University of Economics in Katowice

Journal of Economics and Management

ISSN 1732-1948 Vol. 34 (4) • 2018

Kambale Kavese

Senior Economist
ECSECCTax
South African
kambale@ecsecc.org

Jean Luc Erero

https://orcid.org/0000-0002-7901-3108

Operational Research (OR)
Customs and Excise Institute (TCEI)
South African Revenue Service (SARS)
JErero@sars.gov.za

Impact of fiscal expansion in South Africa – the case of the Eastern Cape Province

doi: 10.22367/jem.2018.34.05

Accepted by Editor Ewa Ziemba | Received: May 10, 2018 | Revised: June 5, 2018; July 6, 2018; July 17, 2018 | Accepted: July 18, 2018.

Abstract

Aim/purpose – Diagnostics of fiscal challenges facing the Eastern Cape Province's (one of the nine South African provinces) economy reveals a reduction in the number of tax payers, a decrease in the Eastern Cape revenue share, a growing government expenditure but declining revenue, low growth path, high levels of unemployment, poverty and income inequality. To address these challenges, fiscal policy-makers endorsed efficiency in government revenue collection which, if well managed, will increase revenue by 1.5 percent. This study seeks to investigate the impact of fiscal expansion in the Eastern Cape economy.

Design/methodology/approach – This study uses the Social Accounting Matrix (SAM--Leontief Model) to assess the impact of efficiency in revenue collection in the Eastern Cape Province. The model provides demand-side tax multipliers. The methodology used to develop the SAM database is in line with the most recent 2008 System of National Accounts (SNA) released by the United Nations (SNA 2008) and international best practices.

Findings – Tax micro-simulations results indicate that an additional R 1 (one Rand) in the fiscus will have positive impact on economic growth, employment creation, poverty reduction and income inequality.

Research implications/limitations – SAM is described as the presentation of SNA accounts in a matrix which elaborates the linkages between the Supply and Use Tables and institutional sector accounts. In many instances, SAMs have been applied to an analysis of interrelationships between structural features of an economy and the distribution of income and expenditure among household groups. The limitation of the model is that it assumes constant return to scale and full employment. Nonetheless, SAM is the economic tool, best when used as a database for a computable general equilibrium model.

Originality/value/contribution – The study recommends the use of this method for assessing the impact of regional economy on the entire country because it is a square matrix that quantitatively captures the transactions that occurred between the production sector, private (households), public (government) institutions, other factors, and the rest of the world. This technique is used for the first time to analyze the economy of the Eastern Cape Province in South Africa.

Keywords: fiscal policy, social accounting matrix (SAM), Eastern Cape Province, South Africa.
JEL Classification: C63, E62.

1. Introduction

Persistent income inequalities in the Eastern Cape Province (South Africa) have led to the realization that growth could be unbalanced, non-inclusive and unsustainable. The post-recession low growth path and declining economic activity have negatively impacted employment creation and government revenue collection. Consequently, high levels of unemployment (especially among the youth) and the fiscal ceiling have not only prevented the quest for all-inclusive, equitable and sustainable economic growth, but have also disturbed the structure of government expenditure in terms of economic growth (Robinson, 2001). Following this, the question then is how to achieve a pro-poor growth in the province. Put differently, how do we ensure that an additional national income reaches the targeted group of people? This is important because fiscal policy makers would not only need to be informed on the growth impact of their initiatives but also on their poverty, employment and other social impacts.

Fiscal policy promotes growth through macro and structural tax and expenditure policies. At the macro level, it plays an important role in ensuring macroeconomic stability, which is a prerequisite for achieving and maintaining economic growth (International Monetary Fund [IMF], 2015). At the micro level, through well-designed tax and spending policies, it can boost employment, investment, and productivity. Fiscal policy is an important tool used to assess government revenue, government expenditure, budget balance and borrowing requirements. The tool reveals more about a country's development strategy. Its redistributive effects, equity promoting and the progressive nature of the tax system make the policy more appropriate to address poverty and inequality than probably any other area of policymaking (National Treasury, 2017). In this respect, the robustness of fiscal policy must be assessed.

Fiscal trends reflect that South Africa raises tax revenue to fund most public spending. When the budget is in deficit, government borrows to meet the shortfall. For instance the proposed budget for 2017/2018 totals R 1.56 trillion, of which revenues cover R 1.41 trillion. The remaining R 149 billion was borrowed. Constrained resources due to low economic growth coupled with high spending on social sector to reduce poverty has since the 2008 recession led to a gap between public spending and revenues (OECD, 2015). The central objective of South Africa's fiscal policy is to stabilize the national debt-to-GDP ratio by closing the budget deficit.

Economic tools such as Social Accounting Matrix (SAM) and Computable General Equilibrium (CGE) model have been used for fiscal policy analysis. In this paper we will use SAM as scientific tool because of the multiplier effects. In fact, it will be possible to measure the impact of say, an additional R 1 (one Rand) increase in government revenue on households of different income, race, gender, occupation and age groups. The Social Accounting Matrix (SAM) model will be used to simulate the impact of a fiscal expansion through a hypothetical 1 percent increase in government expenditure and its effects on growth, employment, poverty reduction, investment and productivity (Robinson, 2001).

The applications of the SAM model at sectoral level are designed to achieve the following purposes: firstly, to identify industries and sectors with high comparative and competitive advantages; secondly, to determine inter-industry impacts through multipliers, to assess backward and forward linkages; and lastly, to assess the number of jobs sustained per sector through infrastructure projects (Eurostat, 2008).

Previous studies that involved the calculation and application of multipliers for the South African economy generally focused mainly on generic multipliers such as GDP multipliers for the country as a whole (Burrows & Botha, 2013). In the best of our knowledge, there is no single study that has estimated tax multipliers for South Africa using SAM.

The primary objective of this paper is to investigate how an additional R 1 in the fiscus will impact the Eastern Cape economy. Moreover, this paper aims to ensure that an additional national income could reach the targeted group of people and contributes to economic growth and employment creation in key sectors in the province. Secondary objectives focus on the performance and development of key fiscal and socioeconomic indicators; providing the methodology used for developing the Eastern Cape Social Accounting Matrix for the year 2016; demonstrating how the SAM is used to analyze socioeconomic impacts of government projects and/or how a regional SAM provides a well-informed strategy to policy makers.

This paper is structured as follows: section 2 presents literature review. Section 3 describes the methodology used to develop the Eastern Cape SAM. Section 4 provides the results of the model and section 5 concludes the report.

2. Literature review

2.1. Fiscal policy

For benchmark purposes and international comparability, South Africa's fiscal indicators are analyzed in relation to other developing countries, specifically the BRICS countries. The evidence provided in this section forms the background information upon which our analysis is performed. Common consensus has revealed that policy must be informed by sound information. As highlighted by Ramon, Thomas, & Wang (2010), evidence-based policymaking is essential for achieving long-term fiscal sustainability.

The International Monetary Fund (IMF) described the fiscal policy as the use of government spending and taxation to influence the economy (IMF, 2017). In South Africa, fiscal policy has a greater role to play in fostering strong, inclusive and sustainable growth and to reduce poverty (National Treasury, 2016). Addressing the triple challenges of growth, poverty and inequality in a way consistent with fiscal sustainability will require a better-quality growth, a faster and more inclusive economic growth, and more efficient public services (World Bank, 2014). A better quality of growth in this context refers to economic growth that especially reduces extreme poverty, creates jobs that narrows structural inequalities while protecting the environment, and sustaining the growth process itself (Ramon, Thomas, & Wang, 2010). In addition to better-quality growth, it will also require job creation in both formal and informal sectors and higher incomes at the lower end of the income distribution with the aim to narrow the gap in incomes that exist between the rich and the poor (World Bank, 2014). In overcoming the challenges facing the country, the government's strategic planning process must be rigorous and policy robust.

The role of fiscal policy for an effective state is to mobilize revenue and spend it on infrastructure, services, and public goods that both enhance human capital and the well-being of communities (especially the poor), as well as stimulating investment and employment creation by the private sector (McLennan, 2006). An effective state also manages public finance to ensure that macro-economic balance is maintained — with policy neither too restrictive to dis-

courage private investment and growth, nor too accommodative to create high inflation and crowd out private investment. Fiscal issues are therefore at the heart of the state's role in the development process and failure in this policy area – whether it is in taxation, public expenditures, or in managing the fiscal deficit and public debt – can quickly undermine growth and poverty reduction. Fiscal weakness can also be fatal to social peace when one or more ethnic, religious, or regional groups are taxed unfairly – or receives too little in the allocation of public spending (Bastagli, Coady, & Gupta, 2012).

The role of policy makers should be, firstly, to select strategic interventions that have the highest impact on growth, poverty and other social determinants. Secondly, to ensure that government expenditure is channeled toward intended recipients in order to ultimately address poverty and inequality. Given the current economic position of low growth path, fiscal ceiling, poverty trap and inequality, it is imperative that government investment be efficiently rerouted toward programs that yield optimal outcome.

2.2. Fiscal trends in BRICS countries

According to Alesina, Barbiero, Favero, Giavazzi, & Paradisi (2017), in Brazil the fiscal expansion is directed mainly towards public investment and redistributive transfers while in India subsidies and tax cuts played a fundamental role in the fiscal expansion.

In Russia, the fiscal policy has assisted in stimulating the economy through the government's policy of a flexible exchange rate, expenditure reductions in real terms, and bank recapitalization – in conjunction with monitoring the Reserve Fund (Onder & Hernandez, 2015).

In China, the main purpose of fiscal policy is to improve income distribution and channeling social resources with expectation of improving the quality and sustainability of China's economic growth while in South Africa the fiscal policy focuses mostly on combatting unemployment and social inequalities (World Bank, 2018).

Government revenues are generated from tax revenue and non-tax revenue. Non-tax revenue refers to income received by government as a result of administrative charges, licenses, fees, sales of goods and services, while tax revenue refers to income received by government through personal income tax, corporate income tax, Value-Added Tax (VAT), and tax on property.

Usually, government raises tax revenue to fund most public spending. When the budget is in deficit, government borrows to meet the shortfall. Table 1 shows how tax revenues as a percentage of Gross Domestic Product (GDP) have fluctuated over the past decade.

Table 1. General government revenue (percent of GDP: 2008-2018)

										Projections	
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	***2017***	***2018***
Brazil	35.9	33.9	36.1	35.1	34.7	34.5	32.6	31.2	32.7	*31.6*	*32*
China	22.4	23.8	24.6	26.9	27.8	27.7	28.1	28.5	28.2	*27.4*	*27.5*
India	19.7	18.5	18.8	19.3	19.8	19.6	19.2	20.4	21.3	*20.9*	*20.8*
Russia	36.5	32.6	32.2	34.9	35	34.4	33.8	31.8	32.3	*31.6*	*31.1*
South Africa	**28**	**26.7**	**26.7**	**27.2**	**27.4**	**27.6**	**28.2**	**29.6**	**29.4**	***29.6***	***29.9***

Source: IMF Fiscal Monitor (2017).

Between 2008 and 2018, tax revenue declined by 3.9 percentage points in Brazil; 1.1 percentage points in India; and 5.4 percentage points in Russia. However, tax revenues as a percentage of GDP increased by 5.1 percentage points in China and by 1.9 percentage points in South Africa. Taking the example of South Africa, during the same period reviewed, expenditure rose by 4.5 percentage points — opening a shortfall gap of 2.6 percentage points. Such deficit indicates that the fiscal stance in the country is not sustainable.

Government expenditure is viewed as an important tool for redistributing income to the marginalized group (Breisinger, Thomas, & Thurlow, 2009). This argument is echoed by the OECD (2015) indicates that public spending policies (more specifically transfers) have a superior effect on poverty and inequality than taxation and other fiscal revenue policies. Literature in developing countries shows a controversy between achieving economic growth or achieving poverty reduction and inequality (Bastagli et. al., 2012). The dichotomy is not conclusive, since different types of fiscal policy options have different effects on economic growth. But for South Africa, the policy is clear. The government of South Africa uses fiscal policy to tackle poverty, inequality and promote inclusive growth (National Treasury, 2017). Such policy is also supported by Siddiqi & Meir (2012) who argued that the functions of public finance are allocation of resources, redistribution of income and macroeconomic stabilization. The allocation and redistribution of income are at the core of the budget expenditure policy. Hence, as articulated by Lewis & Thorbecke (1992), the role of the government in poverty reduction is eminent in terms of how it directs public expenditure.

2.3. Fiscal trends in the Eastern Cape Province

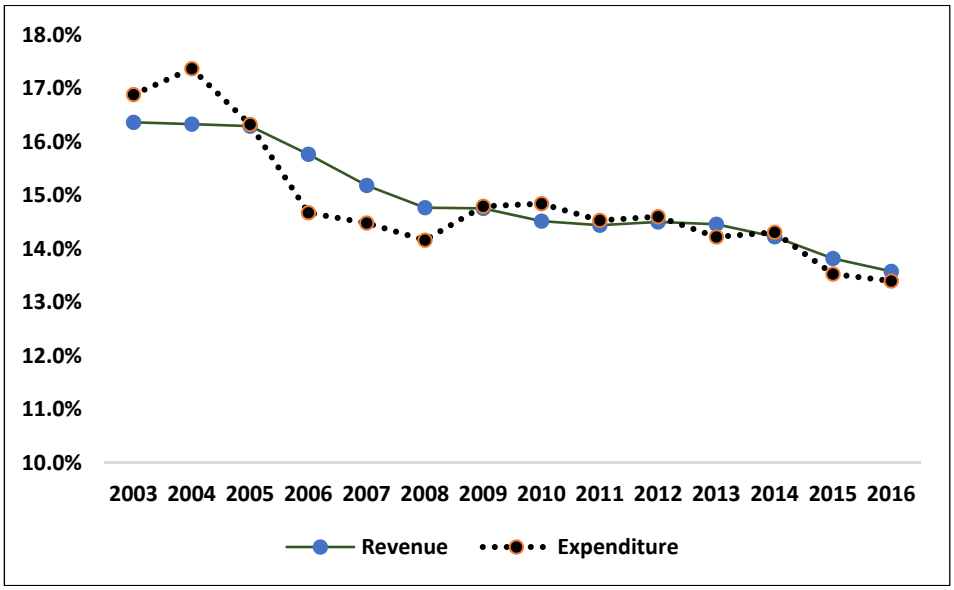
According to the International Organization of Motor Vehicle Manufacturers (OICA), the automotive sector is one of the biggest national economic and socio-economic contributors and considered to be vital to the welfare of the Eastern Cape Province and South Africa as well. Despite the competition at the global market, the government is directing its efforts in promoting this important sector through subsidization (International Organisation of Motor Vehicle Manufacturers [OICA], 2007).

The budget strategy of the Eastern Cape Provincial Treasury is aligned with the national budget and the principles of the National Development Plan (NDP), namely inclusive growth, employment creation, improving the quality of education and health outcomes, investing in infrastructure, building a capable state and partnerships. Over the next Medium Term Economic Framework (MTEF), total expenditure in the province will amount to R 74.4 billion in 2017/2018; R 78.4 billion in 2018/2019 and R 83.6 billion in 2019/2020, with an annual average increase of 6.5% (Eastern Cape Provincial Treasury, 2017).

A key focus of provincial fiscal policy over the 2017/2018 financial year was to give greater impetus to raising the level of regional economic growth through improved capital investment and infrastructure development, supporting enterprise development, promoting primary agriculture production on a commercial scale, agro-industry development, improving own revenue generation, and ensuring efficient and effective service delivery at district municipal level through the provision of ongoing support in targeted regions (Eastern Cape Provincial Treasury, 2017).

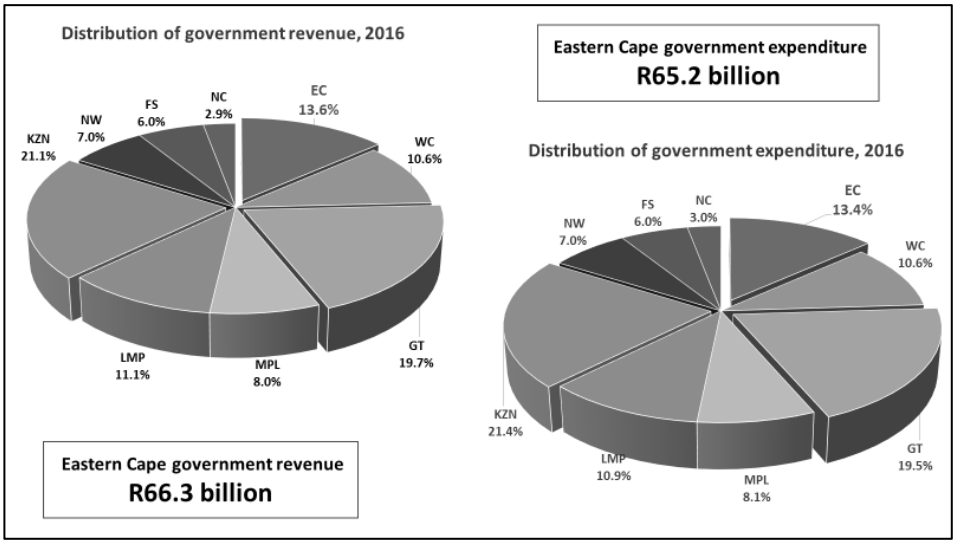
The Eastern Cape Province is gradually losing its share of total revenue. Figure 1 shows how the province's share of total revenue declined from 16.4% in 2003 to 13.6% in 2016. This decline was primarily attributed to high net migration in the province. Hence, the provincial revenue is not sufficient to fund all the priorities contained in the Eastern Cape Development Plan (EC PDP).

Figure 1. Eastern Cape revenue and expenditure as a percentage of the total for South Africa



Source: South Africa Revenue Service [SARS] (2017).

Figure 2. Distribution of revenue and expenditure across provinces



Source: South African Reserve Bank [SARB] (2017).

Constraints in economic growth have negatively impacted on own raised revenue and the revenue collection has not shown any improvement over the past years. This requires a continual improvement in public spending in the Province. Provincial's own revenue generation will improve on infrastructure investment which will have multiplier effects in respect of regional economic growth and on employment opportunities and will widen the tax base (National Treasury, 2017).

When considering the distribution of government revenue and expenditure across provinces, Figure 2 indicates that in 2016, the Eastern Cape government revenue was R 66.3 million (13.6 percent of total revenue in South Africa) and the expenditure was R 65.2 million (13.4 percent of total expenditure in South Africa).

The largest Province (Gauteng) alone accounts for 40 percent of tax payers and generates 50 percent of tax assessed in South Africa. In the Eastern Cape (EC), the picture is different to that of Gauteng. The province accounts for 8 percent of tax payers and generates 6 percent of tax assessed in South Africa.

Table 2 below shows the number of tax payers, the taxable income (R 1 million) of these tax payers, and the tax assessed (R 1 million) in the Eastern Cape and in South Africa. Although the number of tax payers in the Eastern Cape has declined by 19 percent from 466,664 in 2012 to 376,727 in 2016, the tax assessed has increased by 32 percent from R 12,123 million in 2012 to R 16,100 million in 2016 (Table 2). According to Statistics South Africa [Stats SA] (2017), the Eastern Cape Province has the highest net migration rate in the country. If the habitants of the province are tax payers, then the high migration rate will affect the provincial tax base.

Table 2. Number of tax payers, taxable income, and tax assessed in the Eastern Cape and in South Africa (2003-2016)

Year	Eastern Cape			South Africa		
	Number of taxpayers	Taxable income (R million)	Tax assessed (R million)	Number of taxpayers	Taxable income (R million)	Tax assessed (R million)
2003	278 011	22 388	4 565	3 352 190	332 804	79 350
2004	295 108	25 776	4 650	3 542 006	381 457	82 641
2005	327 734	30 855	5 593	3 806 986	441 507	95 994
2006	341 834	34 423	6 198	4 006 466	511 547	111 330
2007	333 229	37 710	6 549	4 068 691	590 738	125 342
2008	327 619	42 812	7 578	4 123 231	692 570	149 524
2009	369 116	51 676	9 067	4 712 709	818 510	172 641
2010	405 676	57 847	9 623	5 235 835	884 432	176 064
2011	434 279	65 505	10 909	5 646 230	1 004 630	199 456
2012	466 664	73 046	12 123	6 172 158	1 131 250	224 170
2013	459 294	83 530	13 007	6 103 488	1 296 850	246 334
2014	444 775	89 203	14 414	5 806 204	1 374 910	269 481
2015	416 052	93 997	15 394	5 370 717	1 456 410	288 873
2016	376 727	93 584	16 100	4 800 344	1 441 530	296 959

Source: SARS (2017).

3. Methodology

3.1. Description of the model

We will use a Social Accounting Matrix (SAM) to analyze the impact of the fiscal policy on the economy of Eastern Cape Province. A SAM provides a comprehensive and consistent description of transactions taking place in an economy during a specified period of time, generally one year (Graham & Round, 1985). It is a square matrix that quantitatively describes the transactions that occurred between the production sector, private (households), public (government) institutions, other factors, and the rest of the world. Each transaction in the SAM is represented by a column and row, with columns tracking expenditures and rows tracking incomes. A SAM follows the principles of double-entry accounting. This has two implications. First, all purchases, expenditures or financial outlay by one account are recorded as sale, income or financial inflow to one or more other accounts. Second, for each account, total income must be equal to total expenditure (Reinert & Roland-Holst, 1997).

According to the United Nations' 2008 System of National Accounts (SNA) (1968), a SAM is described as the presentation of SNA accounts in a matrix which elaborates the linkages between the Supply and Use Tables and institutional sector accounts. In many instances, SAMs have been applied to an analysis of interrelationships between structural features of an economy and the distribution of income and expenditure among household groups.

Miller & Blair (2009) described a SAM as a matrix T in which the transactions with elements $T_{i,j}$ represent payment from column account j to row account i. Following the conventions of double-entry bookkeeping, the total receipts (income) and total expenditure of each actor must balance. That is, for a SAM, every row sum Yi must equal the corresponding column sun Yj:

$$Y_i = \sum_j T_{i.j} = \sum_J T_{j.i} \text{ and } Y_j \sum_j T_{i.j} = \sum_J T_{j.i} \quad (1)$$

where:
Y_i is total receipts of account i,
Y_j is the total expenditures of accounts j.

T_{ij} and t_{ji} represent the transactions recorded in the column accounts and in the row accounts, respectively. These transactions are consistent and interlinked in a single accounting framework called the SAM.

From equation 1, it is possible to derive the main structure of the economy. This is obtained by dividing each cell entry in the SAM matrix by its respective column total which leads to a SAM technical coefficient matrix *A*, shown in equation 2 (Leontief, 1986).

$$A_{i.j} = \frac{T_{i.j}}{y_j} \tag{2}$$

By definition, all the column sums of matrix *A* must be equal to 1, so the matrix is singular. Since column sums must equal row sums, it also follows that (in matrix notation):

$$y = Ay \tag{3}$$

3.2. Structure and construction of the SAM

The structure of our SAM consists of an integrated economic accounting framework. Table 3 provides a list of the major economic accounts prescribed by the 2008 SNA for the construction of this SAM. The *T* accounts are thereafter transferred into a single matrix called 'Macro SAM'. The Macro SAM is thereafter disaggregated into a full SAM that contains a detailed socioeconomic database presented in a matrix format. In other words, the Macro SAM is the highest level of aggregation of the National (Regional) Accounts. It shows how the supply and use of goods and services (rows and columns 1 and 2), the distribution and use of income accounts (rows and columns 3 to 6), the accumulation accounts (rows and columns 7 to 9), and the rest of the world accounts (rows and columns 10 and 11) are presented in a single matrix format. In so doing, one is able to move from a presentation of the data in the form of a ***T*** account to a presentation of data in a Matrix format; and thereafter, to a full disaggregated SAM.

From the SAM as a database to the SAM as a model, all accounts must be classified as either endogenous or exogenous. In the work done by Pyatt & Round (1985), the production factors, production activities and institutions were considered as endogenous, whereas the government current account and the rest of the world account were considered exogenous.

Table 3. Structure of a macro SAM

Integrated Economic Account (classification)		Goods and Services (products)	Production (industries)	Generation of Income (Value Added Categories)	Allocation of Primary Income (institutional sectors)	Secondary Distribution of Income (institutional sectors)	Use of Income (institutional secotors)	Capital (institutional sectors)	Fixed Capital Formation (industries	Financial (financial assets)	Rest of the World		TOTAL
											Current	Capital	
	Codes	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	*12*
Goods and Services (products)	***1***	Trade & Transport Margins	Intermediate Consumption				Final Consumption Expenditure	Changes in Inventories /1	Gross Fixed Capital Formation		Exports of Goods and Services		Ta
Production (industries)	***2***	Output											Tb
Generation of Income (Value Added Categories)	***3***		Net Value Added, at basic prices								Compensation of employees from ROW		Tc
Allocation of Primary Income (institutional sectors)	***4***	Taxes less subsidies on products		Net Generated Income at basic prices	Property Income						Property Income and Taxes less subsidies on prod. from ROW		Td
Secondary Distribution of Income (institutional sectors)	***5***				Net National Income	Current Taxes on Income, Wealth, etc. and curr. transfers					Current Taxes on Income etc and current transfers from ROW		Te
Use of Income (institutional sectors)	***6***					Net Disposable Income	Adj. for change in net equity households on pension funds				Adj. for change in net equity hh. On pension funds frim ROW		Tf
Capital (institutional sectors)	***7***						Net savings	Capital Transfers /2		Borrowing		Capital Transfers from ROW 2/	Tg
Fixed Capital Fromation (industries)	***8***		Consumption of Fixed Capital					Net Fixed Capital Formation					Th
Financial (financial assets)	***9***							Lending				Net lending of ROW	Ti
Rest of the World, Current	***10***	Imports of Goods and Services		Compensation of Employees to ROW	Property Income and Taxes less subsidies on prod to ROW	Current Taxes on Income, etc. and curr. transf. to ROW	Adj. for Change in Net Equity H.H on pension funds to ROW						Tj
Rest of the World, Capital	***11***							Capital Transfers to ROW			Current External Balance		Tk
TOTAL	*12*	Ta	Tb	Tc	Td	Te	Tf	Tg	Th	Ti	Tj	Tk	

Source: Adapted from: SNA 2008 (2009); Stats SA (2008).

3.3. Type I and Type II multipliers

To measure socioeconomic impact, economists distinguish between direct, indirect and induced economic effects (Miller & Blair, 2009). Indirect and induced effects are referred to as secondary effects. The total economic impact is the sum of direct, indirect and induced effects within a region. Any of these impacts may be measured in terms of gross output or sales, income, employment or value added (Mc Donald & Punt, 2002).

The direct impacts measure an increase in the output of a product as a response to an increase in final demand for that particular product, as producers react to meet the increased demand. These direct impacts refer to the effect of the activities that take place within an industry. They refer to the income and expenditure that is associated with the everyday operation of each of the components of the industry. For instance, in a factory the direct impacts refer to the total production/turnover of the factory; the intermediate goods bought by the factory; the salaries and wages paid by the factory; and the profits generated by the factory.

The indirect impacts arise from changes in activity of suppliers. As producers increase their output, increase in demand on their suppliers occurs and causes a ripple effect in the economy. These indirect impacts refer to economic activities that arise in the sectors that provide inputs to the industry and other backward linked industries. For example, if the primary agriculture sector uses fertilizer, the indirect impacts refer to the activity (paying of salaries and wages; and profit generation) that occurs in the fertilizer sector as well as the sectors that provide materials to the fertilizer sector.

The induced impacts measure shifts in spending on goods and services as a consequence of an increase of the household income throughout the economy caused by direct and indirect effects. Impacts refer, i.a., to the economic impacts that result from the payment of salaries and wages to people who are (directly) employed at the various stages in an industry. In addition, the induced impact also includes the salaries and wages paid by businesses operating in the sectors indirectly linked to the industry through the supply of inputs. These additional salaries and wages lead to an increased demand for various consumable goods that need to be supplied by other sectors of the economy that then have to raise their productions in tandem with the demand for their products and services. These induced impacts can then be expressed in terms of their contributions to GDP, employment creation and investment or other useful macroeconomic variables.

Total or economy-wide impact – added together, the direct, indirect and induced impacts provide the total impact that an industry will have on the national and provincial economies (Leontief, 1974; 1986).

The manner in which goods and services flow within the economy is an indication that economic agencies do not operate in isolation (Leontief, 1936). Linkage analysis methods have again attracted increasing attention from policy analysts throughout the world. With regards to the measurement of linkage coefficients, there are two main methods used to examine the interdependency between the production and cost structures of the economy (Miller & Blair, 2009).

Both methods, that is, the **Chenery-Watanabe method** and **Rasmussen method**, also known as the backward linkage and forward linkage of industries, are applied to the Eastern Cape Supply and Use (SU)-Tables and the SAM model.

The **Chenery-Watanabe method** is derived from the input coefficient, a demand-driven model that attempts to supply a quantitative evaluation of backward and forward linkages for the economy's production structure.

The backward linkage of an industry *j* is defined as:

$$BL_j^c = \sum_{i=1}^{n} \frac{x_{ij}}{x_j} = \sum_{i=1}^{n} a_{ij} \tag{4}$$

where:

BL_j^c – denotes the backward linkage of industry *j*,

x_{ij} – the magnitude of industry *i*'s output used as production input by industry *j*, x_j – industry *j*'s output and a_{ij} is the input coefficient of industry *j* to industry *i*

The forward linkage of an industry *i* is defined as:

$$FL_i^c = \sum_{j=1}^{n} \frac{x_{ij}}{x_i} = \sum_{j=1}^{n} a_{ij} \tag{5}$$

The flaw in this method is that the coefficients measure only the initial effect generated by inter-dependencies between industries. These coefficients yield the direct backward and forward linkages.

The **Rasmussen method** is based on the Leontief inverse matrix $(I-A)^1$, and is used to measure inter-industry linkages (Leontief, 1974).

The backward linkage BL_j reflects the effect of an increase in final demand of industry j on overall output; in other words, it measures the extent to which a unit change in the demand for the product i of industry j causes production increases in all industries.

$$BL_j = \sum_{i=1}^{n} g_{ij} \tag{6}$$

where:

g_{ij} – the ij^{th} element of the Leontief inverse matrix.

The forward linkage FL_j^R measures the magnitude of the increase in output for industry *i*, if the final demand in each industry should increase by one unit; in other words, it measures the extent to which industry *i* is affected by an expansion of one unit in all industries (Miller & Blair, 2009).

3.4. The data used to compile the Eastern Cape SAM

We constructed the SAM using data collected from different sources. Since the required data is not drawn from a single source, information from various sources can be inconsistent due to various methodologies, time periods, and definitions used to compile the data. The main challenge is therefore to make the data consistent and useful. For example, there are invariably differences between the incomes and expenditures reported in national household surveys; between the Quarterly Labour Force Survey (QLFS) and the census. This process is valuable since it helps to identify inconsistencies among statistical sources. The technique used to balance the matrices is discussed in the next section. The data used to compile the SAM were collected from four main data sources:

- Statistics South Africa (Stats SA): raw data collected from various periodic censuses of Agriculture, Manufacturing, Construction, Wholesale trade, Catering and accommodation, Business services, Social services, and the 2016 Community Survey for demographic data. Also various publications such as: National accounts statistics, Government financial statistics, Income and expenditure survey, and Labour force survey (Stats SA, 2017).
- Global Insight (IHS-REX) database and Quantec database provide disaggregated national account data at provincial level, including changes in inventories, taxes on products, taxes on production, and subsidies on products and subsidies on production (Global Insight, 2017).
- The Supply and Use Tables were entirely integrated in the SAM: The SU-Tables provide information on production of goods and services, the intermediate consumption expenditure, imports and exports, taxes and subsidies. The data on the components of final demand (household, government, gross fixed capital formation), and the components of gross value added (compensation of employee, gross operating surplus) are also provided in the SU-Tables (Stats SA, 2017).

- Other sources included provincial and national government departments, Chamber of Mines, Eskom, SARB, Transnet, South African Revenue Service (SARS, 2017).

3.5. Balancing the SAM

The range of datasets used to construct the prior micro SAM implies that there will inevitably be imbalances (i.e., row and column totals are unequal). In this respect, cross-entropy econometric technique is used to reconcile SAM accounts (Robinson, 2001). Table 4 presents the equations defining the SAM estimation procedure (Stone, 1962). Starting from an initial estimate of the SAM, additional information is imposed in the form of constraints on the estimation. Equation 7 specifies that the sum of rows and corresponding sum of columns must be equal. It defines the characteristic of a consistent set of SAM accounts. Equation 8 specifies that subaccounts for the SAM must be equal to control totals because these totals are assumed to be measured with error (Equation 9). An example consists of the estimate of GDP provided by national accounts. It is the total value of the factor-activity matrix in the prior SAM. The matrix G is an aggregator matrix, with entries equal to 0 or 1. The index k is general and can include individual cells, column/row sums, and any combination of cells such as macro aggregates. In this respect the changes in index *k* will indicate the magnitude of error in the SAM.

Table 4. Cross-entropy SAM estimation equations

Index	
i, j	Row (i) and column (j) entries
k	Set of constraints
w	Set of weights
Symbol	
T_{ij}	SAM in values
Aij, $\bar{A}ij$	SAM in column coefficients
G_{kij}	Aggregator matrix for each constraint k
γij, $\gamma \bar{ij}$	Aggregate value for constraint k
e_k	Error on each constraint k
e_{ij}^{A}	Error on each cell coefficient
W	Weights and prior on error term for each constraint k or cell coefficient i, j
V	Error support set indexed over w for each constraint k or cell coefficient i, j
Equations	
$\sum_i T_{ij} = \sum_j T_{ij}$	(7)
$\sum_i \sum_j G_{kij} \cdot T_{ij} = \gamma_k$	(8)
$\gamma_k = \gamma_{\bar{k}} + e_k$	(9)
$e_{ij}^{A} = \sum_w W_{ijw}^{A} \cdot \bar{V}_{ijw}^{A}$	(10)

The error specification in Equations 8 and 9 describes the errors as a weighted sum of a specified 'support set' (the V parameters). The weights (W) are probabilities to be estimated, starting from a prior SAM on the standard error of measurement of values of appropriate column and row from the square matrix of the SAM (Equation 10).The number of elements in the error support set (w) determines how many moments of the error distribution are estimated. The probability weights must be non-negative and sum to one for each column and row of the square SAM. The objective function consists of the cross-entropy distance between the estimated probability weights and the errors in both coefficients and aggregates of SAM flows. It can be shown that the objective function is uniquely appropriate. Using any other objective function should introduce unwarranted assumptions (or information) about the errors.

4. Simulation results

4.1. Fiscal multipliers (First scenario)

This first scenario presents simulation results of the impact of fiscal expansion on the Eastern Cape economy for a hypothetical R 1 million increase in final demand. It shows backward multipliers, that is the demand-side tax multipliers for VAT, customs and excise, fuel levy and tax on production. The impact is positive: the results in Table 5 show that a hypothetical R 1 million increase in final demand will generate in total R 61,067 direct and indirect impact for VAT, R 25,683 for tax on production, R 18,102 for fuel levy and R 14,777 for both customs and excise duties. Table 5 includes the simulation results of the impact of fiscal expansion on the Eastern Cape economy.

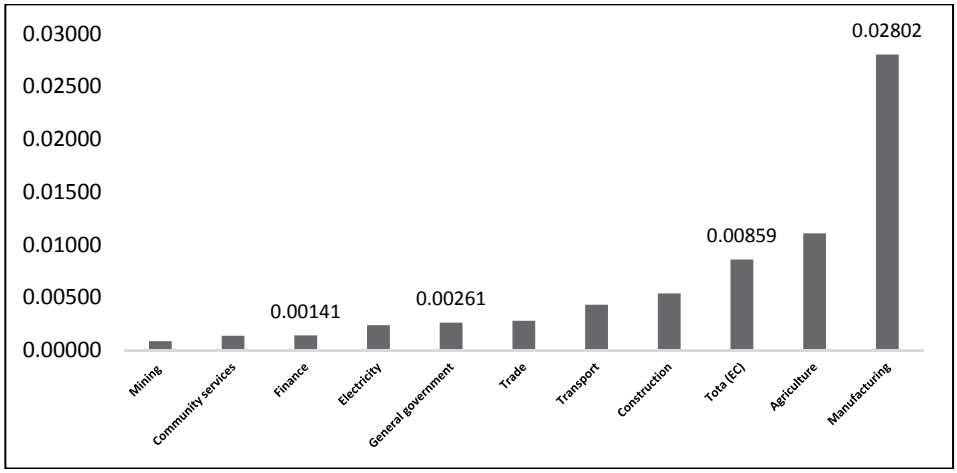
Table 5. Simulation results of the impact of fiscal expansion on the Eastern Cape economy

Tax multipliers (Rand)	Type I multiplier					Type II multiplier	
	Initial impact	First round	Direct impact	Indirect effect	Direct & indirect impact	Induced impact	Economy-wide impact
VAT	34 678	15 882	50 560	10 507	61 067	4 322	65 389
Customs	5 677	1 542	7 219	939	8 158	435	8 593
Excise	5 067	686	5 753	278	6 031	153	6 184
Fuel Levy	4 952	6 844	11 796	4 482	16 278	1 824	18 102
Tax on production	14 330	6 684	21 014	4 669	25 683	1 828	27 511

Source: Author's calculation adapted from the EC SAM Model (2016).

Looking at the VAT multiplier at sectoral level, high impact occurs in the manufacturing sector followed by agriculture. This means that agro-processing activities which involve both agriculture and manufacturing have a high impact on VAT. Figure 3 presents the VAT multiplier per R 1 increase in final demand.

Figure 3. VAT multiplier per R 1 increase in final demand



Source: Author's calculation adapted from the EC SAM Model (2016).

4.2. Simulate a hypothetical 1.5 percent increase in government revenue (Second scenario)

The second scenario assumes that efficiency in revenue collection in the province will increase the current revenue by 1.5 percent. This means the current revenue will increase from the current base of R 66,341 million to R 67,336 million. It is further assumed a balanced budget whereby the additional revenue will be spent by government. In this way, we need to assess the net economic impact on the Eastern Cape Province.

In this second scenario, we used the SAM-Leontief model to generate the following impacts on the Eastern Cape economy:

- Economic impact in terms of output and gross value added (GVA),
- Employment impact in terms of jobs created in the formal sector (by skill levels) and in the informal sector,
- Income inequality and poverty impact in terms of income that will be generated and redistributed to the households, and
- Investment impact in terms of gross domestic fixed investment

4.2.1. Economic impact

A hypothetical 1.5 percent increase in government revenue, once spent in the province, will have a positive total effect on total production output of R 1.611 million (Table 6). Assume government spends that money on grants and

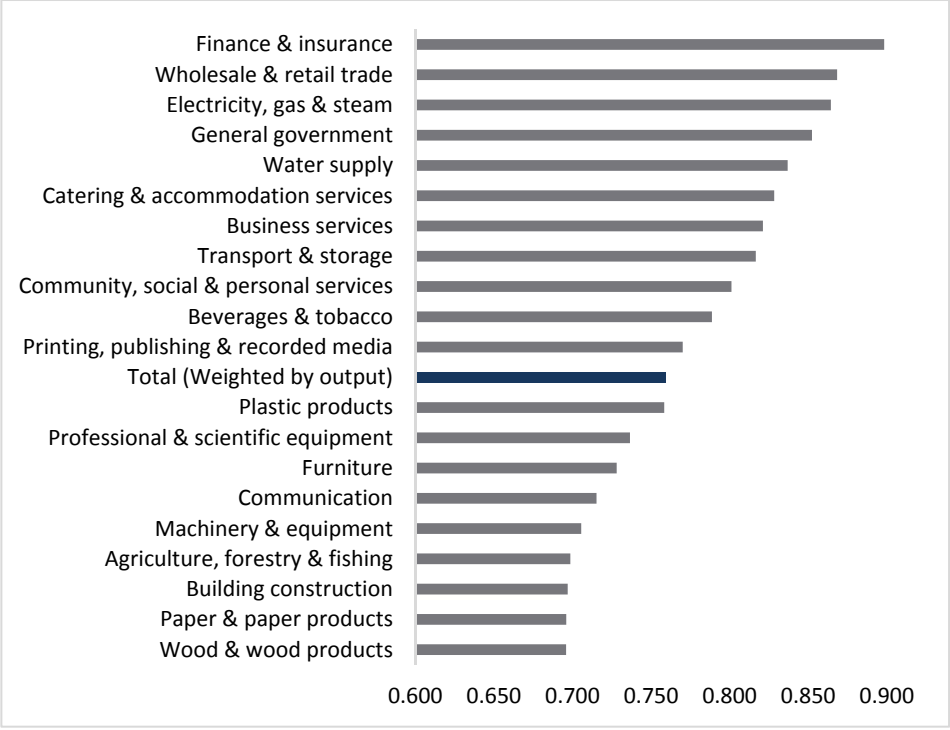
wages, household beneficiaries will in turn spend the money, stimulating more demand on goods and services, causing an induced output effect of R 257 million. Figure 4 includes sector GVA multipliers for a hypothetical 1.5 percent in government revenue. Finance and insurance sector will benefit the most when government increases its revenue.

Table 6. Output and GVA multipliers for a hypothetical 1.5 percent increase in government revenue

(Rand)	Direct impact	Indirect effect	Total effect	Induced impact	Economy-wide impact
OUTPUT	1 366 147 031	245 735 396	1 611 882 426	257 598 955	1 869 481 381
GVA	608 123 532	106 898 033	715 021 564	44 451 788	759 473 353

Source: Author's calculation adapted from the EC SAM Model (2016).

Figure 4. Sector GVA multipliers for a hypothetical 1.5 percent increase in government revenue



Source: Author's calculation derived from the EC SAM Model (2016).

The economy-wide impact associated with 1.5 percent increase in government revenue on output will be R 1.869 million. Since economic growth is measured in terms of value-added, economy-wide impact associated with a 1.5 percent increase in government revenue on GVA will be R 759 million. In 2016, the Eastern Cape GVA was R 210,866 million. The impact of R 759 million will shift the economy to grow by 0.35 percent. The main sectors that will contribute to economic growth are Finance and Trade (Figure 4).

4.2.2. Employment impact

Table 7 includes the employment multipliers. We are assuming that the efficiency in revenue collection will increase the Eastern Cape government revenue by 1.5 percent. The additional revenue will be reinjected in the province. The SAM-Leontief model used to assess economy-wide impact on employment showed positive results with 3,018 jobs in total of which 71.4 percent in the formal sector and 28.6 percent in the informal sector. Out of the 2,155 jobs in the formal sector, 44.3 percent will be generated by semi-skilled laborers, 31.1 percent by unskilled workers, and 24.8 percent by skilled workers. Employment opportunities created refer to one person employed for one year. For the purpose of this study, seasonal work is therefore not counted as an individual employment opportunity, but instead combined to calculate the number of total jobs created in one year.

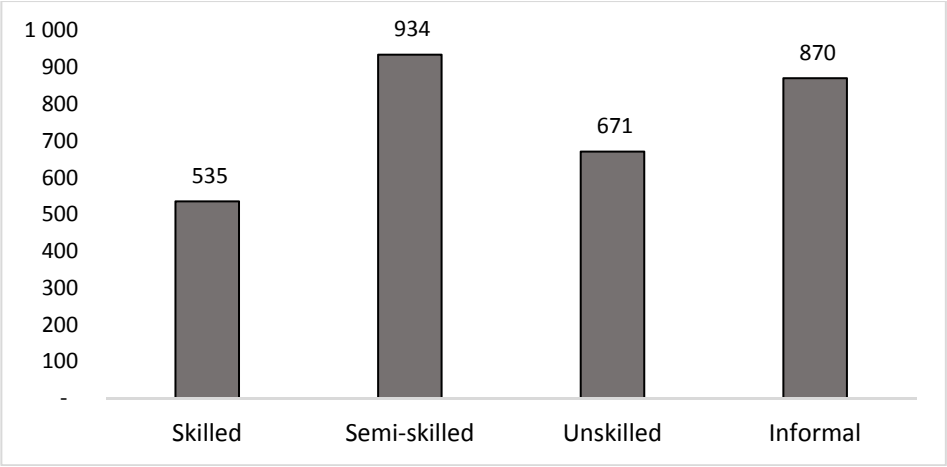
Table 7. Employment multipliers for a hypothetical 1.5 percent increase in government revenue (number of jobs in the formal and informal sector)

(Number of jobs)	Direct impact	Indirect effect	Total effect	Induced impact	Economy-wide impact
Total	2 474	371	2 845	173	3 018
Formal	1 772	253	2 025	130	2 155
Skilled	460	51	511	24	535
Semi-skilled	764	118	882	52	934
Unskilled	548	84	632	39	671
Informal	702	118	820	50	870

Source: Author's calculation adapted from the EC SAM Model (2016).

In 2016, there were 1,450,979 people employed in the Eastern Cape. The additional 3,018 people will raise employment by 0.2 percent. Figure 5 includes the employment multipliers for a hypothetical 1.5 percent increase in government revenue. It indicates that more jobs will be generated amongst the people with semi-skilled levels.

Figure 5. Employment multipliers for a hypothetical 1.5 percent increase in government revenue (number of jobs by skill levels)



Source: Author's calculation adapted from the EC SAM Model (2016).

4.2.3. Impact on income inequality and poverty alleviation

In this model, we use income as a proxy for poverty alleviation. The income multiplier shows the total value of compensation of employees (wages, salaries and supplements) necessary to satisfy one unit of currency's worth of final demand of the output of the industry. Because compensation of employees is a part of GVA, results should show that income multipliers are lower than GVA multipliers. Again, we are assuming that the efficiency in revenue collection will increase the Eastern Cape government revenue by 1.5 percent. The additional revenue will be reinjected in the province. The SAM-Leontief model used to assess the economy-wide impact on compensation of employees showed positive results of R 15 million income earned in the informal sector and R 45 million earned by unskilled labors. These income multipliers will contribute to poverty reduction and income inequality in the province. Table 8 includes the income multipliers for a hypothetical 1.5 percent increase in government revenue. The direct impact was positive on both formal and informal sectors.

Table 8. Income multipliers for a hypothetical 1.5 percent increase in government revenue

(Rand Values)	Direct impact	Indirect effect	Total effect	Induced impact	Economy-wide impact
Total	271 339 639	38 003 925	309 343 564	16 725 026	326 068 590
Formal	259 519 037	35 532 159	295 051 195	15 730 757	310 781 952
Skilled	120 231 086	13 483 932	133 715 018	6 256 712	139 971 729
Semi-skilled	102 411 293	16 298 115	118 709 408	6 963 096	125 672 505
Unskilled	36 876 692	5 750 127	42 626 819	2 510 955	45 137 774
Informal	11 820 655	2 471 800	14 292 456	994 280	15 286 736

Source: Author's calculation adapted from the EC SAM Model (2016).

4.2.4. Impact on investment

Table 9 includes the investment multiplier for a hypothetical 1.5 percent increase in government revenue. Fixed investment in economics refers to investment in fixed capital or to the replacement of depreciated fixed capital. Thus, fixed investment relates to the investment in physical assets such as machinery, land, buildings, installations, vehicles, and technology. The investment multiplier for a hypothetical 1.5 percent increase in government revenue throughout the economy will amount to R 15.5 million.

Table 9. Investment multiplier for a hypothetical 1.5 percent increase in government revenue

	Direct impact	Indirect effect	Total effect	Induced impact	Economy-wide impact
Investment	**120 256 291**	**22 112 360**	**142 368 651**	**9 100 096**	**151 468 747**

Source: Author's calculation adapted from the EC SAM Model (2016).

5. Conclusions

This study used the Social Accounting Matrix (SAM-Leontief Model) to investigate the impact of fiscal expansion on economic growth. The methodology used to develop the SAM database is in line with the United Nations' 2008 System of National Accounts (SNA) and international best practices (A System of National Accounts 2008 (SNA 2008), 2009).

The results show that enhancing own revenue generation and ensuring efficiency in government revenue collection will have positive economy-wide impact in the province. For instance in the first scenario, the simulation results of

the impact of fiscal expansion on the Eastern Cape economy for a hypothetical R 1 million increased in final demand. It shows backward multipliers, that is the demand-side tax multipliers for VAT, customs and excise, fuel levy and tax on production. The impact is positive as a hypothetical R 1 million increase in final demand will generate in total R 61,067 direct and indirect impact for VAT, R 25,683 for tax on production, R 18,102 for fuel levy and R 14,777 for both customs and excise duties.

In terms of employment, we assumed that the efficiency in revenue collection will increase the Eastern Cape government revenue by 1.5 percent. In this respect, the additional revenue will be reinjected in the province. The SAM--Leontief model used to assess economy-wide impact on employment showed positive results with 3,018 jobs in total of which 71.4 percent in the formal sector and 28.6 percent in the informal sector. Out of the 2,155 jobs in the formal sector, 44.3 percent will be generated by semi-skilled laborers, 31.1 percent by unskilled workers, and 24.8 percent by skilled workers. Employment opportunities created refer to one person employed for one year.

The economy-wide impact associated with 1.5 percent increase in government revenue on output will be R 1.869 million. Since economic growth is measured in terms of value-added, economy-wide impact associated with a 1.5 percent increase in government revenue on GVA will be R 759 million.

The empirical outcome from this research reveals that government should consider with caution the impact of fiscal expansion on the Eastern Cape economy for a hypothetical R 1 million increase in final demand. There is a useful way of further examining the techniques of multipliers effect and the construction of the model as performed in this thesis. Scope for further research on converting the SAM database to a Computable General Equilibrium Model is recommended.

References

A System of National Accounts 2008 (SNA 2008). (2009). New York: European Commission – International Monetary Fund – Organisation for Economic Co-operation and Development – United Nations – World Bank.

Alesina, A., Barbiero, O., Favero, C., Giavazzi, F., & Paradisi, M. (2017). *The effects of fiscal consolidations: Theory and evidence* (NBER Working Paper No. 23385). Cambridge: NBER.

Bastagli, F., Coady, D., & Gupta, S. (2012). *Income inequality and fiscal policy* (IMF staff discussion note, SDN/12/08). Washington, DC: International Monetary Fund.

Breisinger, C., Thomas, M., & Thurlow, J. (2009). *Social accounting matrices and multiplier analysis: An introduction with exercises*. Food Security in Practice Technical Guide 5. Washington, DC: International Food Policy Research Institute.

Burrows, L. R., & Botha, A. P. (2013). Explaining the changing input-output multipliers in South African: 1980-2010. Paper presented at the Biennial Conference of the Economic Society of South Africa. 25-27 September 2013, Bloemfontein.

Eastern Cape Provincial Treasury. (2017). G*overnment of the Eastern Cape: Provincial Treasury's annual report*. 2016/2017 financial year. Bhisho: Author. Retrieved from https://www.ecsecc.org/information-centre/?type=statistics-data#publications

Eurostat. (2008). *Eurostat Manual of supply, use and Input-Output Tables* (Methodologies and Working Papers). Luxembourg: Author.

Global Insight. (2017). *Regional explorer database*. Retrieved from http://www.ihsmarkit.co.za/products/rex/

Graham, P., & Round, J. I. (1985). *Social accounting matrices: A basis for planning*. Washington, DC: World Bank.

International Monetary Fund [IMF]. (2015, June). *Fiscal policy and long-term growth* (Policy paper). Washington, DC: Author. Retrieved from https://www.imf.org/external/np/pp/eng/2015/042015.pdf

International Monetary Fund [IMF]. (2017). *Database*. Retrieved from http://www.imf.org/en/Publications/FM/Issues/2017/04/06/fiscal-monitor-april-2017

International Organisation of Motor Vehicle Manufacturers [OICA]. (2007). *The World's Automotive Industry. Some key figures*. Annual Report 2007. Retrieved from http://oica.net/wp-content/uploads/2007/06/oica-depliant-final.pdf

Leontief, W. (1936). Quantitative input-output relations in the economic system of the United States. *Review of Economics and Statistics*, *18*(III), 105-125. doi: 10.2307/1927837

Leontief, W. (1974). Structure of the world economy: Outline of a simple input-output formulation. *Swedish Journal of Economics, 76*, 387-401. doi: 10.2307/3439247

Leontief, W. (1986). *Input-output economics*. 2nd ed. New York: Oxford University Press.

Lewis, B. D., & Thorbecke, E. (1992). District-level economic linkages in Kenya: Evidence based on a small regional social accounting matrix. *World Development, 20*(6), 881-897.

McDonald, S., & Punt, C. (2002). *A social accounting matrix for the Western Cape*. Elsenburg: Department of Agriculture, Western Cape Government.

McLennan, W. (2006). *Australian national accounts: Introduction to input-output multipliers* (Information paper No. 5246.0). Canberra: Australian Bureau of Statistics.

Miller, R. E., & Blair, P. D. (2009). *Input-output analysis: Foundations and extensions*. Cambridge: Cambridge University Press.

National Treasury. (2016). *Budget review*. 2016/2017 financial year. Pretoria: Republic of South Africa.

National Treasury. (2017). *Budget review*. 2017/2018 financial year. Pretoria: Republic of South Africa.

OECD. (2015). *Construction of OECD inter-country Input-Output table for measuring trade in value-added indicators: Sources and methods*. Paris: Author.

Onder, H., & Hernandez, F. (2015). *Fiscal implications of aging and natural resource dynamics* (Background paper for the World Bank's Aging Research Project for the Russian Federation). Washington, DC: World Bank.

Pyatt, G., & Round, J. I. (1985). *Social accounting matrices: A basis for planning, file copy 9950*. Washington, D.C: The World Bank.

Ramon, E., Thomas, V., & Wang, Y. (2010). *The effect of fiscal policies on the quality of growth* (IEG evaluation brief No. 9). Washington, DC: World Bank.

Reinert, K. A., & Roland-Holst, D. W. (1997). Social accounting matrices. In J.F. Francois, & K. A. Reinert (Eds.), *Applied methods for trade policy analysis: A handbook* (pp. 94-121). Cambridge: Cambridge University Press.

Robinson, R. S. (2001). *Input-output guidebook: A practical guide for regional economic impact analysis*. Moscow: EMSI.

South African Reserve Bank [SARB]. (2017). *Quarterly bulletin*. Pretoria: South African Reserve Bank. Retrieved from https://www.resbank.co.za/Publications/Detail-Item-View/Pages/Publications.aspx?

South Africa Revenue Service [SARS]. (2017). *Tax statistics*. Retrieved from http://www.sars.gov.za/AllDocs/Documents/Tax%20Stats/Tax%20Stats%202017/Tax%20Stats%202017%20Publication.pdf

Statistics South Africa [Stats SA]. (2017). *Various publications released by the National Accounts*. Retrieved from www.statssa.gov.za

Stone, R. (1962). *A computable model of economic growth.* Volume 2: *A social accounting matrix for 1960 (with Alan Brown and others)*. London: Chapman and Hall.

United Nations. (1968). *A System of National Accounts. Studies in Methods*. Series F, No. 2, Rev. 3, New York. Retrieved from https://unstats.un.org/unsd/snaama/methodology.pdf

World Bank. (2014). *South Africa Economic update*. New York, Author.

World Bank. (2018). *World Economic Outlook*. New York, Author.