC6 (41)	Middelburg
	Elliot		Cradock
	Maclear		---
	---	EC7 (42)	Joubertina
EC3 (37)	Komga		Humansdorp
	Stutterheim		Hankey

GAMS name & (Statistical region number)	Magisterial districts in statistical regions	GAMS name & (Statistical region number)	Magisterial districts in statistical regions
	Cathcart		
	Queenstown	EC8 (43)	Port Elizabeth
	Tarka		Uitenhage
	Sterkstroom		
	Molteno	EC9 (44)	Aberdeen
			Graaff-Reinet
EC4 (38)	East London		Pearston
	King William's Town		
		EC10 (45)	Jansenville
	Willowmore		Steytlerville
NORTHERN CAPE			
NC1 (10)	Namakwaland	NC5 (14)	Kuruman
	Kenhardt		Postmasburg
	Gordonia		Hay
NC2 (11)	Calvinia	NC6 (15)	Prieska
	Sutherland		Carnarvon
	Williston		
		NC7 (16)	Herbert
NC3 (12)	Fraserburg		Barkly West
	Victoria West		Warrenton
			Hartswater
NC4 (13)	Hopetown		
	Britstown	NC8 (17)	Kimberley
	De Aar		
	Philipstown		
	Richmond		
	Hanover		
	Colesberg		
	Noupoort		
FREE STATE			
FS1 (24)	Boshof	FS6 (29)	Bethlehem
	Fauresmith		Harrismith
	Jacobsdal		Vrede
	Koffiefontein		Frankfort
	Petrusburg		Reitz
			Lindley
FS2 (25)	Bloemfontein		Senekal
	Botshabelo		Fouriesburg
			Ficksburg
FS3 (26)	Bethulie		
	Rouxville	FS7 (30)	Brandfort
	Smithfield		Winburg
	Zastron		Marquard

GAMS name & (Statistical region number)	Magisterial districts in statistical regions	GAMS name & (Statistical region number)	Magisterial districts in statistical regions
	---		Clocolan
FS4 (27)	Odendaalsrus		Excelsior
	Welkom		Ladybrand
	Virginia		Wepener
	---		Dewetsdorp
FS5 (28)	Kroonstad		Reddersburg
	Ventersburg		Edenburg
	Hennenman		Trompsburg
	Parys		Jagersfontein
	Vredefort		Philippolis
	Koppies		---
	Heilbron	FS8 (31)	Sasolburg
	Viljoenskroon		---
	Bothaville	(32)	Witsieshoek
	Wesselsbron		---
	Hoopstad		
	Bultfontein		
	Theunissen		

KWAZULU-NATAL			
(46)	Ndwedwe	KZ6 (55)	Umvoti
	Mapumulu		Kranskop
	---		Lions River
(47)	Umbumbulu		New Hanover
	Umlazi		Mooi River
	---		---
KZ1 (48)	Durban	KZ7 (56)	Kliprivier
	Pinetown		Weenen
	Inanda		Estcourt
	Chatsworth		Bergville
	---		---
(49)	Msinga	KZ8 (57)	Newcastle
	Nkandla		Utrecht
	Nqutu		Dannhauser
	---		Dundee
(50)	Mahlabatini		Glencoe
	Nongoma		---
	---	KZ9 (58)	Paulpietersburg
KZ2 (51)	Pietermaritzburg		Ngotshe
	---		Vryheid
KZ3 (52)	Camperdown		Babanango
	Ixopo		Simdlangentsha
	Umzinto		---
	Richmond	KZ10 (59)	Lower Tugela
	---		Lower Umfolozi
KZ4 (53)	Port Shepstone		Mtonjaneni
	Alfred		Eshowe

GAMS name & (Statistical region number)	Magisterial districts in statistical regions	GAMS name & (Statistical region number)	Magisterial districts in statistical regions
			Mtunzini
KZ5 (54)	Mount Currie		
	Polela	KZ11 (60)	Hlabisa
	Underberg		Ubombo
	Impendle		Ingwavuma
NORTH WEST			
NW1 (18)	Vryburg	NW3 (20)	Klerksdorp
NW2 (19)	Potchefstroom	NW4 (21)	Rustenburg
	Ventersdorp		Brits
	Coligny		
	Koster	NW5 (22)	Marico
	Lichtenburg		Swartruggens
	Delareyville		
	Wolmaransstad		
	Schweizer-Reneke		
	Bloemhof		
	Christiana		
GAUTENG			
GT1 (73)	Germiston	GT4 (76)	Bronkhorstspruit
	Alberton		Cullinan
	Boksburg		
	Kempton Park	GT5 (77)	Vereeniging
	Benoni		Vanderbijlpark
GT2 (74)	Brakpan	GT6 (78)	Pretoria
	Springs		Wonderboom
	Nigel		Soshanguve
	Heidelberg		
		GT7 (79)	Johannesburg
GT3 (75)	Krugersdorp		Randburg
	Roodepoort		
	Westonaria		
	Randfontein		
	Oberholzer		
MPUMALANGA			
MP1 (61)	Highveld Ridge	(64 (cont))	Ermelo
	Balfour		Amersfoort
	Kriel		Wakkerstroom
	Delmas		Piet Retief
MP2 (62)	Witbank	MP5 (65)	Nelspruit

GAMS name & (Statistical region number)	Magisterial districts in statistical regions	GAMS name & (Statistical region number)	Magisterial districts in statistical regions
	Middelburg		
	---	MP6 (66)	Nsikazi
MP3 (63)	Mdutjana		Barberton
	Moutse		Witrivier
	Groblersdal		Belfast
	Mkobola		Waterval-Boven
	Mbibana		Nkomazi
	---		Eerstehoek
MP4 (64)	Bethal		Pelgrimsrus
	Standerton		Lydenburg
	Volksrust		---
	Carolina		
	---		---
LIMPOPO			
LP1 (67)	Phalaborwa	LP4 (70)	Thabazimbi
	Giyani		Warmbad
	Mapulaneng		---
	Mhala	LP5 (71)	Letaba
	Lulekani		Naphuno
	Bolobedu		Ritavi
	Namakgale		Thabamoopo
	---		Nebo
LP2 (68)	Malamulele		Sekhukhuneland
	Messina		---
	Soutpansberg	LP6 (72)	Pietersburg
	Hlanganani		Seshego
	Sekgosese		---

LP3 (69)	Potgietersrus		
	Waterberg		
	Ellisras		
	Mokerong		
	Bochum		

Table 29: Mapping of Statistical regions to agricultural activities

Province	Statistical Region Number	Agro-economic production area
Western Cape	**1; 2; 6**	Metropolitan and surrounding areas
Western Cape	**3; 4; 7; 8**	West Coast and Southern Cape
Western Cape	**5; 9**	Karoo
Northern Cape	**10; 13; 15; 16; 17**	Animal production and Irrigation
Northern Cape	**11; 12; 14**	Irrigation
North West	**18**	Animal production area
North West	**19; 20; 21; 22**	Grain and animal production area
Free State	**24; 25; 26; 30**	Southern Free State
Free State	**27; 28; 31**	Northern Free State
Free State	**29; 32**	Eastern Free State
Eastern Cape	**36; 37; 38**	High rainfall
Eastern Cape	**35; 39; 41; 42; 43**	Medium rainfall
Eastern Cape	**44; 45**	Low rainfall
KwaZulu-Natal	**49; 58; 57**	North West
KwaZulu-Natal	**50; 59; 60**	North East
KwaZulu-Natal	**51; 52; 54; 55; 56**	South West
KwaZulu-Natal	**46; 47; 48; 53**	South East
Mpumalanga	**61; 62; 63**	Highveld: Crops and Animals
Mpumalanga	**64**	Highveld: Crops and Animals
Mpumalanga	**65; 66**	Lowveld: Fruit and Sugar
Limpopo	**69; 70; 71**	Grains and animals
Limpopo	**72;**	Poultry
Limpopo	**67; 68**	Fruits under irrigation
Gauteng	**73; 77; 78**	Dryland and grazing areas
Gauteng	**74-76; 79**	Irrigated areas, vegetables and grains planting

Table 30: Mapping of current expenditures in 2002 Census of Agriculture to 95 commodities in SAM

SAM account number	SAM Account Description	Current expenditure item	Distribution ratio
C1	Agricultural products	Seed and plant material Stock and poultry feed	100.00% 15%
C2	Coal and lignite products	Fuel	0.07%
C4	Other mining products	Fuel	5.05%
C11	Animal feeds	Stock and poultry feed	85%
C18	Made-up textile products	Protective clothing for farm workers Packing material	100.00% 60.76%
C20	Other textile products	Packing material	0.23%
C26	Wood products	Packing material	11.21%
C28	Containers of paper	Packing material	20.68%
C29	Other paper products	Packing material	1.32%
C30	Published and printed products	Packing material	0.31%
C32	Petroleum products	Fuel	94.88%
C34	Fertilizers	Fertilisers	100.00%
C36	Pesticides	Remedies for combating diseases and pests in: Field and horticultural crops Remedies for combating diseases and pests in: Livestock and poultry	100.00% 48.19%
C37	Paints	Maintenance and Repairs to: Buildings, dams and fencing	6.88%
C38	Pharmaceutical products	Remedies for combating diseases and pests in: Livestock and poultry	51.81%
C39	Soap products	Other farming expenses	0.52%
C40	Other chemical products	Other farming expenses	1.59%
C41	Rubber tyres	Other farming expenses	3.65%
C42	Other rubber products	Other farming expenses	5.49%
C43	Plastic products	Packing material	5.49%
C44	Glass products	Maintenance and Repairs to: Buildings, dams and fencing	0.57%
C46	Ceramic products	Maintenance and Repairs to: Buildings, dams and fencing	10.16%
C47	Cement	Maintenance and Repairs to: Buildings, dams and fencing	4.38%
C48	Other non-metallic products	Maintenance and Repairs to: Buildings, dams and fencing	6.68%
C49	Iron and steel products	Maintenance and Repairs to: Buildings, dams and fencing	3.25%
C50	Non-ferrous metals	Maintenance and Repairs to: Buildings, dams and fencing	0.91%
C51	Structural metal products	Maintenance and Repairs to: Buildings, dams and fencing	1.88%
C52	Treated metal products	Maintenance and Repairs to: Buildings, dams and fencing	5.01%
C54	Other fabricated metal products	Maintenance and Repairs to: Buildings, dams and fencing	36.80%
C58	Lifting equipment	Other farming expenses	16.44%
C59	General machinery	Other farming expenses	10.16%
C60	Agricultural machinery	Maintenance and Repairs to: All machinery, vehicles and equipment	19.87%

SAM account number	SAM Account Description	Current expenditure item	Distribution ratio
C70	Accumulators	Other farming expenses	6.81%
C72	Other electrical products	Other farming expenses	2.57%
C75	Motor vehicles	Maintenance and Repairs to: All machinery, vehicles and equipment	11.26%
C76	Motor vehicles parts	Maintenance and Repairs to: All machinery, vehicles and equipment	11.52%
C77	Other transport products	Other farming expenses	16.80%
C81	Electricity	Electricity	100%
C82	Water	Water purchased	100%
C83	Buildings	Maintenance and Repairs to: Buildings, dams and fencing	11.65%
C84	Other constructions	Maintenance and Repairs to: Buildings, dams and fencing	11.82%
C85	Trade services	Rental	100%
C86	Accommodation	Other farming expenses	0.54%
C87	Transport services	Services rendered: Transport Maintenance and Repairs to: All machinery, vehicles and equipment	100% 57.35%
C88	Communications	Other farming expenses	1.32%
C89	FSIM	Interest	100%
C90	Insurance services	Insurance premiums	100%
C91	Real estate services	Rental	100%
C92	Other business services	Services rendered: Contractors Services rendered: Security Rental	100% 100% 100%
C94	Health and social work	Services rendered: Veterinary	100%
C95	Other services / activities	Other farming expenses	34.10%

Table 31: Mapping of agricultural commodities in IES to agricultural commodity SAM accounts

SAM number	Income data in Census	Household Expenditure category (2000 I&E Survey)
C1a	Summer Cereals	
C1b	Winter Cereals	
C1c	Oil-seeds	
C1d	Sugarcane	
C1e	Other Field Crops	
C1f	Vegetables	Potatoes Sweet potatoes Mealies Onions Tomatoes Beans Cabbage Carrots Pumpkin etc Beetroot Lettuce Marogo Other vegetables
C1g	Wine grapes	
C1h	Citrus	Oranges Other citrus fruit
C1i	Subtropical	Bananas Other tropical fruit
C1j	Deciduous	Apples Other deciduous fruit Other fruit
C1k	Other Horticulture	Flowers Nuts Plants etc
C1l	Livestock Sales	
C1m	Milk and Cream	
C1n	Animal Fibres	
C1o	Poultry	Eggs
C1p	Game	
C1q	Fish	
C1r	Other Animals	
C1s	Forestry	Firewood Dung Cropwaste

12.6. Phase configuration mappings

Notes: Only mappings that represent disaggregation are shown. S9 refers to accounts at nine-sector level.

Table 32: Phase configuration mappings used during SAM estimation

Phase	Macro Accounts	Micro Accounts
PhaseA	CALL - All Commodities	S9CAG - S9: Agriculture, forestry and fishing
		S9CMIN - S9: Mining and quarrying
		S9CMAN - S9: Manufacturing
		S9CUT - S9: Electricity, gas and water
		S9CCON - S9: Construction
		S9CTACC - S9: Trade, catering, accommodation
		S9CTCOM - S9: Transport communication
		S9CFIN - S9: Finance business services
		S9CGOV - S9: Other services
	AALL - All Activities	S9AAG - S9: Agriculture, forestry and fishing
		S9AMIN - S9: Mining and quarrying
		S9AMAN - S9: Manufacturing
		S9AUT - S9: Electricity, gas and water
		S9ACON - S9: Construction
		S9ATACC - S9: Trade, catering, accommodation
		S9ATCOM - S9: Transport communication
		S9AFIN - S9: Finance business services
		S9AGOV - S9: Other services
PhaseB	MALL - All Margins	M1 - Trade margin
		M2 - Transport margin
	LABALL - All Labour	FEC - Labour Eastern Cape
		FFS - Labour Free State
		FGT - Labour Gauteng
		FKZ - Labour KwaZulu Natal
		FLP - Labour Limpopo
		FMP - Labour Mpumalanga
		FNC - Labour Northern Cape
		FNW - Labour North West
		FWC - Labour Western Cape
	HALL - All Households	HEC - Households Eastern Cape
		HFS - Households Free State
		HGT - Households Gauteng
		HKZ - Households KwaZulu Natal
		HLP - Households Limpopo
		HMP - Households Mpumalanga
		HNC - Households Northern Cape
		HNW - Households North West
		HWC - Households Western Cape
	S9CAG - S9: Agriculture, forestry and fishing	C1 - Agriculture, forestry and fishing
	S9CMIN - S9: Mining and quarrying	C2 - Coal and lignite products
		C3 - Gold and uranium ore products
		C4a - Crude oil products
		C4b - Other mining products

Phase	Macro Accounts	Micro Accounts
	S9CMAN - S9: Manufacturing	C5 - Meat products
		C6 - Fish products
		C7 - Fruit and vegetables products
		C8 - Oils and fats products
		C9 - Dairy products
		C10 - Grain mill products
		C11 - Animal feeds
		C12 - Bakery products
		C13 - Sugar products
		C14 - Confectionery products
		C15 - Other food products
		C16 - Beverages and tobacco products
		C17 - Textile products
		C18 - Made-up textile products
		C19 - Carpets
		C20 - Other textile products
		C21 - Knitting mill products
		C22 - Wearing apparel
		C23 - Leather products
		C24 - Handbags
		C25 - Footwear
		C26 - Wood products
		C27 - Paper products
		C28 - Containers of paper
		C29 - Other paper products
		C30 - Published and printed products
		C31 - Recorded media products
		C32 - Petroleum products
		C33 - Basic chemical products
		C34 - Fertilizers
		C35 - Primary plastic products
		C36 - Pesticides
		C37 - Paints
		C38 - Pharmaceutical products
		C39 - Soap products
		C40 - Other chemical products
		C41 - Rubber tyres
		C42 - Other rubber products
		C43 - Plastic products
		C44 - Glass products
		C45 – Ceramic ware
		C46 - Ceramic products
		C47 - Cement
		C48 - Other non-metallic products
		C49 - Iron and steel products
		C50 - Non-ferrous metals
		C51 - Structural metal products
		C52 - Treated metal products
		C53 - General hardware products
		C54 - Other fabricated metal products
		C55 - Engines
		C56 - Pumps
		C57 - Gears
		C58 - Lifting equipment
		C59 - General machinery
		C60 - Agricultural machinery

Phase	Macro Accounts	Micro Accounts
		C61 - Machine-tools
		C62 - Mining machinery
		C63 - Food machinery
		C64 - Other special machinery
		C65 - Household appliances
		C66 - Office machinery
		C67 - Electric motors
		C68 - Electricity apparatus
		C69 - Wire and cable products
		C70 - Accumulators
		C71 - Lighting equipment
		C72 - Other electrical products
		C73 - Radio and television products
		C74 - Optical instruments
		C75 - Motor vehicles
		C76 - Motor vehicles parts
		C77 - Other transport products
		C78 - Furniture
		C79 - Jewellery
		C80 - Other manufacturing
	S9CUT - S9: Electricity, gas and water	C81 - Electricity
		C82 - Water
	S9CCON - S9: Construction	C83 - Buildings
		C84 - Other constructions
	S9CTACC - S9: Trade, catering, accommodation	C85 - Trade services
		C86 - Accommodation
	S9CTCOM - S9: Transport communication	C87 - Transport services
		C88 - Communications
	S9CFIN - S9: Finance business services	C89 - FSIM
		C90 - Insurance services
		C91 - Real estate services
		C92 - Other business services
	S9CGOV - S9: Other services	C93 - General Government services
		C94 - Health and social work
		C95 - Other services and activities
		C96 - Domestic services
	S9AAG - S9: Agriculture, forestry and fishing	A1a - All Agriculture
		A1b - Forestry
		A1c - Fishing
	S9AMIN - S9: Mining and quarrying	A2 - Coal
		A3 - Gold
		A4 - Other mining
	S9AMAN - S9: Manufacturing	A5 - Meat
		A6 - Fish
		A7 - Fruit
		A8 - Oils
		A9 - Dairy
		A10 - Grain mills
		A11 - Animal feeds
		A12 - Bakeries
		A13 - Sugar
		A14 - Confectionery
		A15 - Other food
		A16 - Beverages and tobacco

Phase	Macro Accounts	Micro Accounts
		A17 - Textiles
		A18 - Textile articles
		A19 - Carpets
		A20 - Other textiles
		A21 - Knitting mills
		A22 - Wearing apparel
		A23 - Leather
		A24 - Handbags
		A25 - Footwear
		A26 - Wood
		A27 - Paper
		A28 - Containers of paper
		A29 - Other paper
		A30 - Publishing
		A31 - Recorded media
		A32 - Petroleum
		A33 - Basic chemicals
		A34 - Fertilizers
		A35 - Primary plastics
		A36 - Pesticides
		A37 - Paints
		A38 - Pharmaceuticals
		A39 - Soap
		A40 - Other chemicals
		A41 - Tyres
		A42 - Other Rubber
		A43 - Plastic
		A44 - Glass
		A45 - Non-structural ceramics
		A46 - Structural ceramics
		A47 - Cement
		A48 - Other non-metallic
		A49 - Iron and steel
		A50 - Non-ferrous metals
		A51 - Structural metal
		A52 - Treated metals
		A53 - General hardware
		A54 - Fabricated metal
		A55 - Engines
		A56 - Pumps
		A57 - Gears
		A58 - Lifting equipment
		A59 - General machinery
		A60 - Agricultural machinery
		A61 - Machine-tools
		A62 - Mining machinery
		A63 - Food machinery
		A64 - Special machinery
		A65 - Household appliances
		A66 - Office machinery
		A67 - Electric motors
		A68 - Electricity apparatus
		A69 - Wire and cable
		A70 - Accumulators
		A71 - Lighting equipment
		A72 - Electrical equipment

Phase	Macro Accounts	Micro Accounts
		A73 - Radio and television
		A74 - Optical instruments
		A75 - Motor vehicles
		A76 - Motor vehicle parts
		A77 - Other Transport
		A78 - Furniture
		A79 - Jewellery
		A80 - Other manufacturing
	S9AUT - S9: Electricity, gas and water	A81 - Electricity
		A82 - Water
	S9ACON - S9: Construction	A83 - Buildings
		A84 - Other construction
	S9ATACC - S9: Trade, catering, accommodation	A85 - Trade
		A86 - Accommodation
	S9ATCOM - S9: Transport communication	A87 - Transport services
		A88 - Communications
	S9AFIN - S9: Finance business services	A89 - Insurance
		A90 - Real estate
		A91 - Business activities
	S9AGOV - S9: Other services	A92 - General Government
		A93 - Health and social work
		A94 - Activities and services
		A95 - Domestic services
PhaseC1	FWC - Labour Western Cape	FWC1 - wc afr skilled/high-skilled
		FWC2 - wc afr semi-skilled
		FWC3 - wc afr unskilled
		FWC4 - wc col/asi high-skilled
		FWC5 - wc col/asi clerks
		FWC6 - wc col/asi service & shops
		FWC7 - wc col/asi craft & trade
		FWC8 - wc col/asi machine & plant ops
		FWC9 - wc col/asi elementary
		FWC10 - wc col/asi agric & domestic work/unspecified
		FWC11 - wc whi high-skilled
		FWC12 - wc whi skilled
		FWC13 - wc whi semi- & unskilled
	HWC - Households Western Cape	HWC1 - wc afr, female, lwr sec and lower
		HWC2 - wc afr, male, primary and lower
		HWC3 - wc afr, male, lwr sec
		HWC4 - wc afr, upp sec and higher
		HWC5 - wc asi & col, female, primary and lower
		HWC6 - wc asi & col, female, lwr sec
		HWC7 - wc asi & col, female, upp sec and higher
		HWC8 - wc asi & col, male, primary and lower
		HWC9 - wc asi & col, male, lwr sec
		HWC10 - wc asi & col, male, upp sec and higher, low-inc
		HWC11 - wc asi & col, male, upp sec and higher, high-inc
		HWC12 - wc whi, lwr sec and lower
		HWC13 - wc whi, upp sec, low-inc

Phase	Macro Accounts	Micro Accounts
		HWC14 - wc whi, upp sec, high-inc
		HWC15 - wc whi, tertiary, low-inc
		HWC16 - wc whi, tertiary, high-inc
PhaseC2	FEC - Labour Eastern Cape	FEC1 - ec afr high-skilled
		FEC2 - ec afr skilled
		FEC3 - ec afr agric & fishery
		FEC4 - ec afr craft & trade
		FEC5 - ec afr machine & plan ops
		FEC6 - ec afr elementary
		FEC7 - ec afr domestic & unspecified
		FEC8 - ec col/asi high-skilled/skilled
		FEC9 - ec col/asi semi-/unskilled
		FEC10 - ec whi high-skilled
		FEC11 - ec whi skilled
		FEC12 - ec whi semi-/unskilled
	HEC - Households Eastern Cape	HEC1 - ec afr, agric
		HEC2 - ec afr, homeland, female, none
		HEC3 - ec afr, homeland, female, primary
		HEC4 - ec afr, homeland, female, lwr sec
		HEC5 - ec afr, homeland, female, upp sec and higher, low-inc
		HEC6 - ec afr, homeland, female, upp sec and higher, high-inc
		HEC7 - ec afr, homeland, male, none
		HEC8 - ec afr, homeland, male, primary
		HEC9 - ec afr, homeland, male, lwr sec
		HEC10 - ec afr, homeland, male, upp sec and higher, low-inc
		HEC11 - ec afr, homeland, male, upp sec and higher, high-inc
		HEC12 - ec afr, non-homeland, female, none
		HEC13 - ec afr, non-homeland, female, primary
		HEC14 - ec afr, non-homeland, female, lwr sec
		HEC15 - ec afr, non-homeland, female, upp sec and higher
		HEC16 - ec afr, non-homeland, male, none
		HEC17 - ec afr, non-homeland, male, primary
		HEC18 - ec afr, non-homeland, male, lwr sec
		HEC19 - ec afr, non-homeland, male, upp sec and higher
		HEC20 - ec asi & col, primary and lower
		HEC21 - ec asi & col, lwr sec
		HEC22 - ec asi & col, upp sec and higher
		HEC23 - ec whi, lwr sec and lower
		HEC24 - ec whi, upp sec
		HEC25 - ec whi, tertiary
PhaseC3	FFS - Labour Free State	FFS1 - fs afr high-/skilled
		FFS2 - fs afr semi-skilled
		FFS3 - fs afr unskilled
		FFS4 - fs col/asi high-/skilled
		FFS5 - fs col/asi semi-/unskilled
		FFS6 - fs whi high-/skilled
		FFS7 - fs whi semi-/unskilled
	FNC - Labour Northern Cape	FNC1 - nc afr high-/skilled
		FNC2 - nc afr semi-/unskilled
		FNC3 - nc col/asi high-/skilled

Phase	Macro Accounts	Micro Accounts
		FNC4 - nc col/asi semi-/unskilled
		FNC5 - nc whi high-skilled/skilled
		FNC6 - nc whi semi-/unskilled
	HFS - Households Free State	HFS1 - fs afr, agric
		HFS2 - fs afr, female, none
		HFS3 - fs afr, female, primary
		HFS4 - fs afr, female, lwr sec
		HFS5 - fs afr, female, upp sec and higher
		HFS6 - fs afr, male, none
		HFS7 - fs afr, male, primary, low-inc
		HFS8 - fs afr, male, primary, high-inc
		HFS9 - fs afr, male, lwr sec, low-inc
		HFS10 - fs afr, male, lwr sec, high-inc
		HFS11 - fs afr, male, upp sec and higher, low-inc
		HFS12 - fs afr, male, upp sec and higher, high-inc
		HFS13 - fs asi & col
		HFS14 - fs whi, lwr sec and lower
		HFS15 - fs whi, upp sec
		HFS16 - fs whi, tertiary
	HNC - Households Northern Cape	HNC1 - nc afr, primary and lower
		HNC2 - nc afr, lwr sec and higher
		HNC3 - nc col & asi, lwr sec and lower
		HNC4 - nc col & asi, upp sec and higher
		HNC5 - nc whi
PhaseC4	FKZ - Labour KwaZulu Natal	FKZ1 - kz afr high-skilled
		FKZ2 - kz afr skilled
		FKZ3 - kz afr agriculture & fisheries
		FKZ4 - kz afr craft & trade
		FKZ5 - kz afr machine & plant ops
		FKZ6 - kz afr elementary
		FKZ7 - kz afr domestic & unspecified
		FKZ8 - kz col high-/skilled
		FKZ9 - kz col semi-/unskilled
		FKZ10 - kz asi high-skilled/skilled
		FKZ11 - kz asi semi-/unskilled
		FKZ12 - kz whi high-skilled/skilled
		FKZ13 - kz whi semi-/unskilled
	HKZ - Households KwaZulu Natal	HKZ1 - kz afr, agric, homeland
		HKZ2 - kz afr, agric, non-homeland, low-inc
		HKZ3 - kz afr, agric, non-homeland, high-inc
		HKZ4 - kz afr, homeland, female, none
		HKZ5 - kz afr, homeland, female, primary
		HKZ6 - kz afr, homeland, female, lwr sec
		HKZ7 - kz afr, homeland, female, upp sec and higher
		HKZ8 - kz afr, homeland, male, none
		HKZ9 - kz afr, homeland, male, primary
		HKZ10 - kz afr, homeland, male, lwr sec
		HKZ11 - kz afr, homeland, male, upp sec and higher
		HKZ12 - kz afr, non-homeland, female, none
		HKZ13 - kz afr, non-homeland, female, primary
		HKZ14 - kz afr, non-homeland, female, lwr sec

Phase	Macro Accounts	Micro Accounts
		HKZ15 - kz afr, non-homeland, female, upp sec and higher, low-inc
		HKZ16 - kz afr, non-homeland, female, upp sec and higher, high-inc
		HKZ17 - kz afr, non-homeland, male, none
		HKZ18 - kz afr, non-homeland, male, primary
		HKZ19 - kz afr, non-homeland, male, lwr sec, low-inc
		HKZ20 - kz afr, non-homeland, male, lwr sec, high-inc
		HKZ21 - kz afr, non-homeland, male, upp sec and higher, low-inc
		HKZ22 - kz afr, non-homeland, male, upp sec and higher, high-inc
		HKZ23 - kz asi, female, lwr sec and lower
		HKZ24 - kz asi, male, lwr sec and lower, low-inc
		HKZ25 - kz asi, male, lwr sec and lower, high-inc
		HKZ26 - kz asi, male, upp sec and higher, low-inc
		HKZ27 - kz asi, male, upp sec and higher, high-inc
		HKZ28 - kz col
		HKZ29 - kz whi, lwr sec and lower
		HKZ30 - kz whi, upp sec, low-inc
		HKZ31 - kz whi, upp sec, high-inc
		HKZ32 - kz whi, tertiary
PhaseC5	FLP - Labour Limpopo	FLP1 - lp afr high-skilled
		FLP2 - lp afr skilled
		FLP3 - lp afr semi-skilled
		FLP4 - lp afr unskilled
		FLP5 - lp col/asi high-/skilled
		FLP6 - lp col/asi semi-/unskilled
		FLP7 - lp whi high-/skilled
		FLP8 - lp whi semi-/unskilled
	FNW - Labour North West	FNW1 - nw afr high-/skilled
		FNW2 - nw afr semi-skilled
		FNW3 - nw afr unskilled
		FNW4 - nw col/asi high-/skilled
		FNW5 - nw col/asi semi-/unskilled
		FNW6 - nw whi high-/skilled
		FNW7 - nw whi semi-/unskilled
	HLP - Households Limpopo	HLP1 - lp afr, agric
		HLP2 - lp afr, female, non & pre-primary
		HLP3 - lp afr, female, primary
		HLP4 - lp afr, female, lwr sec
		HLP5 - lp afr, female, upp sec and higher, low-inc
		HLP6 - lp afr, female, upp sec and higher, high-inc
		HLP7 - lp afr, male, none
		HLP8 - lp afr, male, primary, low-inc
		HLP9 - lp afr, male, primary, high-inc
		HLP10 - lp afr, male, lwr sec

Phase	Macro Accounts	Micro Accounts
		HLP11 - lp afr, male, upp sec and higher, low-inc
		HLP12 - lp afr, male, upp sec and higher, high-inc
		HLP13 - lp asi & col
		HLP14 - lp whi
	HNW - Households North West	HNW1 - nw afr, agric
		HNW2 - nw afr, female, none
		HNW3 - nw afr, female, primary
		HNW4 - nw afr, female, lwr sec
		HNW5 - nw afr, female, upp sec and higher
		HNW6 - nw afr, male, none, low-inc
		HNW7 - nw afr, male, none, high-inc
		HNW8 - nw afr, male, primary, low-inc
		HNW9 - nw afr, male, primary, high-inc
		HNW10 - nw afr, male, lwr sec, low-inc
		HNW11 - nw afr, male, lwr sec, high-inc
		HNW12 - nw afr, male, upp sec and higher, low-inc
		HNW13 - nw afr, male, upp sec and higher, high-inc
		HNW14 - nw asi & col
		HNW15 - nw whi, lwr sec and lower
		HNW16 - nw whi, upp sec and higher
PhaseC6	FGT - Labour Gauteng	FGT1 - gt afr high-skilled
		FGT2 - gt afr clerks
		FGT3 - gt afr service & shops
		FGT4 - gt afr craft & trade
		FGT5 - gt afr machine & plant ops
		FGT6 - gt afr elementary
		FGT7 - gt afr domestic/agric/unspecified
		FGT8 - gt col high-/skilled
		FGT9 - gt col semi-/unskilled
		FGT10 - gt asi high-/skilled
		FGT11 - gt asi semi-/unskilled
		FGT12 - gt whi high-skilled
		FGT13 - gt whi skilled
		FGT14 - gt whi semi-/unskilled
	HGT - Households Gauteng	HGT1 - gt afr, agric
		HGT2 - gt afr, non-homeland, female, none
		HGT3 - gt afr, non-homeland, female, primary
		HGT4 - gt afr, female, lwr sec
		HGT5 - gt afr, non-homeland, female, upp sec, low-inc
		HGT6 - gt afr, non-homeland, female, upp sec, high-inc
		HGT7 - gt afr, non-homeland, female, tertiary
		HGT8 - gt afr, non-homeland, male, none
		HGT9 - gt afr, non-homeland, male, primary
		HGT10 - gt afr, non-homeland, male, lwr sec
		HGT11 - gt afr, non-homeland, male, upp sec
		HGT12 - gt afr, non-homeland, male, unknown
		HGT13 - gt afr, non-homeland, male, tertiary, low-inc
		HGT14 - gt afr, non-homeland, male, tertiary, high-inc

Phase	Macro Accounts	Micro Accounts
		HGT15 - gt col, lwr sec and lower
		HGT16 - gt col, upp sec and higher
		HGT17 - gt asi, lwr sec and lower
		HGT18 - gt asi, upp sec and higher
		HGT19 - gt whi, lwr sec and lower, low-inc
		HGT20 - gt whi, lwr sec and lower, high-inc
		HGT21 - gt whi, upp sec, low-inc
		HGT22 - gt whi, upp sec, high-inc
		HGT23 - gt whi, tertiary, low-inc
		HGT24 - gt whi, tertiary, high-inc
PhaseC7	FMP - Labour Mpumalanga	FMP1 - mp afr high-skilled
		FMP2 - mp afr skilled
		FMP3 - mp afr semi-skilled
		FMP4 - mp afr unskilled
		FMP5 - mp col/asi high-/skilled
		FMP6 - mp col/asi semi-/unskilled
		FMP7 - mp whi high-/skilled
		FMP8 - mp whi semi-/unskilled
	HMP - Households Mpumalanga	HMP1 - mp afr, agric
		HMP2 - mp afr, female, none
		HMP3 - mp afr, female, primary
		HMP4 - mp afr, female, lwr sec
		HMP5 - mp afr, female, upp sec and higher
		HMP6 - mp afr, male, none
		HMP7 - mp afr, male, primary, low-inc
		HMP8 - mp afr, male, primary, high-inc
		HMP9 - mp afr, male, lwr sec, low-inc
		HMP10 - mp afr, male, lwr sec, high-inc
		HMP11 - mp afr, male, upp sec and higher, low-inc
		HMP12 - mp afr, male, upp sec and higher, high-inc
		HMP13 - mp asi & col
		HMP14 - mp whi
PhaseD	C1 - Agriculture, forestry and fishing	C1a - Summer Cereals
		C1b - Winter Cereals
		C1c - Oilseeds
		C1d - Sugarcane
		C1e - Other Field Crops
		C1f - Potatoes and Vegetables
		C1g - Wine grapes
		C1h - Citrus
		C1i - Subtropical
		C1j - Deciduous
		C1k - Other Horticulture
		C1l - Livestock Sales
		C1m - Milk and Cream
		C1n - Animal Fibres
		C1o - Poultry
		C1p - Game
		C1q - Fish
		C1r - Other Animals
		C1s - Forestry
		C1t - Wild Flowers Compost and Firewood
	A1a - All Agriculture	AWC1 - Western Cape 1
		AWC2 - Western Cape 2

Phase	Macro Accounts	Micro Accounts
		AWC3 - Western Cape 3
		AWC4 - Western Cape 4
		AWC5 - Western Cape 5
		AWC6 - Western Cape 6
		AWC7 - Western Cape 7
		AWC8 - Western Cape 8
		AWC9 - Western Cape 9
		ANC1 - Northern Cape 1
		ANC2 - Northern Cape 2
		ANC3 - Northern Cape 3
		ANC4 - Northern Cape 4
		ANC5 - Northern Cape 5
		ANC6 - Northern Cape 6
		ANC7 - Northern Cape 7
		ANC8 - Northern Cape 8
		ANW1 - North West 1
		ANW2 - North West 2
		ANW3 - North West 3
		ANW4 - North West 4
		ANW5 - North West 5
		AFS1 - Freestate 1
		AFS2 - Freestate 2
		AFS3 - Freestate 3
		AFS4 - Freestate 4
		AFS5 - Freestate 5
		AFS6 - Freestate 6
		AFS7 - Freestate 7
		AFS8 - Freestate 8
		AEC1 - Eastern Cape 1
		AEC2 - Eastern Cape 2
		AEC3 - Eastern Cape 3
		AEC4 - Eastern Cape 4
		AEC5 - Eastern Cape 5
		AEC6 - Eastern Cape 6
		AEC7 - Eastern Cape 7
		AEC8 - Eastern Cape 8
		AEC9 - Eastern Cape 9
		AEC10 - Eastern Cape 10
		AKZ1 - Kwazulu-Natal 1
		AKZ2 - Kwazulu-Natal 2
		AKZ3 - Kwazulu-Natal 3
		AKZ4 - Kwazulu-Natal 4
		AKZ5 - Kwazulu-Natal 5
		AKZ6 - Kwazulu-Natal 6
		AKZ7 - Kwazulu-Natal 7
		AKZ8 - Kwazulu-Natal 8
		AKZ9 - Kwazulu-Natal 9
		AKZ10 - Kwazulu-Natal 10
		AKZ11 - Kwazulu-Natal 11
		AMP1 - Mpumalanga 1
		AMP2 - Mpumalanga 2
		AMP3 - Mpumalanga 3
		AMP4 - Mpumalanga 4
		AMP5 - Mpumalanga 5
		AMP6 - Mpumalanga 6
		ALP1 - Limpopo 1

Phase	Macro Accounts	Micro Accounts
		ALP2 - Limpopo 2
		ALP3 - Limpopo 3
		ALP4 - Limpopo 4
		ALP5 - Limpopo 5
		ALP6 - Limpopo 6
		AGT1 - Gauteng 1
		AGT2 - Gauteng 2
		AGT3 - Gauteng 3
		AGT4 - Gauteng 4
		AGT5 - Gauteng 5
		AGT6 - Gauteng 6
		AGT7 - Gauteng 7
	F2 - Land	FNWC - Western Cape Land
		FNNC - Northern Cape Land
		FNNW - North West Land
		FNFS - Free State Land
		FNEC - Eastern Cape Land
		FNKZ - KwaZulu-Natal Land
		FNMP - Mpumalanga Land
		FNLP - Limpopo Land
		FNGT - Gauteng Land

Technical Papers in this Series

Number	Title	Date
TP2003:1	Creating a 1995 IES Database in Stata	September 2003
TP2003:2	Creating a 1995 OHS and a combined OHS-IES Database in Stata	September 2003
TP2003:3	A Standard Computable General Equilibrium Model Version 3: Technical Documentation	September 2003
TP2004:1	SeeResults: A spreadsheet Application for the Analysis of CGE Model Results	November 2004
TP2004:2	The Organisation of Trade Data for inclusion in Social Accounting Matrix	December 2004
TP2005:1	Creating a 2000 IES-LFS Database in Stata	February 2005
TP2005:2	Forming Representative Household and Factor Groups in a SAM	March 2005
TP2005:3	The PROVIDE Project Standard Computable General Equilibrium Model, Version 2	July 2005
TP2006:1	Compiling National, Multiregional and Regional Social Accounting Matrices for South Africa	November 2006

Other PROVIDE Publications

Background Paper Series
Working Papers
Research Reports