

https://dspace.org/

Identification of nucleus industries with higher growth potential for focused interventions and impact evaluation: case of South Africa

Mukandila, Andrew Kabulu

2015
http://hdl.handle.net/10539/18800

Downloaded from a DSpace repository. https://dspace.org/

UNIVERSITY OF THE WITWATERSRAND

Faculty of Commerce Law and Management

School of Economic and Business Sciences



Identification of Nucleus Industries with Higher Growth Potential for Focused Interventions and Impact Evaluation: Case of South Africa

By:

Name	:	Andrew Kabulu Mukandila
Student No.	:	0215444D
Cell No.	:	082 975 2365
Email	:	andrewmukandila@yahoo.com
Registration	:	2013

A research report submitted in partial fulfillment of the requirements for the Masters degree in Development Theory and Policy

Masters in Development Theory and Policy

Supervisor : Dr. Seeraj Mohamed

29 January 2015

Declaration

I declare this research report is my unaided work. It is submitted in partial fulfillment of the requirement of the degree of Masters in Development Theory and Policy at the University of the Witwatersrand, Johannesburg. It has never been submitted before for any degree or examination in any other University.

……..

Andrew K. Mukandila
Student Number: 0215444D

…….day of……, 2015

Acknowledgment

I thank the Lord, my God, for His gift of life and allowing me to see this day of submission of this work.

I am grateful to Dr. Seeraj Mohamed, my Supervisor, for broadening my understanding on underlined issues in economics during our interactions.

I thank my dear friend and brother, Tatenda Zengeni, for his encouragement and companionship on this journey.

May the Lord bless Springs of Love Ministries for the support and prayers throughout these years.

I dedicate this work to Chantal Lusamba, the companion of my life, Joshua, Carmel, Judith, Grace, Jabez, Gloria, Lizette, Shalom, Chantal, Xipemu, Valery, Arlette, Carmel, Aurel, Janice… my children, grandchildren, Brother, nieces… and generations to come for their patience even during difficult moments and hope they inspired to me during the work.

Abstract

This study aims at providing a scientific approach on how to identify nucleus sectors which have great potential for growth and positive impact on the rest of the economy for government interventions. The term “nucleus sectors” refers to sectors with potential to greatly impact on other sectors. The rationale for targeting available resources into sectors that have potential for enhancing growth in the rest of the economy is driven by the low level of investment in the productive sector over the past 20 years. The study uses the Input Output model and the Dynamic Social Accounting Matrix (DySAM) model to determine sub-sectors with higher multiplier effects to the rest of the economy. The nucleus of sectors is then identified by ranking sectors according to their multiplier effect on the rest of the economy through both backward and forward linkages. The South African Macroeconometric Model (MEMSA) is then used for the validation of the study results. The study identified 10 subsectors based on their potential to contribute to both economic growth and employment creation. The following sectors were identified, Leather and leather products; Furniture; Tobacco; Footwear; Textiles; Motor vehicles, parts and accessories; Wearing apparel; Paper and paper products ; Rubber products; and Professional and scientific equipment. The study also concluded that the gradual decline in the manufacturing share of employment coupled with the steady increasing employment share of services should not be interpreted as takeover of manufacturing by services. The manufacturing subsector still remains strategic for economic growth.

Contents

Declaration ii
Acknowledgment iii
Abstract iv
List of Figures vii
List of Tables viii
List of Appendix ix
CHAPTER 1: INTRODUCTION AND OVERVIEW ON THE CONCEPT ON INDUSTRIAL POLICY 1
1.1. Introduction 1
1.2. Problem Statement / Research Question 3
1.3. Research Aims and Objectives 4
1.4. Hypothesis 4
1.5. Methodology 5
1.5.1. Linkages in the economy using Input-Output Table and Social Account Matrix 5
1.5.2. Input Technical Coefficient Matrix 7
1.5.3. Measurement of backward linkages 8
1.5.4. Output Technical Coefficient Matrix 8
1.5.5. Measurement of forward linkages 9
1.5.6. Limitation of Input – Output Analysis 10
1.5.7. Macroeconomic Sectoral Interconnections 12
1.5.8. Shock in a Model concept 13
1.5.9. Sub-sectors selection 15
1.5.10. SAM Modelling Concept and Methodology 15
1.5.11. Validation and monitoring of the application on empirical data 19
1.6. Organization of the Study 19
CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK ON ECONOMIC ANALYSIS AND MODELLING 21
2.1. South African Industrial Path 21
2.2. Balanced and Unbalanced Growth Theory 22
2.3. Government Designation Policy or Localization 24
2.4. An Overview of Social Accounting Matrix (SAM) 25
CHAPTER 3: AN OVERVIEW OF THE SOUTH AFRICA'S INDUSTRIAL POLICY 27
3.1. Introduction 27
3.2. Description of the SA Classification of the Manufacturing Sector 31
3.3. Dynamism in the Manufacturing Sector and the Rest of the Economy 33
3.4. Importance of the Manufacturing Sector in the SA Economy 35
CHAPTER 4: COMPREHENSIVE ANALYSIS OF FINDINGS AND POLICY IMPLICATIONS 36
4.1. Introduction 36
4.2. Impact Results of An Injection at 1 Digit SIC Code Level 36
4.3. Growth Multipliers: Backward and Forward Linkages in the SA Economy 40
4.4. Employment Multipliers 42
4.5. Impact Results of An Injection at 3 Digits SIC Code Level 46

4.6. Analysis of the Manufacturing Sector and Policy Implications at Aggregate Level 52
4.7. Analysis of Manufacturing Sub-Sectors in the Economy for policy Direction 54
4.8. Results Validation 57
4.8.1. SAM approach and implication on policy 57
4.8.2. Validation through MEMSA application 58
CHAPTER 5: CONCLUSION AND CONSIDERATIONS 61
REFERENCES 65
APPENDIX 69

List of Figures

Figure 1: Backward and Forward Linkages 6
Figure 2: Interrelationship between Agents in the economy 12
Figure 3: Behavioral Flow of Main Economic Actors and Agents in an Open Economy 16
Figure 4: Annual Output index per Sector (1994=100) 29
Figure 5: Employment in selected Manufacturing Sub-Sectors (in 000') 30
Figure 6: Contribution of Sub-Sectors to Manufacturing Value-Added (% in 2012) 32
Figure 7: Gross Domestic Investment (1990 - 2012) in R million 34
Figure 8: Growth Multipliers by Sector (2013) 39
Figure 9: Economic Linkages (Multipliers) in SA Economy by Sector 41
Figure 10: Employment Trends in Manufacturing and Financial intermediation, insurance, real estate and business service 42
Figure 11: Employment Multipliers by Sector 46
Figure 12: Indirect Backward Growth Multipliers by Sub-Sectors 50
Figure 13: Indirect Backward Employment Multipliers by Sub-Sectors 51
Figure 14: Linkage Multipliers of the Manufacturing Sector 52
Figure 15: Ranking of Impact of Activities and Commodities 58

List of Tables

Table 1: Transactions - Interactions of Economic Agents 17
Table 2: Nature of Transactions between Economic Agents 18
Table 3: South Africa's Input-Output Matrix Format 37
Table 4: Sectors Multipliers at SIC Code Level 1 38
Table 5: Employment Multipliers at 1 digit SIC Code Level 44
Table 6: Sectoral Growth Multipliers at SIC code level 3 48
Table 7: Sectoral Employment Multipliers SIC code level 3 49
Table 8: Growth and Employment Multipliers Sectoral Ranking 54
Table 9: Ranking by Importance of Multipliers 55
Table 10: Total Impact of Intervention on Commodities and Activities 57
Table 11: Impact of Interventions in sectors of the economy as % share of GDP 60

List of Appendix

Appendix 1: SA Standardized Industry Input-Output Structure Format 69
Appendix 2: Input-Output Matrix at 1 digit SIC code level 71
Appendix 3: Identity Matrix 72
Appendix 4: Leontief Invest 72
Appendix 5: Growth Multipliers at 3 digit SIC code level 73
Appendix 6: Employment Multipliers at 3 digit SIC code level 75
Appendix 7: SAM Result on Activities and Commodities impact potential on Sectors 77
Appendix 8: Total Growth Multipliers at 3 digit SIC code level 80
Appendix 9: Total Employment Backward Multipliers at 3 digit SIC code level .. 81
Appendix10: MEMAS Impact of Interventions on Selected Indicators 82

CHAPTER 1: INTRODUCTION AND OVERVIEW ON THE CONCEPT ON INDUSTRIAL POLICY

1.1. Introduction

Considering the high unemployment rate which continues to characterise South Africa, the selection of sectors for policy intervention is a key factor of the government's approach to industrialisation and job creation. To realize its industrialisation and job creation's objectives the government adopted the National Industrial Policy Framework (NIPF) in January 2007. The NIPF sets out the country's broad approach to industrialisation with core objectives that includes the diversification of the economy beyond its reliance on traditional commodities (resource based industry) and non-tradable services, and the promotion of more labour-absorbing industries.

This study aims at providing a scientific approach on how to identify nucleus sectors which have great potential for growth and positive impact on the rest of the economy for government interventions. The term "nucleus sectors" refers to sectors with potential to greatly impact on other sectors. The rationale for targeting available resources into sectors that have potential for enhancing growth in the rest of the economy is concerned about the low level of investment in the productive sector over the past 20 years.

Peet (1987) cited in Altman and Mayer (2003) states that "no major country has yet become rich without having become industrialized….greater wealth and better living standards under any political system are closely connected to industrialisation". However, the debate on industrial policy continues to be divided, with most mainstream economist against it (Chang, 2002). The history of economic growth in developed and developing countries with higher growth, demonstrates that the development of any country is closely linked to industrialisation (Altman and Mayer, 2003). This argument is advanced by structuralists who view development as a process requiring a dynamic, non-marginal change through state interventions. They suggest that market dynamism cannot be left alone without guidance to direct investment into strategic sectors of developing economies trying to catch up (Chang, 2002; Reinert, 2007; Amsden, 1989). The

neoclassical mainstream argues that free markets are efficient and can promote economic growth. They argue that the market should be allowed to take its course and follow its natural path without any state intervention. This argument assigns a narrow role for industrial policy of providing complementary inputs to the market, a stable and conducive macroeconomic environment (CSID, 2010). Focusing on the East Asian experience, mainstream economists argue that state intervention did not interfere with the market. They also argue that the degree of intervention was less than elsewhere; meaning that the interventions were neither harmful nor helpful (Chang, referring to the World Bank, 1993). In view of much documented evidence of state effective intervention in East Asian countries, the World Bank's argument is difficult to prove with empirical data on the ground.

Heterodox economists, on the other hand, advocate for a greater role of the state which takes individual circumstances of the recipient country into account, and guides the market in order to efficiently allocate resources in identified sectors for greater impact of state interventions. Drawing on lessons from the experience of East Asia which had an effective industrial policy, Chang (2002) argues that industrial policy can be an important developmental tool for many developing countries.

Altman and Mayer (2003) define industrial policy as a key tool of state intervention to achieve the broader objective of economic development which includes economic growth coupled with social objectives such as job creation, decreased inequality and poverty. The protagonists of the view that industrial policy should have a reduced state role argue that industrial growth through state interventions has a risk of state-created rents and policy failure. This argument implies that the lack of necessary information by state will lead to 'social waste' (Chang, 2006). They emphasize that state-created rents are difficult to remove compared to market-created rent. They foresee the existence of infant industries which refuse to grow (Bell *et al.*, 1984).

This study focuses on South Africa's industrial development strategy which calls for reduction of unemployment and inequality. The study analyses the economic system of

South Africa and the interactions of sectors with their impacts on each other using economic modelling. The selection of sectors with great impacts was done through quantifying the impact of shocks on macroeconomic variables. In recent years industrial policy has become a major focus in developing countries with emphasis also on social objectives such as addressing the high level of unemployment which characterizes them. This study contribute to the literature that discusses industrialization in South Africa by identifying the top 10 subsectors that government can focus on in order to stimulate long-term economic growth. To the best of our knowledge there is no literature that identifies the subsectors that government can focus on in order to grow the economy.

1.2. Problem Statement / Research Question

Policy-makers are expected to develop a sound industrial policy and guide its implementation. The scarcity of investment funds for production sectors is the main concern which justifies targeting and prioritization of interventions in sectors with greater potential for growth enhancement. It is important to identify the sectors which should be considered for state intervention. The objective of the study is to guide the selection of economic sectors for state intervention, considering the limitations to accessing investment capital by production sectors in South Africa.

Access to available investment funds is made even more difficult by aversion to risk of the funding models of commercial banks and development institutions, the short-term nature of loans without substantial grace period and high interest rates (Stockhammer, 2010). Thus, most developing countries' industrial policies seem to advocate for state intervention support. The dilemma for developing countries is the determination of appropriate sectors for state interventions and the ability to forecast the potential impact of support to these sectors on the rest of the economy. Noland (2004) suggests that growth-enhancing interventions would be successful if the industries targeted for intervention have strong inter-industry linkages to the rest of the economy. He also argues that the targeted sectors should be leading sectors, so that growth stimulus would be transmitted through multiplier effects in the economy. He further suggests that growth

in output of these sectors should have strong linkages with the industry; or else there would be little capacity for industrial-specific stimulus. As argued by Noland (2004), the potential return to state interventions in priority sectors should be estimated prior to the intervention. This view guides selection of sectors based on demonstrable evidence and this forms the basis for this study research question.

1.3. Research Aims and Objectives

The strategic sectors constitute a nucleus with potential for growth which can be determined through their combined backward and forward linkages. In this study "nucleus" is used to refer to sectors with potential to greatly impact on other sectors. This is because the aim of the research is to identify key sectors with potential to pull other sectors of the economy. The concentration of capital investment and/or a focus state intervention in such leading sectors should lead to growth in lagging dependent sectors through backward and forward linkages. The study will determine the magnitude of these chain effects in linked sectors and quantify the potential impact of intervention in such sectors.

The study will analyse the value chain of sectors suggested for the nucleus of sectors at 3 digits SIC code level of disaggregation using economic modeling techniques to predict the impact of interventions.

1.4. Hypothesis

The study will use empirical data available in the economy to analyse the potential growth impact on the economy of various sectors through economic modeling. The results will be used to confirm or reject the hypothesis that *"The manufacturing sector has higher growth and employment multipliers than any other sector in the South African economy"*.

1.5. Methodology

The study uses Input-Output Matrix and Social Account Matrix (SAM) as they capture and measure the real size of demand and supply (interactions) from one sector to another. The Dynamic Social Accounting Matrix (DySAM) model is used for its level of disaggregation of sectors into lower sub-sectors to determine sub-sectors with higher multiplier effects to the rest of the economy. The nucleus of sectors is then identified by ranking sectors according to their multiplier effect on the rest of the economy through both backward and forward linkages. The South African Macroeconometric Model (MEMSA) is then used for the validation of the study results. MEMSA was developed by Applied Development Research Solutions (ADRS). The model is a bottom up disaggregated approach with 7 estimated variables for 41 sectors of the economy (ADRS, website). The computation of impact of intervention is done online on the ADRS website. Economic scenarios were created by increasing and decreasing demand in a sector in order to capture the impact of intervention on the economy.

The analysis will determine the linkages in the economy and compare the potential of sectors using input-output (I/O) and Social Account Matrix (SAM) of all sectors of the economy. Scenario simulation of shocks will estimate the likely impact of interventions on the rest of the economy.

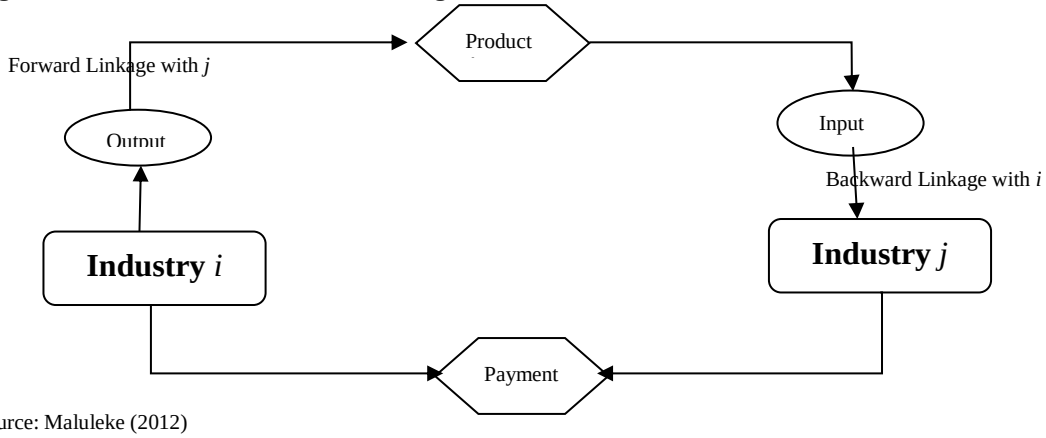
1.5.1. Linkages in the economy using Input-Output Table and Social Account Matrix

The study measures the strength of industrial linkages (backward and forward) which is defined as the economy-wide dependencies. It explores an efficient way to measure impacts of possible interventions and suggests sectors with greater impact on the economy for prioritisation. For theoretical background on linkages, the study refers to the concepts developed in the paper, presentation and report by Noland (2004), Adelzadeh (2012) and CSID (2009) respectively, unless otherwise specified.

An economy-wide assessment allows an extensive evaluation of the impact of policy proposal and Input-Output (I/O) multipliers model is based on a matrix $(n \times n)$ establishing the interdependencies between the various sectors of the economy with n the number of sectors used to represent the economy. Tounsi *et al*., (2013) define input-output analysis as a technique that is used to capture all the economy-wide interdependencies, called linkages between different sectors. It is a quantitative method of economic analysis that represents macroeconomic activity as a system of interrelated goods and services based on supply and demand of every sector in the economic system. An interaction between sectors can therefore be simulated to gauge the impact of an increase in final demand of output of different sectors for impact comparison purpose. The Input-Output Analysis is viewed as an application of linear programming in economics (Tounsi S. *et al*., 2013).

If it is assumed that an industry *i* produces a product A which is used as input by the industry *j*, then the industry *i* is "forward" linked to the industry *j* and the industry *j* is "backward" linked to industry *i*.

Figure 1: Backward and Forward Linkages



Source: Maluleke (2012)

The I/O table is a matrix showing the values of goods and services produced in each industry of the economy, and shows how that output is used as intermediate by other sectors. The domestic flow matrix is used to measure the potential stimulus to domestic output. The Input-Output table represents in the column *j* and the row *i* as per Matrix (0)

below, the production F_{ij} from i^{th} sector consumed by j^{th} sector as intermediate in the process of production of the final product $X_{.j}$ with $i = 1,2,...,n$, $j = 1,2,...,n$; n is number of sectors in the economy.

$$\begin{array}{c} \\ \text{Industrial input} \end{array} \begin{array}{c} \begin{array}{cccccccc} & \multicolumn{7}{c}{\text{Industrial output}} \\ & 1 & 2 & .... & j & .... & n \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ ... \\ i \\ .... \\ n \end{array} \begin{pmatrix} F_{11} & F_{12} & ..... & F_{1j} & .... & F_{1n} \\ F_{21} & F_{22} & ..... & F_{2j} & .... & F_{2n} \\ F_{31} & F_{32} & ..... & F_{3j} & .... & F_{3n} \\ .... & ... & .... & .... & .... & .... \\ F_{i1} & F_{12} & ..... & F_{ij} & .... & F_{in} \\ .... & .... & ..... & .... & .... & ... \\ F_{n1} & F_{n2} & ..... & F_{nj} & .... & F_{nn} \end{pmatrix} \end{array} \quad (0)$$

1.5.2. Input Technical Coefficient Matrix

The production of one unit of the final product by sector *j* requires $a_{ij} = \frac{F_{ij}}{X_{.j}}$ intermediate from sector i, with $X_{.j} = \sum_{i=1}^{n} F_{ij}$

The input coefficient matrix $A = \left[a_{ij} \right]$ for *n*- industry economy will be given by:

$$\begin{array}{c} \\ \text{Industrial input} \end{array} \begin{array}{c} \begin{array}{cccccccc} & \multicolumn{7}{c}{\text{Industrial output}} \\ & 1 & 2 & .... & j & .... & n \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ ... \\ i \\ .... \\ n \end{array} \begin{pmatrix} a_{11} & a_{12} & ..... & a_{1j} & .... & a_{1n} \\ a_{21} & a_{22} & ..... & a_{2j} & .... & a_{2n} \\ a_{31} & a_{32} & ..... & a_{3j} & .... & a_{3n} \\ .... & ... & .... & .... & .... & .... \\ a_{i1} & a_{12} & ..... & a_{ij} & .... & a_{in} \\ .... & .... & ..... & .... & .... & ... \\ a_{n1} & a_{n2} & ..... & a_{nj} & .... & a_{nn} \end{pmatrix} \end{array} \quad (1)$$

Each column *j* of the Matrix specifies the input requirements for the production of one unit of output of the industry *j*.

1.5.3. Measurement of backward linkages

The mathematical algebra capturing the flow of industrial output in the system is given by:

$$X_{(n\times1)} = A_{(n\times n)}X_{(n\times1)} + f_{(n\times1)} \quad (2)$$

Where X is a matrix of $(n\times1)$ dimension capturing the total value of outputs by all industries in the system, and AX the value of output used in the economy as intermediate and f a matrix of $(n\times1)$ dimension capturing the value of output used as final demand for consumption; f includes local consumption by household and government, and exports.

Equation (2) can be rewritten as:

$$X = (I - A)^{-1}f \quad (3)$$

The inverse matrix $(I-A)^{-1}$ is called the Leontief Matrix with I as identity matrix of size $(n\times n)$ and A the coefficient matrix as per expression (1) above. If the Leontief inverse matrix is symbolized as matrix Z comprising the elements z_{ij} such as:

$$Z = (I - A)^{-1} \quad (4)$$

Therefore the sum of coefficient z_{ij} of j^{th} column of the Leontief Matrix expressed mathematically by

$$\sum_{i=1}^{n} z_{ij} \quad (5)$$

Expression (5) measures the backward linkages of sector j or upstream dependency of sector j. It measures the increase in total output of the system required to supply inputs from the initial unit increase of output in industry j. According to the CSID (2009), "The total backward linkages measure the economy-wide (direct and indirect) stimulatory effects on output from a one unit increase in a sectors demand for inputs".

1.5.4. Output Technical Coefficient Matrix

The share of output of industry i used in the production of one unit of the final product by sector j is given by $b_{ij} = \frac{F_{ij}}{X_{i.}}$, with $X_{i.} = \sum_{j=1}^{n} F_{ij}$

The output coefficient matrix $B = \left[b_{ij} \right]$ for *n*- industry economy will be given by:

$$
\begin{array}{c}
\\
\text{Industrial input} \\
\end{array}
\begin{array}{c}
\begin{array}{cccccccc}
 & \multicolumn{6}{c}{\text{Industrial output}} & \\
 & 1 & 2 & .... & j & .... & n & \\
\end{array} \\
\begin{array}{c}
1 \\ 2 \\ 3 \\ ... \\ i \\ .... \\ n
\end{array}
\begin{pmatrix}
b_{11} & b_{12} & ..... & b_{1j} & .... & b_{1n} \\
b_{21} & b_{22} & ..... & b_{2j} & .... & b_{2n} \\
b_{31} & b_{32} & ..... & b_{3j} & .... & b_{3n} \\
.... & ... & .... & .... & .... & .... \\
b_{i1} & b_{12} & ..... & b_{ij} & .... & b_{in} \\
.... & .... & ..... & .... & .... & ... \\
b_{n1} & b_{n2} & ..... & b_{nj} & .... & b_{nn}
\end{pmatrix}
\end{array}
\qquad (6)
$$

Each row *i* of the Matrix specifies the output from the sector *i* required for the production of one unit of output of the industry *j* or downstream dependency of sector *j* on *i*.

1.5.5. Measurement of forward linkages

The mathematical algebra capturing the flow of industrial output in the system is given by:

$$X_{(n\times 1)} = B_{(n\times n)} X_{(n\times 1)} + f_{(n\times 1)} \qquad (7)$$

Where *X* is a matrix of $(n\times 1)$ dimension capturing the total value of output from all industries in the system, and *BX* the value of output used in the economy as intermediate and *f* a matrix of $(n\times 1)$ dimension capturing the value of output used as final product demand for consumption; *f* includes local consumption by household and government and exports.

The expression (7) can be rewritten as:

$$X = (I - B)^{-1} f \qquad (8)$$

The forward inverse matrix $(I-B)^{-1}$ is called output inverse matrix with *I* as identity matrix of size $(n\times n)$ and *B* the coefficient matrix shown above. If the Leontief inverse matrix is symbolized as matrix W comprising the elements w_{ij} such as:

$$W = (I - B)^{-1} \qquad (9)$$

Therefore the sum of coefficient w_{ij} of i^{th} row of the output inverse matrix can be expressed mathematically by

$$\sum_{i=1}^{n} w_{ij} \qquad (10)$$

And it measures the forward linkages of sector *j* or downstream dependency of sector *j*. It measures the impact on output of sectors in the economy arising from a unit increase in the demand of output from sector *i*.

"The backward Leontief inverse can be used to assess the effects of an increase in final demand on variables such as employment and export", (CSID, 2009).

The sum of coefficient w_{ij} of i^{th} row of the Leontief Matrix measures the forward linkages. It measures the increase in total output of the system required to utilize the increase of outputs from the initial input from industry *i*. For a given industry, the sum of its backward and forward linkages indicates the total or maximum potential causal links stimulated by an increase in its output.

1.5.6. Limitation of Input – Output Analysis

The limitations of I/O models are related to the number of industries included in each sector of the economy for the analysis. The limitation of the model emanates from its assumption that each industry produces one homogeneous commodity and uses a fixed factor (or factor combination) of the production of its output. "The more disaggregated the sectors, the less likely the chances of there being joint production", CSID (2009: pp. 11).

Another factor that limits the model is the assumption that production in every industry is subject to constant returns to scale yet returns fluctuate, for example, due to the introduction of new technologies. CSID (2009) argues that the technical coefficients are assumed fixed, implying that there are no changes in technique or technology in the production of goods and services over the projection period. Over a short term, the

projections are likely to reflect the trend in the economy but it is not the case over a long-term period of projection.

The homogeneity of production in sectors can be mitigated by a high level of disaggregation of sectors in interconnected sub-sectors of the economic system for analysis. The higher the level of disaggregation, the more likely is the ability of the model to reflect closely the reality on the ground. A high level of disaggregation of the sectors in the economic system and the capability of the model to handle such disaggregation is essential, to mitigate the impact of the assumption of one homogeneous commodity produced and the use of a fixed factor of production in the same sub-sector.

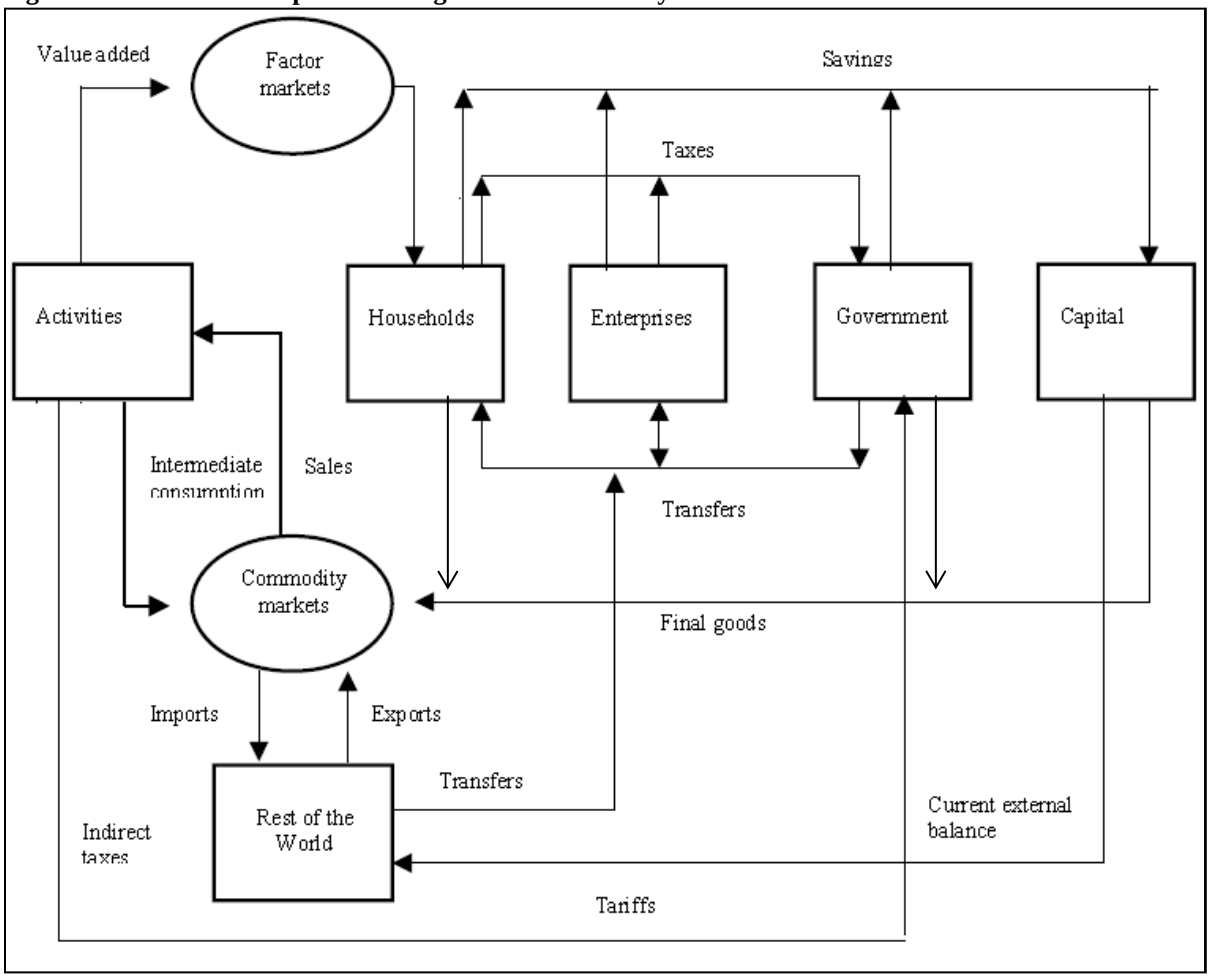
Alarcon (2013) suggests that the major limitation of I/O tables is the fact that they do not include detailed differential data about distributional and consumption sides of the economic processes. They solely focus on production consumption as final or intermediate products without measuring the feedback from institutions. Therefore the feedback arising out of factor income generation (factor of production), household expenditures, other institutions and the rest of the world cannot be measured or modelled using I/O tables.

In general the main limitation of I/O tables is the fact that they reflect interactions of sectors at an aggregate level without a precision of sub-sector level. The contribution of households on the economy is also not reflected. These limitations are important for this study and in order to address them, the study considers further analysis on SAM matrix which is disaggregated at three digits SIC code level. SAM matrix is also used to analyse the impact of household income and expenditure in the economy. The next section below analyses the impact of the main economic agents in the economy which include household, government and institutions.

1.5.7. Macroeconomic Sectoral Interconnections

The interrelationships between macro sectors are used to illustrate linkages in the economy with arrows indicating the direction of payments from one sector to another. The figure 2 below is a simplified representation of a complex interaction in the economy.

Figure 2: Interrelationship between Agents in the economy



Source: http://www.monash.edu.au policy/ gempack.htm

The Social Account Matrices (SAM) can be used to model linkages between disaggregated sectors of the economic system and that constitutes the basis of the SAM multiplier model. The model simulates impacts in the economy through changes in demand and/or supply and systematically evaluates the impact of such changes on the whole economic system.

1.5.8. Shock in a Model concept

In general, a shock in economy is an event that produces significant change on demand or supply with a probable impact on economic variables such as production, employment and price (CSID, 2009). Bijker (2012) defines a shock as a change in demand which alters the initial equilibrium between demand and supply of factors. In order to sustain the change in demand, a shock changes the total demand in the sector of focus, i.e. demand for intermediates into production and the final demand (Bijker, 2012). Bijker argues that a shock typically arises from an initial exogenous increase in the demand for commodities through an increase in exports, investment spending or government spending and provokes multiple impacts in the economy. This means that an exogenous shock that leads to an increase in production of a sector, causes a rise in demand for intermediate inputs at each level of the upstream. Thus, at each level, a shock is created but this time the shock is endogenous to the system. Structural change or technical innovation can also introduce exogenous shock and exogenous changes in intermediate demand (Bijker, 2012).

To show the process of quantification and mathematical formulation of an impact of a shock, the expression in (2) will be rewritten in the following format:

$$A[x]+[f]=[x] \tag{11}$$

As per equation (2) $[x]$ is a matrix of $(n\times 1)$ dimension capturing the total value of outputs by all industries in the system, and $A[x]$ the value of output used in the economy as intermediate and $[f]$ a matrix of $(n\times 1)$ dimension capturing the value of output used as final demand.

The equation (11) expresses the outputs by the sectors of the economy and can be rewritten as:

$$[x]=(I-A)^{-1}[f] \tag{12}$$

This means that $[x]$ can be derived from a given $[f]$ and the change in $[f]$ noted Δf determines the change in $[x]$ noted as Δx. Therefore, the basic equation which determines a shock is represented by:

$$\Delta x=(I-A)^{-1}\Delta f \tag{13}$$

Where Δf represents the change in demand, referred to as the shock and Δx expresses the change in total production, referred to as the impact of the shock. The impact Δx is the total accumulated impact with a scope which may be direct, direct + indirect, or direct + indirect + induced. The direct impact makes references to the sector where the shock occurs and the change in demand thereafter directly related to the sector. But the indirect impact arises because of interconnection between activities and commodities with the production sectors and induced impact by including more sectors to those of production i.e. those related to income distribution and the use of income by corporations and households (Bijker, 2012).

The expression (13), $(I-A)^{-1}$ mathematically can be decomposed

$$(I-A)^{-1} = \left[I + A + A^2 + A^3 + ... + A^k \right] \quad (14)$$

The expression (14) into (13), the equation (13) becomes:

$$\Delta x = \left[I + A + A^2 + A^3 + ... + A^k \right] \Delta f \quad (15)$$

or

$$\Delta x = I\Delta f + A\Delta f + A^2\Delta f + A^3\Delta f + ... + A^k\Delta f \quad (15b)$$

If it is assumed that:

$\Delta x_1 = A\Delta f$,

$\Delta x_2 = A\Delta x_1 = A^2\Delta f$,

$\Delta x_3 = A\Delta x_2 = A^3\Delta f$,

….

$\Delta x_k = A\Delta x_{k-1}\Delta f A^k \Delta f$

Then the equation (15b) will be written as:

$$\Delta x = \Delta f + \Delta x_1 + \Delta x_2 + \Delta x_3 + ... + \Delta x_k \quad (15c)$$

The equation (15c) is the representation of the total impact of a shock and it is practically meaningful if only A^k converges toward zero when *k* approach infinite. This means that A^k decreases or becomes continuously smaller as *k* increases.

1.5.9. Sub-sectors selection

The study uses a two stages approach in the identification of nucleus industries with high growth potential. Firstly manufacturing sub-sectors are ranked according to the size of both growth and employment multiplier linkage to the rest of the economy separately. A sub-sector with the highest multiplier is accorded the highest ranking while the sub-sector with the lowest multiplier is accorded the lowest ranking. Secondly, the ranking of sub-sectors is done by combining the size of growth and employment multipliers and then ranked to identify the nucleus industries.

1.5.10. SAM Modelling Concept and Methodology

The methodology is based on the Systems National Accounting (SNA) Framework that is built in a matrix format for a single time period, usually a year. The Matrix reflects the actual transaction relationship, called economic flow, between economic agents namely industry (financial and non-financial sectors), household and government, institutions and the rest of the world. SAM being an expanded input-output table in format and principles, some formulations of the model will use or refer to the I-O Model methodology in the analysis. The static nature of SAM and I/O tables (snapshot referring to a single time period) do not make it possible to capture in its details the changes overtime and can only be limited to the single period of reference for the analysis and recommendations.

Therefore, the following limitations or assumptions, underlined by Alarcon (2013) are generally for both SAM and I/O based models:

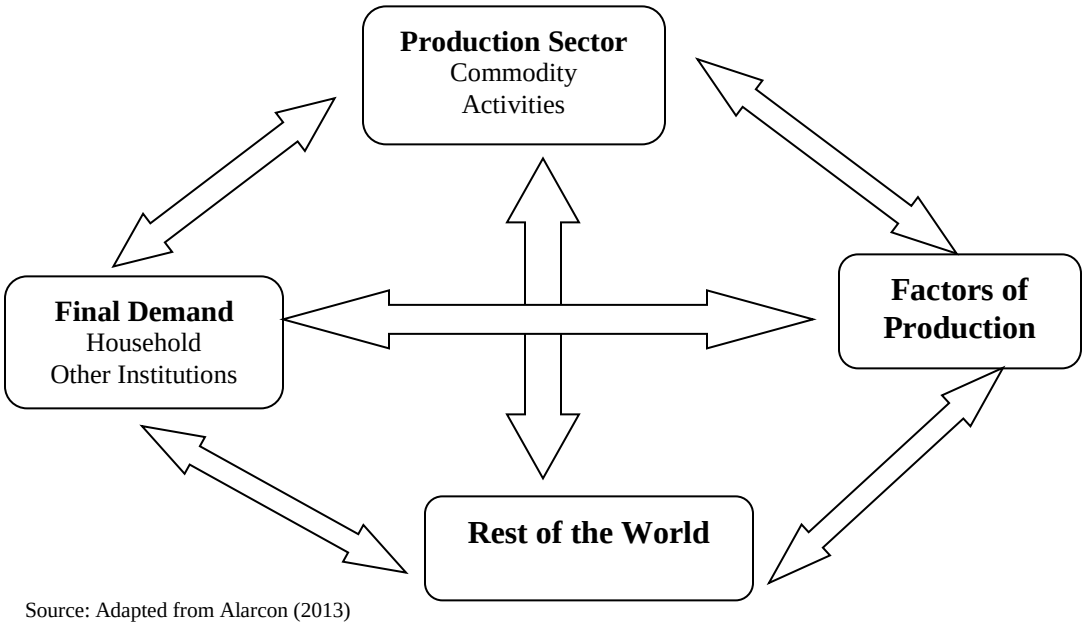
- The coefficients are fixed,
- Data refers to one single period (normally a year for SAM and in some cases Trimester for I/O),
- The reference period is normally not current (in the case of SAM, more 5 year period lapses before the next the publication for analysis), and
- The prediction capacity is limited generally to short term.

Alarcon *et al*. (2011) and Alarcon (2013) suggest a dynamic SAM model called DySAM in place of static SAM models. The SA SAM 2011 (the latest available), is updated from

SA SAM 2005 using available financial data such as but not limited to the Medium-Term Expenditure Framework (MTEF) , and using the DySAM process on the SA SAM 2005.

The principal economic actors and agents can be represented in their aggregated behaviour in the flowing (Figure 3):

Figure 3: Behavioral Flow of Main Economic Actors and Agents in an Open Economy



Source: Adapted from Alarcon (2013)

In a table format, the interaction is represented in the table below (Table 1):

Table 1: Transactions - Interactions of Economic Agents

			Endogenous				Exogenous (Final Demand)		Total (Income)
			Production Sectors (Goods & Services)		FP	HH&OI	KHH-KOI	RoW	
			CM	PA					
Endogenous	Production Sectors (Goods & Services)	CM	0	T		T	X_{1a}	X_{2a}	Y_a
		PA	T	0			X_{1b}	X_{2b}	Y_b
		FP				0	X_{1c}	X_{2c}	Y_c
		HH&OI		T		T	X_{1d}	X_{2d}	Y_d
Exogenous	Leaks	KHH-KOI	L_{1a}	L_{1b}	L_{1c}	L_{1c}	Z_{1a}	Z_{1b}	Y_e
		RoW	L_{2a}	L_{2b}	L_{2c}	L_{2d}	Z_{2a}	Z_{2b}	Y_f
Total (Expenditure)			Y_a	Y_b	Y_c	Y_d	Y_e	Y_f	

Symbols
CM: Commodities
PA: Activities
FP: factors of Production
T: Transaction endogenous account to endogenous account

HH: Households and corporations
OI: Other institutions (incl. government)
KHH-KOI: Capital Account of HH & OI
RoW: Rest of the World

Leaks
L1: Commodity Tax, Import Duty and Imports
L2: Activity Tax and Depreciation
L3: Factors payment to the RoW
L4: Income Tax, Household Savings, Corporate Savings, Remittances to the RoW
Z: falls out the model (government & RoW savings, remittances and aid to governments form the RoW

Source: Adapted from Alarcon, 2013

In the above adapted Alarcon (2013) table (Table 1), all transactions are payments from an account in a column to an account in a row. The model interprets Ts as transactions that represent payments from an endogenous account (column) to an endogenous account (row). The design separates commodities to activities in production sectors within endogenous accounts and the value zero (0) is assigned where the design does not allow transactions and a blank where there is no transaction by definition. This type of transaction represents the demand and supply for inputs (or intermediates) into production of goods or services of a sector or industry.

The leaks (or L_i) are transactions representing payments from an endogenous account (column) to an exogenous account (row). A leak represents an amount of payment which will not impact on the economic activities or production. The payment is considered falling out of the model. A payment form exogenous account (column) to exogenous account (row) also refers to fall out (a special case of a leak). The government and the

RoW savings, remittances and aid to governments form the RoW are also leaks that fall out of the model and in the table are represented by Z.

The X_i transactions represent payments from exogenous account (column) to an endogenous (account). The transaction reflects the demand for goods and services for final consumption by households, government, other institutions and the rest of the world. The type of transactions is called injection. The injections for this study will be the only way used for an intervention into the economic system. The injection will constitute a scenario or simulation to evaluate the impact of a policy. The Table 2 provides a summary description of the SAM Matrix and interactions.

Table 2: Nature of Transactions between Economic Agents

		Endogenous				Exogenous (Final Demand)	
		CM (27)	PA (27)	FA (11)	HH&OI (12 +3)	KHHI-KOI (10)	RoW (2)
Endogenous	CM (27)	Transactions Matrix (80 X 80)				Injections Matrix (80 X 12)	
	PA (27)						
	FA (11)						
	HH&OI (12 +3)						
Exogenous	KHHI-KOI (10)	Leaks Matrix (12 X 80)				Falls out Matrix (12 X 12)	
	RoW (2)						

Source: Adapted from Alarcon, 2013

In the South African SAM Matrix under commodities and activities, there are 27 sub-sectors each (if there is not further disaggregation such as construction expanded into building, roads, electricity & waste management, and sanitation & water supply) (Alarcon 2013, StatsSA 2008). Therefore a total of 54 endogenous production sectors of

goods or services are used as the highest level of disaggregation for the study. The factors of production have 11 sub-groups each defining the profession or occupation. Households have 12 sub-groups classifying their level of income. Other institutions are grouped into 3 sub-groups (namely financial corporations, non-financial corporation and households) which include monetary authority, other monetary institutions, public investment commissioners, insurers and retirement funds, other financial institutions, central government and provincial administration, local authorities, public sector, private sector, and households. The rest of the world includes rest of the world current and capital accounts.

1.5.11. Validation and monitoring of the application on empirical data

Through using the MEMSA Model on empirical data, the study evaluates the impact on the economic growth of South Africa's post-apartheid industrial policies in relation to sectors identified for intervention prioritisation in the study. The focus will be the evaluation of identified sectors with greater potential for spillover effect and economic growth. Scenario simulations in the identified priority sectors for policy interventions were applied using MEMSA Model and the impacts will be measured for validation of results. The results inform the study on the validity of the methodology used for priority sector selection. The literature review will include existing methodology used for sector selection for intervention and a review of literature supporting or criticizing these policies and their implementation. The paper evaluates the supply side interventions in comparison with the demand side interventions.

1.6. Organization of the Study

The next chapter provides an overview of the South African Industrial Policy. The chapter discusses pre- and post- 1994 industrial policies. It is followed by an analysis of the economy using empirical data in chapter four, measuring linkages of sectors and sub-sectors within the economy. The fifth chapter gives a comprehensive analysis of the findings which includes the identification of nucleus industries and derives the related policy implications. Last is the conclusion which captures the overall debate and finding

results which confirms the hypothesis of the study that the manufacturing sector has higher growth and employment multipliers than any other sector in the South African economy.

CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK ON ECONOMIC ANALYSIS AND MODELLING

2.1. South African Industrial Path

The South African industrial development programme during the apartheid era was centered around mineral extraction and energy production (Fine and Rustomjee, 1996). Thus, the industrialisation path was predominantly resource-based industrialisation with greater focus on basic chemical and metal sectors which were capital- and energy-intensive sectors (Altman and Mayer, 2003; CSID, 2010). The apartheid government's policies excluded the majority of the South Africa population from the economy, by so doing creating an exceptionally huge unemployed population and a scarcity of skilled labour. The industrial policy objectives under the apartheid era were mainly the building up of Afrikaner capital, job creation for Afrikaner workers, military objectives, evasion of international sanctions, and to satisfy the consumption patterns of the most advanced economies (Chang, 1998). After 1994, an effort was made to establish upstream industries through taking advantage of natural resources for an alternative to industrialization around the Minerals Energy Complex (MEC) (Fine and Rustomjee, 1996). The MEC are sectors supporting various mining activities and sectors processing raw commodities into some basic semi-manufactured resources easy to export, this will be discussed in great depth in chapter 3. The industrial transformation effort was contained in two policy documents namely the Enhancement of International Competitiveness of South Africa (supply-side) document and the Industrial Strategy Project document aimed at improving Manufacturing Performance in South Africa (DTI, 2014; DTI 1998). The industrialization path still remains centered around the MEC which is still the base of the manufacturing sector. Unemployment rate still remains high and requires a strategy to increase formal sector employment. The debate on the role of the state in South Africa's economic development still remains divided. Confronted with growing inequality and unemployment, there is a growing call for greater state intervention with an industrial policy which has great impact on the rest of the economy (CSID, 2009).

The reference to sector-specific 'targeting' as the main core of industrial policy is based on the need to ensure a selection of strategic sectors that have a greater multiplier effect on the rest of the economy (Chang, 2006). The sectors with such effect will be called interchangeably strategic sectors, priority sectors, leading sectors or "nucleus" industries. As already discussed earlier in chapter 1, the term "nucleus" refers to sectors with potential to greatly impact on other sectors. In answering the question on which sectors can play the leading role in the growth of an economy, two theories were developed: "balanced and unbalanced growth theories"

2.2. Balanced and Unbalanced Growth Theory

Since the end of colonization, developing countries have failed to catch up despite having adopted free market policies (Chang, 2002). The causes of slow growth and the strategies to be taken in developing countries to initiate a take-off in growth have generated debate among scholars and policy-makers. Firstly, the theory of balanced growth suggests that main obstacle to development is the small market in developing countries, which constitutes a limitation to market opportunities (Kuhnen, 1987). The proponents of the theory further suggest that a large market with greater opportunities can only be created by investing simultaneously in all or many industrial sectors of the economy (Namrata e*t al.*, n.d; Bhatt, 1965; Bhatt, n.d.; Rauch, 1994). The demand of each sector will then create the market for goods in other forward and backward linked sectors. Murphy *et al.*(1989) called the idea of a coordinated investments across sectors the basis of the concept of 'the Big Push'. Murphy *et al.* (1989) in defining the theory of Big Push, argues that poor economies need a boost in demand, to expand the size of the market, so that entrepreneurs have an incentive to incur the fixed costs of industrialization. "No exogenous improvement in endowments or technological opportunities is needed to move to industrialization, only the simultaneous investment by all the sectors using the available technology", says Murphy *et al.* (1989: pp 1004) in advancing the theory of balanced growth. The theory stresses that growth in developing countries can occur only when well-coordinated, extensive and massive investments are realized concurrently in all industrial sectors of the economy. Murphy *et al.* (1989) argue that with such massive investments, the demand spillovers created between sectors are strong enough to generate

a ‘Big Push’. The available capacity of production in all sectors of the economy is therefore fully utilized and thus increases domestic purchasing power (local demand) along with supply of consumer goods and agricultural products (Namrata e*t al.*, n.d; Bhatt, 1965; Bhatt, n.d.; Rauch, 1994). The theory suggests that simultaneous growth creates a situation in which no surplus or shortage exists. The theory also suggests that this can only happen if government intervenes significantly and all economic activities are coordinated efficiently.

However, critics of the theory suggest an alternative called “the unbalanced theory of growth” which suggests that developing economies do not supply adequate investible capital to pursue extensive and simultaneous investments in a large number of industries for expansion (Ndongko, 1975). Ndongko stresses that the approach argues for concentrated and sequential development patterns for the achievement of economies of scale and expansion which induce development on a regional basis.

The unbalanced growth theory implies that industrial investible funds availed by commercial banks and development institutions for investment in production sectors in developing countries, is very limited; thus the available funds must be used efficiently. The theory of unbalanced growth suggests that a concentration of investment funds in a limited number of industries with higher growth potential will also stimulate growth through combined backward and forward linkages (Ndongko, 1975; CSID, 2010). It assumes that the increased demand for inputs into additional production due to new investments in targeted industries will impact positively on the input prices. The price of the increased input will therefore increase profits, making available capital for investment to respond to increased demand. In addition, the process is seen as impacting on each industry’s backward linkages, creating at the same time demand for inputs at each level of the value chain. It provides outputs for the forward linkage industries at reduced price due to economies of scale created with higher demand. The demand for services such as transport, communication, packaging and warehousing will grow. The theory recognizes that in order to achieve a significant level of development government should intervene in strategic industries through measures such as protection of infant industries, incentives

to support import substitution of certain goods and keeping fixed exchange rate to support export growth (Ndongko, 1975; Bhatt, 1965 and Namrata e*t al.*, n.d.).

Hirschman quoted by Namrata (n.d.), states "Economic growth follows the course of imbalances in the system. Competitions, tensions as well as inducements are the inevitable outcome of the unbalanced growth, and more these are, greater the prospects of growth." According to Hirschman, unbalanced growth generates externalities which can be explained as the growth of an industry of focus (strategic industry) stimulates growth in industries supplying it with inputs. Similarly industries supplying inputs for the strategic industry increase their demand for inputs from related backward linked industries, thus generate also growth at that level, and so on. The chain of impacts is established from one initial investment which motivates investments in backward linkages (dependent industries), and thus stimulates growth in the system. In other words, the theory of unbalanced growth suggests that in the process which follows initial growth in strategic industries, complementarities stimulate growth of related industries. Growth of outputs in strategic industries generates additional production in the industries supplying inputs. Their marginal cost is thus reduced with the increasing demand through economy of scale.

2.3. Government Designation Policy or Localization

The Department of Trade and Industry regards the manufacturing sector as an engine of economic growth and therefore any relative decline in manufacturing would have deleterious consequences for growth. The DTI explicitly expresses the importance of the growth-pulling or growth-enhancing properties of the manufacturing sector for consideration of its policy priority sectors (DTI, 2013). IPAP (DTI, 2009) expresses concerns over the decline of share of manufacturing in GDP over time in South Africa, while that of services has been growing. Thus, there has been a structural change in the sectoral contribution of the South African economy which explains the rationale behind the designation policy. The designation policy aims at using state procurement as a lever to revive the manufacturing sector. The IPAP(DTI, 2014) argues that large public procurement is an opportunity for manufacturing growth, if conducted strategically rather

than on an ad-hoc basis, as is the case currently for many products procured for the public sector and state own companies. IPAP (DTI, 2009; DTI, 2014) identifies priority sectors which will depend on leveraging public expenditure by strengthening procurement to deliver greater industrial development and net economic benefits. Therefore the amendment of Preferential Procurement Policy Framework Act (PPPFA) of 2011 empowers the DTI to designate a sector, sub-sector/industry or a product for local procurement. Hence, only locally produced goods, services or works or locally manufactured goods that meet the prescribed minimum threshold for local content can be procured by public entities. In terms of the amended PPPFA regulations, **the dti** is mandated to use public procurement as a lever for re-industrialisation and industrial development through sector/ product designation for public procurement.

This study will provide research and analysis indicating which sectors' growth should have a larger economic impact. These findings could inform the process of designation which could lead to reconsidering current policy.

2.4. An Overview of Social Accounting Matrix (SAM)

This study uses a dynamic Social Accounting Matrix (DySAM) of the South African economy produced for 2011 by Alarcon (2013). The SAM is dynamic in the sense that it is based on annual projection from the SAM published by StatsSA on a ten year interval. Projections are done using available information from; national budget, mid-term expenditure framework (MTEF), national accounts, SARS data, employment and household surveys, StatsSA and Reserve Bank data, and input-output tables (Bahta, 2013). The annual projections in the DySAM cover the years 2006 to 2011. A special advantage of using a SAM is that a sector can be further disaggregated into sub-sectors which are a closer proxy of the output/ product of such sub-sector. The fundamental importance of the higher level of disaggregation emerges clearly from the multiplier analysis of the sub-sector. The SAM lessens the limitation of the Input-output method, which assume that each industry produces one homogeneous commodity and uses a fixed factor (or factor combination) of production of its output. The high level of

disaggregation of the sectors reduces the blindness to details caused by distinct products being aggregated at sector production level (CSID, 2009).

Taylor (1983) defines a SAM as a tabular presentation of the national account, with incomes equal to expenditure for all sectors of the economy. A SAM matrix makes the distinction between activities and commodities when dealing with sectors of the economy. A flow between two sectors or between a sector and an agent in the economy can either be categorised as a payment to- or received from- sector activities or sector commodities in the economy noted in this study as "co-Sector name" or "a-Sector name" (Taylor, 2004). According to Alarcon (2013) a flow is sector activity when it is related to the sector as supply side and it is sector commodity when it related as demand side. It allows a comparison of impacts created by interventions (injections in the sector) targeting supply and demand sides.

The social structure in the economy is captured through household impact on the economy. The household use of income and destination of expenditure creates an impact on the economy which can be measured or influenced through policies for economic growth. In the South African SAM, the household category is subdivided into professional categories that include legislators; professionals; technicians; clerks; service workers; skilled agricultural workers; craft workers; plant and machine operators; elementary occupations; domestic workers; and occupation unspecified (StatsSA, 2008). The SAM establishes a link between data from social origin and data from economic origin (StatsSA, 2008).

CHAPTER 3: AN OVERVIEW OF THE SOUTH AFRICA'S INDUSTRIAL POLICY

3.1. Introduction

The word industrialisation was first used in reference to the European Industrial Revolution of the late 18th and early 19th centuries (Bairoch and Goertz, 1985). Industrialisation is mostly associated with the transformation of a country or society from primary agrarian economy to an economy based on manufacturing of goods and services and mechanisation of production mostly organised in production chain lines. Industrialisation is also characterised by intensive technology innovation. For the purpose of this work, industrialisation is defined as a large-scale development of the manufacturing sector, or high growth of the manufacturing contribution to the economy, beyond a certain threshold making such growth visible in the economy, and resulting in greater size of employment and higher income.

The level of economic development and industrialisation of African countries generally lags behind other developing economies of East Asia and South America. Despite being abundantly endowed with natural resources and more than three decades of the application of the free market strategy advocated for by the IMF and the Word Bank, African countries have failed to industrialise, even during periods of resource boom.

The failure to industrialise in Africa gives way to the view that resource abundance is associated with factors restricting growth. Thus, in this view, natural resource abundance generates growth-restricting forms of state intervention, exceptionally large degrees of rent seeking, and corruption. In this view, natural resources become more of a curse than a blessing (Di John, 2011). However, Di John (2011) suggests that history has demonstrated that economic growth can only be achieved through sustained and successful industrialisation. Di John's argument opposes the neoclassical view of economic growth based on the country's comparative advantage. Di John and many structuralist economists argue that exports based on commodities (natural resources) will not generate a basis for manufacturing development or industrialisation. Prebisch (1950), Baran and Sweezy (1966) quoted by Di John (2011) observed that primary products were

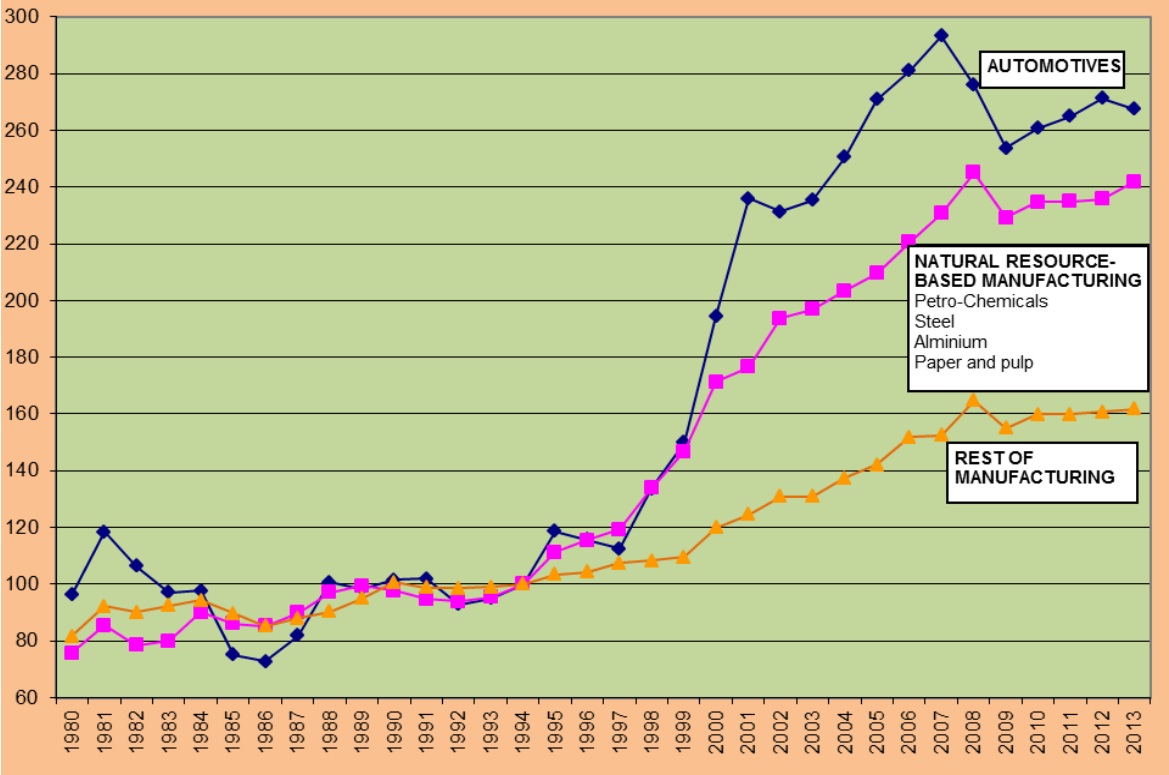
subject to declining terms of trade and threatening price volatility thus were unlikely to stimulate growth.

In the South African context, the development of industrial policy reflects three phases which explain policy orientation. The three phases refer to the end of World-War II to democracy in 1994; from 1994 to 2007; and post-2007 (Zalk, 2013). The three phases for this research will be called respectively, Pre-1994, post-1994 and Post-2007. A formal industrial policy was introduced with the launch of the first Industrial Policy Action Plan (IPAP) in August 2007. IPAP is guided by the National Industrial Framework (NIPF) which was approved by the Cabinet in January 2007.

Prior to 2007, the post-1994 policies were entirely based on the Washington Consensus (WC) market theory of liberalisation. After 2007 macroeconomic policy was still based on WC thinking, but pressure on government to deal with poverty, inequality and unemployment led to policies that supported redistribution of wealth and job creation. The WC theory assumed that the allocation of capital by the market will be more efficient and will attract higher level of private investments that will lead to the rise in growth and employment rates. The post-1994 policies were informed by the 1996 Growth Employment and Redistribution (GEAR) strategy that assumed that domestic price stability will create the necessary degree of certainty needed to attract massive private investment (Zalk, 2013). These policies were a reaction to the fact that the industrialisation path of the apartheid era was more around the Mineral Energy Complex (MEC) and therefore sort to expand the industrial sectors of the economy (Fine and Rustomjee, 1996). As discussed earlier, the MEC are sectors supporting various mining activities and sectors processing raw commodities into some basic semi-manufactured resources easy to export. Those MEC sectors linked to mining were heavily protected and supported by the State (Fine and Rustomjee, 1996). Subsequently, the rest of manufacturing with weaker linkages to the MEC, remained stagnant. Post-1994 policies had to address rapidly growing unemployment. Thus, these policies were conceived with an assumption that State interventions did not allow the rest of manufacturing to grow

(Zalk, 2013). The development of Post-1994 policies did not take into account the context of the apartheid era which focused its intervention around the MEC.

Figure 4: Annual Output index per Sector (1994=100)

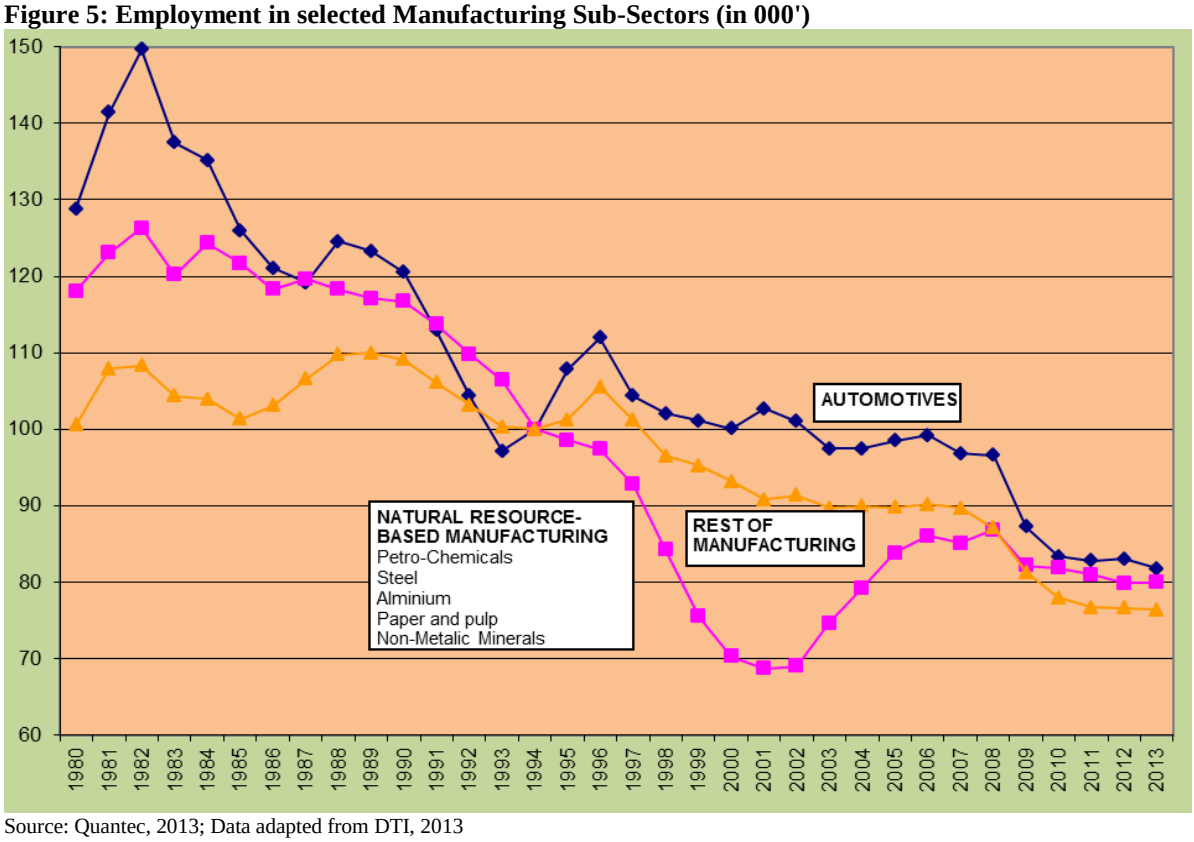


Source: Quantec, 2013; Data adapted from IPAP, 2013

As shown in Figure 3, before 1994, Manufacturing sectors did not experience significant growth despite the excessive protection of the MEC sectors of the manufacturing. This is partly explained by the following factors, there was escalating resistance to apartheid, lots of strikes, international isolation, and a debt crisis in 1985 where the apartheid government had to unilaterally declare a moratorium on debt repayments. Growth in output of Automotives, Natural Resource-Based Manufacturing and the Rest of Manufacturing remained minimal before 1994. The Automotives and the rest of manufacturing seemed to experience a significant stagnation or decline in their output between 1988 and 1994 as reflected on the graph. Zalk (2013) is of the view that the situation experienced by the manufacturing sector at the eve of democratic era, influenced significantly the policy orientation in the post-1994 period. It led to the

adoption of the market liberalisation as policy of choice for the newly elected government. This policy orientation (post-1994) led the rest of manufacturing to experience a very limited growth in output and in some cases a considerable decline followed by significant loss of manufacturing capacity in a number of manufacturing sub-sectors. The capacity loss is mainly due to the fact that the rest of manufacturing with weak linkages to the MEC were less developed and the level of downstream development was also limited, thus could not compete with well entrenched manufacturing sector of other developing countries in both East Asia and South America. Amsden (2010b) stressed that it was premature for South Africa to open its market at the eve of democracy and suggested that there was need for protection of the manufacturing industry post-1994. The Automotive sector was the only non-MEC sub-sector of manufacturing that experienced and continues to experience significant growth post-1994. This was as a result of state intervention in support of the sub-sector through **the dti**'s automotive support programmes which incentivise actual investment in the sector.

Figure 5: Employment in selected Manufacturing Sub-Sectors (in 000')



Source: Quantec, 2013; Data adapted from DTI, 2013

The general trend is that on the one hand, manufacturing employment has been decreasing since 1980 as shown in Figure 4. On the other hand, manufacturing output has been increasing over the same period. Despite the loss in manufacturing employment, growth in output is still being observed in the sector.

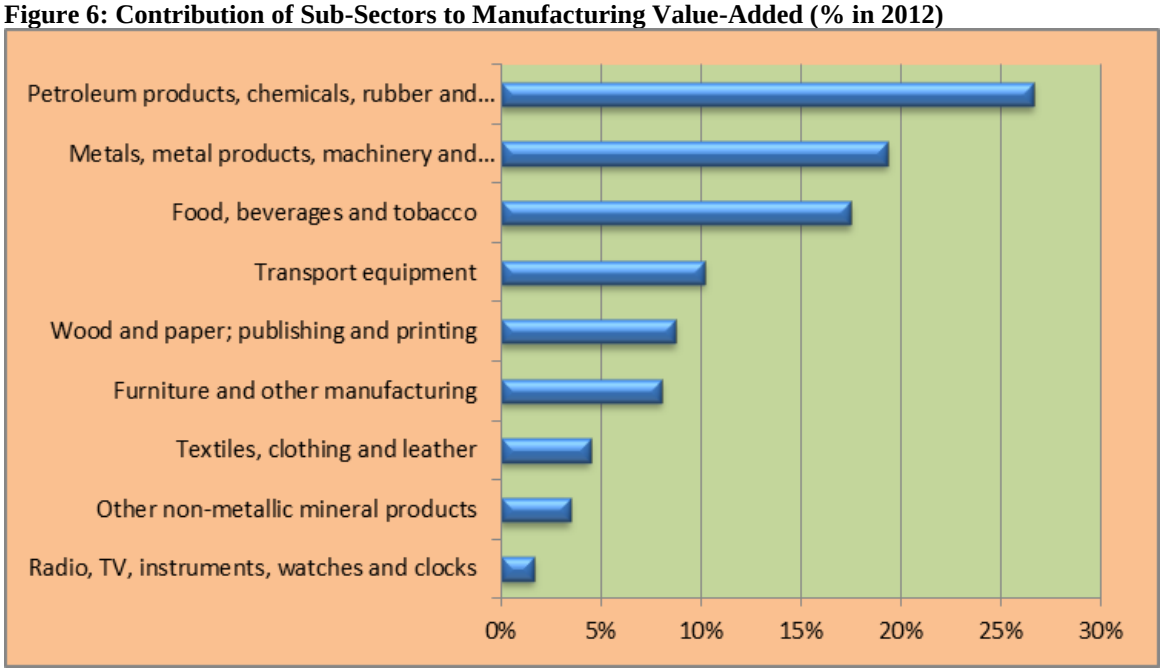
3.2. Description of the SA Classification of the Manufacturing Sector

Statistics[1] South Africa (StatsSA) classifies manufacturing under Standard industrial classification (SIC) 3 at 1 digit sic code level. The breakdown of the manufacturing sector at 2 digits sic code level provides 10 sub-sectors. The classification by StatsSA, makes provision for further breakdown at 3 digits sic code level which provides 60 sub-sectors. Generally StatsSA groups the sub-sectors at 3 digits sic code level into 35 sub-subsectors when publishing manufacturing data. But grouping of sub-sectors can be disaggregated at the level of 5 digits sic code within manufacturing, making it close to the description of the main commodity outputs from each sub-sector. Quantec's Standardised Industry Input Structure classifies Manufacturing at 3 digits level as item code A121 within the secondary sector (A12) of the economy. The disaggregation of the services sectors at the same level with manufacturing (code A121), provides the following classifications: trade, catering and accommodation services; transport, storage and communication; financial intermediation, insurance, real estate and business services; and community, social and personal services. A table of classification at 3 digits level is found in the Appendix 1 and provides further information on the breakdown in sectors and sub-sectors of the South African economy.

The sub-sectors with manufacturing using Quantec classification are reflected in Figure 5 ranked by their contribution to the manufacturing GDP:

[1] Stats SA South Africa (2013), Standard Industrial Classification for all economic Activities (Seventh Edition)

Figure 6: Contribution of Sub-Sectors to Manufacturing Value-Added (% in 2012)



Data Source: Quantec, 2013

All the sub-sectors contribute significantly to the manufacturing sector but at different levels and within a wide range of differences. The percentages in Figure 5 are computed based on the value added before tax deduction called the "value added (VA) at basic prices" (at market prices). The VA before tax gives the full picture of contribution of the sub-sector into the Manufacturing. If BP stands for the value added at basic prices (market prices) and FC, the value added at factor costs and NIT, the Net Indirect Taxes on production, then BP = FC + NIT, based on Quantec definition.

StatsSA's publication, 'the economic growth quick fact', posted on the 25th February 2014, shows that the gross domestic product (GDP at the market prices) increased by 3.8% in the 4th quarter of 2013 and identifies the main contributor to the increase as the manufacturing industry with 1.8% and the mining and quarrying industry with 0.8%[2]. The publication expresses the importance of the manufacturing sector in the share of the South African economy, despite the decline from 19% in 1993 to 17% in 2012 in real terms of a nominal GDP of R3.2 trillion at market price in 2012, or R246 billion less than the seasonally adjusted 2013 GDP.

[2] Stats SA Website: http://beta2.statssa.gov.za/?page_id=735&id=1

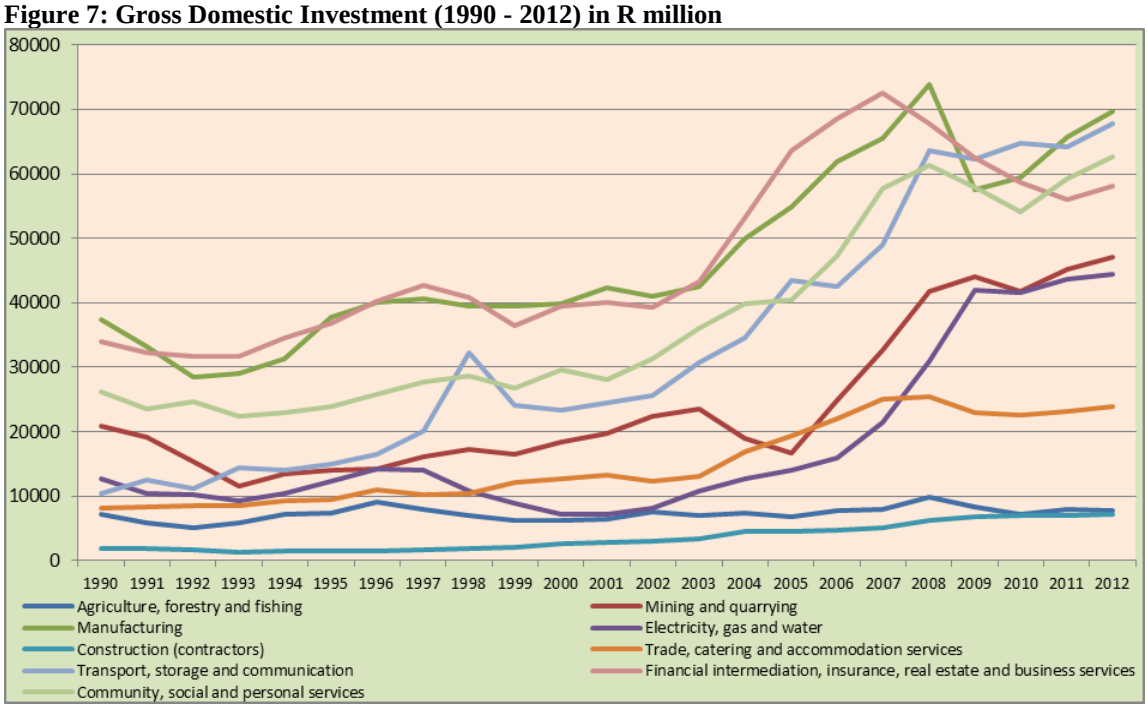
3.3. Dynamism in the Manufacturing Sector and the Rest of the Economy

The South African economy faces a challenge of one of the highest unemployment rates globally at 23% for the past 10 years and is considered as a crisis. This high level persisted despite a relatively high rate of economic growth of around 5% during the last five years before the financial crisis (CSID, 2009). The unemployment rate as published by StatsSA did not experience any significant decline. Concerns are raised over the manufacturing decline which is qualified in some literature as deindustrialisation or premature deindustrialisation, suggesting that growth in services does not result in unemployment reduction (Kaldor 1966; CSID 2009; Tregenna 2008; Zalk 2013).

Two sectors in the South African economy, as shown in Figure 6, have been competing closely for investment capital share. The financial intermediation, insurance, real estate and business services and manufacturing sector recorded significant share of investment compared to the rest of the economy until recently (after 2009 - post financial crisis) that Transport, storage and communication sector at some extent community, social and personal services registered an increase in the level of investments as shown in Figure 6.

An increase in investment does not necessarily translate into growth. Bigsten and Soderbom (2010) find that the link between investments and growth is not a straightforward relationship for Africa. They state that increased investment is certainly necessary for rapid growth but it is not sufficient. They refer growth to model studies that incorporate, human capital, imbalance between skilled labour and demand, economic environment, and technical progress through innovation (ibid.).

Figure 7: Gross Domestic Investment (1990 - 2012) in R million



Source of Data: Quantec, 2013

Bigsten and Soderbom's (2010) paper, quoting Arbache *et al*. (2008) and Johnson *et al*. (2007), suggests that growth is even better explained when deeper growth determinants such as policy variables, geographic variables, and institutional factors are included among others in the growth model. The paper explains that weak economy and political institutions, greater propensity to experience conflict and social strife, and bad macroeconomic policies derail growth in Africa.

More and more literature, mostly by heterodox scholars, discuss factors that generate sustained growth in relation to the sector in which that growth is initiated (Amsden 1989; CSID 2009; Tregenna 2008; Zalk 2013). This means that the sector of intervention's focus is determinant of long-term growth of the economy. The fact that developing economies do not often have sufficient funds for investment in large number of sectors for expansion, there is need to concentrate available investment funds into a sector (or limited number of industries) with higher potential to stimulate growth through backward linkages in the economy. The view expressed is that a niche industry determination is crucial to create spillover effects to the economy from an intervention in a sector (Zalk,

2013). A growth in the niche industry stimulates additional activities into the rest of the economy, and if coordinated efficiently, the impact will reach the rest of the industries in the value chain, which at their turn will impact their value chain, and so on. This basically underlie the concept of 'nucleus industries'.

3.4. Importance of the Manufacturing Sector in the SA Economy

The importance of Manufacturing is measured in the study through the impact it has on the rest of the economy when an increase in demand (injection) for output is created. The impact is then compared to the effect of other sectors in the South African economy if the same size of increase in demand is done in those sectors. The growth multiplier of each sector is an aggregate impact measure of the sector. But all the sub-sectors within manufacturing are not contributing equally to the growth of the rest of the economy when demand is increased. Ballance (1987) quoted Tregenna (2008), describes sector-specificity in economic growth as the fact that a unit value added is not necessary equivalent across sectors. This means that a unit value addition in one sector does not produce the same growth inducing or growth enhancing effects as in another sector. The analysis looks therefore into sub-sectors at the lowest level of disaggregation available to determine the sub-sector with the highest impact.

CHAPTER 4: COMPREHENSIVE ANALYSIS OF FINDINGS AND POLICY IMPLICATIONS

4.1. Introduction

This chapter discusses the study results and policy implications. A comprehensive analysis is done using the methodology discussed in chapter 1. The results are also further tested for robustness using the SAM and MEMSA models.

4.2. Impact Results of An Injection at 1 Digit SIC Code Level

Using the Input-Output table provided by Quantec (see appendix 2). The production of one unit of the final product by sector *j* requires $a_{ij} = \frac{F_{ij}}{X_{.j}}$ intermediate from sector i, with $X_{.j} = \sum_{i=1}^{n} F_{ij}$. The input coefficient matrix $A = \left[a_{ij} \right]$ for *n*- sectors of the economy will be given by equation (1). At 1 digit level of disaggregation, the coefficient matrix is a matrix of 9 sectors. The backward linkages are computed as the sum of coefficient z_{ij} of j^{th} column of the Leontief Matrix expressed mathematically by the expression (5).

Table 3: South Africa's Input-Output Matrix Format

Output / Input	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water	Construction (contractors)	Trade, catering and accommodation services	Transport, storage and communication	Financial intermediation, insurance, real estate and business services	Community, social and personal services	Final consumption expenditure	Gross capital formation	Residual item	Exports of goods and services
Agriculture, forestry and fishing	A & B (matrices)												
Mining and quarrying													
Manufacturing													
Electricity, gas and water													
Construction (contractors)													
Trade, catering and accommodation services													
Transport, storage and communication													
Financial intermediation, insurance, real estate and business services													
Community, social and personal services													
Value added at factor costs													
Government: Net indirect taxes on production													
Indirect taxes on products													
Subsidies on products													
Imports of goods and services													

Source: adapted from Quantec, 2013

The share of output of industry *i* used in the production of one unit of the final product by sector *j* is given by $b_{ij} = \frac{F_{ij}}{X_{i.}}$, with $X_{i.} = \sum_{j=1}^{n} F_{ij}$. The output coefficient matrix $B = \left[b_{ij} \right]$ for *n*- sectors of the economy will be given by the expression (6). In this case, $n = 9$.

Forward linkages are expressed mathematically using the flow of industrial output in the system by the equation (7) where *X* is a matrix capturing the total value of output from all industries in the system, and *BX* the value of output used in the economy as intermediate and *f* a matrix capturing the value of output used as final product. Expression (10) measures the forward linkages of sector j or the impact on output of sectors in the economy arising from a unit increase in the demand of output from sector i.

The result of the 2013 Input-Output matrix analysis is captured in the Table 4 below:

Table 4: Sectors Multipliers at SIC Code Level 1

Type of Impact	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water	Construction (contractors)	Trade, catering and accommodation services	Transport, storage and communication	Financial intermediation, insurance, real estate and business services	Community, social and personal services
Total Impact	**5.615**	**6.650**	**9.958**	**4.137**	**5.363**	**3.105**	**4.022**	**2.954**	**3.196**
Comparison Ratio Manufacturing - Total Impact to other sectors	1.8	1.5	1.0	2.4	1.9	3.2	2.5	3.4	3.1
Backward Linkage									
Direct Impact	1.251	1.529	4.510	1.236	1.327	1.193	1.445	1.563	1.233
Backward Indirect Impact	4.364	5.120	5.448	2.901	4.036	1.912	2.286	1.391	1.963
Comparison Ratio Manufacturing - Direct Impact to other sectors	3.6	2.9	1.0	3.6	3.4	3.8	3.1	2.9	3.7
Comparison Ratio Manufacturing - Backward impact to other sectors	1.2	1.1	1.0	1.9	1.4	2.8	2.4	3.9	2.8
Forward Linkage									
Forward Indirect Impact	1.373	3.312	9.767	0.785	0.621	2.831	4.421	5.559	1.045
Comparison Ratio Manufacturing – Forward impact	7.1	2.9	1.0	12.4	15.7	3.5	2.2	1.8	9.3

Data source: Quantec, 2013

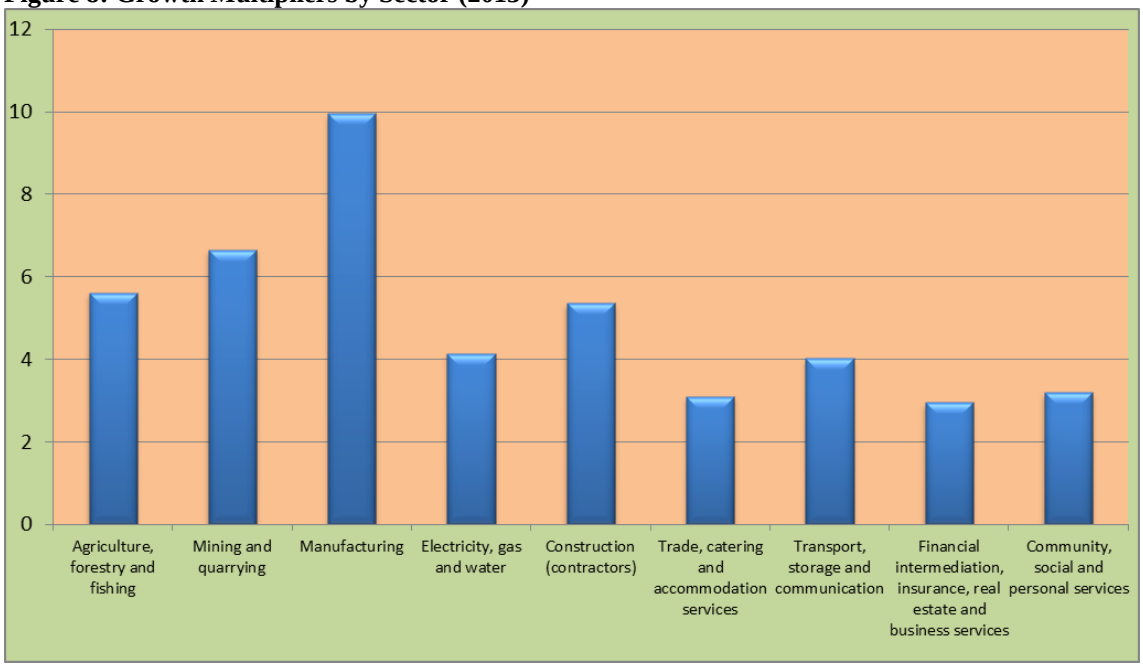
The results of the analysis of impact of sectors on the rest of the South African economy join the conclusion reached by Tregenna (2008). Tregenna regards manufacturing sector as a sector imbued with special characteristics not shared by other sectors. The special characteristics typically attributed to manufacturing sector in heterodox literature as referred to in the paper, include the growth "pulls along" economic growth, which is the growth effect extended into other sectors of the economy. The manufacturing impact on the rest of the economy as shown in the Table 4 is 9.958 meaning that for R1 million of additional demand in the manufacturing, R9.958 million worth of intermediate demand is generated into the manufacturing value chain. This value includes the direct, indirect and induced effects of the injection on the economy. The manufacturing growth multiplier is the highest in the economy (9.958) when compared to the impact of the same injection on other sectors. It is more than three times the size of impact generate by the Financial intermediation, insurance, real estate and business services and almost double of the third largest impact from Agriculture, forestry and fishing sector. This implies that the ability or potential to drive growth in the economy is higher in manufacturing than any other sector of the economy as also concluded by Tregenna (2008). It is also important to note from the results above that the Financial intermediation, insurance, real estate and business services sector has the least impact on the economy after a R1million injection.

Figure 8 below captures the growth multiplier of all sectors in the South African economy as shown in table 4 above. The South African manufacturing sector's growth multiplier is the highest of all the sectors in the economy as shown in figure 8.

Growth multiplier translates the impact on the economy that a sector can create when there is a one unit increase in demand for output of the sector. It shows the importance of linkages which is expressed as an impact of a sector on the rest of the economy. It gives the level of increase in the demand for production (of intermediates) in the downstream industries linked to the sector which registers the initial increase in demand for output. It measures how integrated is the sector with the rest of the economy.

In the case of South Africa, the results shows that the manufacturing Sector is the most integrated, since it has the highest multiplier effect on the economy. An intervention in the manufacturing sector creates the highest value addition activities in the economy than same intervention in any other sector. The results also suggest that the multiplier effect of the manufacturing sector is about 1.5 times more than the multiplier effect of the second largest contributing sector (Mining and quarrying).

Figure 8: Growth Multipliers by Sector (2013)



Source of Data: Quantec, 2013

4.3. Growth Multipliers: Backward and Forward Linkages in the SA Economy

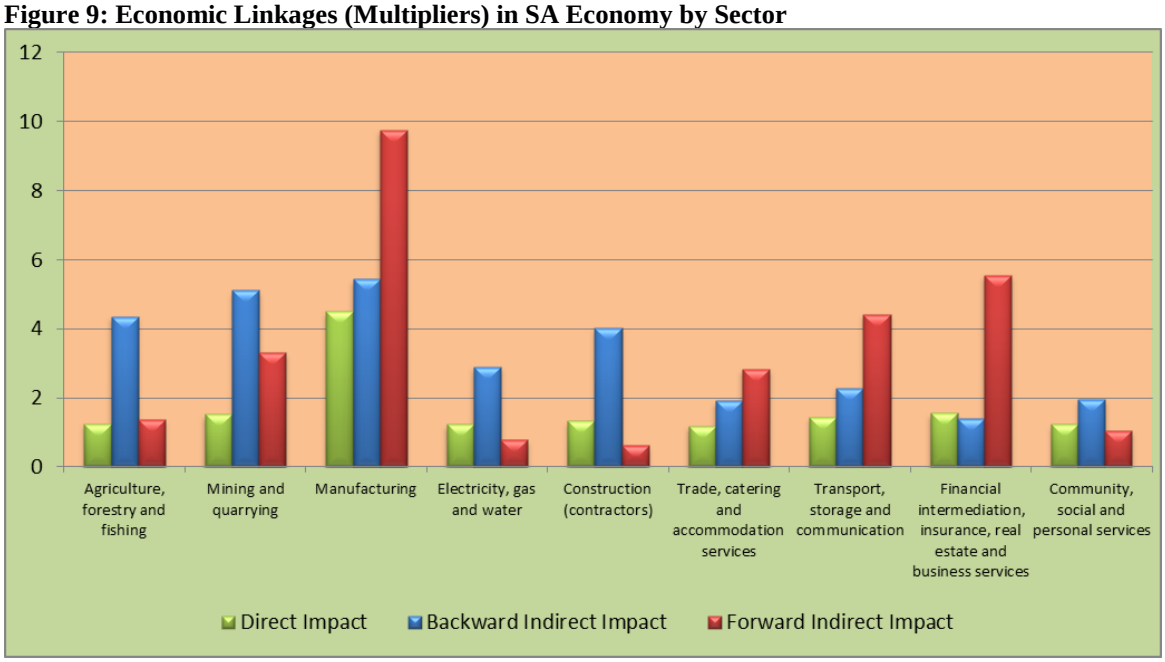
Table 4 above shows that for a R1 million additional demand in the manufacturing, R9.958 million worth of activities (goods and services) are generated into the economy. It is important to highlight that the growth multiplier is an aggregate impact which includes direct and indirect impact. This section breaks down the aggregate impact into direct and indirect (backward and forward linkages).

The direct impact expresses the importance of the pull effect on sub-sectors within the sector where the injection (or intervention) has taken place. It is also a measure of internal connectivity or integration of the sector within itself or interdependence of the sub-sectors.

Figure 9 shows that the South African manufacturing sector is the most integrated with the highest direct impact, valued at more than double the impact within all the services sub-sectors. This means that a direct intervention within the manufacturing sector generates the highest growth impact within manufacturing (4.510) compared to the result of an intervention of the same size in any other sector of the South African economy. It is more than three times in most of the cases when compared to other sectors at the same level of disaggregation.

This demonstrates that South African manufacturing subsectors intrasectoral linkages are greater than intrasectoral linkages of subsectors of other economic sectors. This implies that an intervention in manufacturing will have a larger effect on manufacturing than any other sector would have on manufacturing. This also confirms the suggestion by Tregenna (2008), which from a policy perspective, expresses the need for a particular focus on the manufacturing sector. This analysis of linkages means that the sub-sectors in the manufacturing sector are the most interdependent or interconnected. The policy implication is that any intervention in a manufacturing sub-sector will have spillover effect in activities on the rest of the manufacturing.

Figure 9: Economic Linkages (Multipliers) in SA Economy by Sector



Source of Data: Quantec, 2013

The manufacturing backward linkage (5.448) is the highest of all sectors of the South African economy. It is almost four times the backward linkage of financial intermediation, insurance, real estate and business services sector. This suggests that if an intervention is targeting a sector with the greatest potential to create additional activities in the rest of the economy, the manufacturing sector should be the focus of such an intervention, which should potentially be more supportive of sustainable growth in the South African economy.

The backward linkage of manufacturing (5.448) is the highest compared to the rest of the sectors at the same level of disaggregation. The result supports the heterodox consideration mainly in the broad Kaldorian tradition quoted by Tregenna (2008) for manufacturing having a pulling along effect in its growth on the rest of the economy. From policy perspective, such level of manufacturing integration in the economy supports the argument in the heterodox literature that, "a relative decline in manufacturing could have deleterious effects for maintaining high growth rates in the medium- to long-term", Tregenna. (2008).

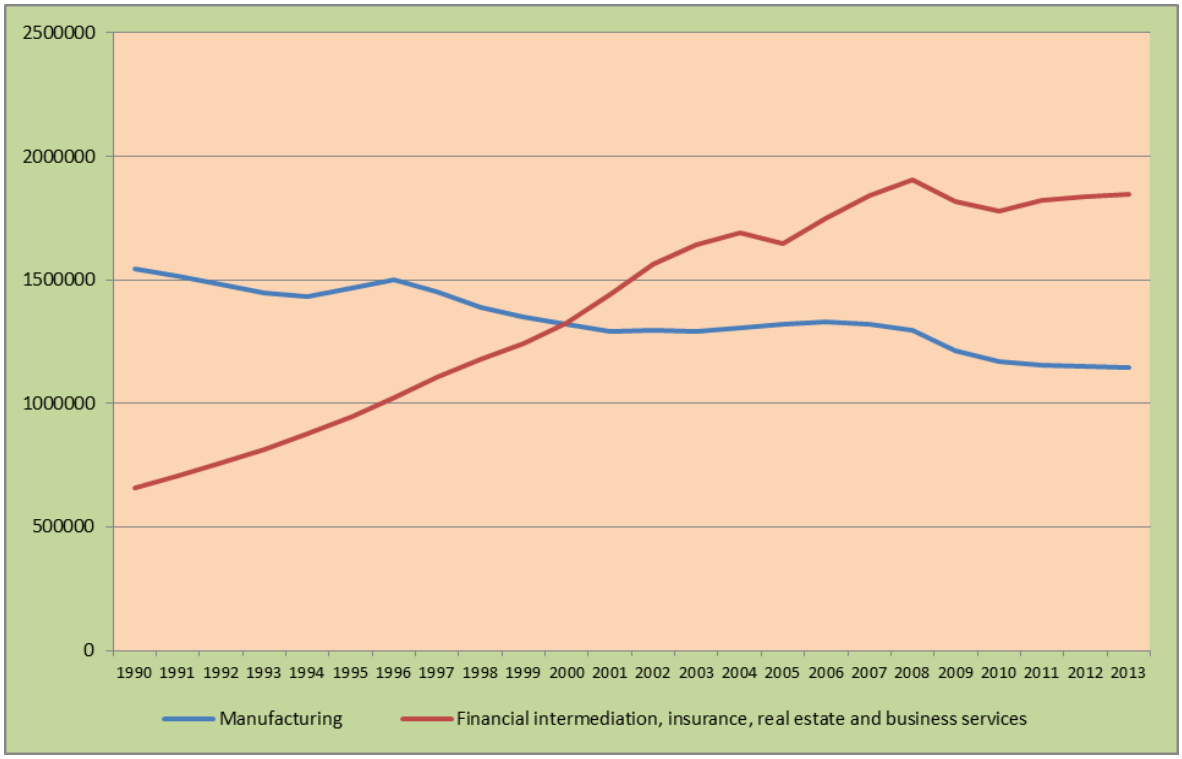
The forward linkage of manufacturing (9.767) is once again the highest of all sectors of the economy at an SIC code level 1 of disaggregation. This result suggests that products from manufacturing support other sectors in their process of producing goods and services. It again shows the importance of manufacturing to the performance of other sectors.

Backward and forward linkages will be further analysed when looking to higher levels of sectoral disaggregation (sic code level 3)

4.4. Employment Multipliers

The trend in manufacturing employment since 1990 is decreasing while all the services sub-sectors increased their employment over the same period.

Figure 10: Employment Trends in Manufacturing and Financial intermediation, insurance, real estate and business service



Data Source: Quantec, 2013

The above figure shows that financial intermediation, insurance, real estate and business services (FIIREBS) subsector is growing employment, as do the rest of the sectors in the

services sector. Based on the times series data from Quantec, it is observed that apart from sub-sectors in the services sector, the other subsectors are stagnant or decreasing in their size of employment. Employment in the mining and quarrying sector did not change significantly since 1990 and has remained low compared to financial intermediation, insurance, real estate and business services and manufacturing. This stagnant pattern is also observed in transport, storage and communication, and construction. Therefore the analysis of manufacturing will be done in comparison with the financial intermediation, insurance, real estate and business services at the same level of disaggregation.

For the study, the concept "financial sector" will refer to financial intermediation, insurance, real estate and business services (FIIREBS).

Employment level of the manufacturing sector has been higher that the financial sector until the year 2000. And since then, the pattern of employment has changed in favour of the financial sector over manufacturing. It is important to mention that Tregenna (2005); Mohamed (2010) works show that when you disaggregate FIIREBS most of the employment is in Business Services not linked to finance and most of the jobs created in Business Services were outsourced cleaning jobs and private security guards.

Does growth of employment in the financial sector (including business services) mean that the sector is more important for job creation than manufacturing? The analysis of the table on employment multipliers in the South African economy (Table 5) will provide greater understanding of the importance of manufacturing relative to the financial sector.

Table 5: Employment Multipliers at 1 digit SIC Code Level

Output / Input	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water	Construction (contractors)	Trade, catering and accommodation services	Transport, storage and communication	Financial intermediation, insurance, real estate and business services	Community, social and personal services
Agriculture, forestry and fishing	8.34	1.52	3.32	0.76	1.23	0.51	0.84	0.44	0.54
Mining and quarrying	1.41	4.48	3.22	1.32	1.40	0.49	0.84	0.45	0.55
Manufacturing	1.89	2.04	4.47	1.02	1.65	0.66	1.13	0.59	0.72
Electricity, gas and water	0.09	0.14	0.18	1.03	0.07	0.04	0.06	0.03	0.04
Construction (contractors)	0.11	0.15	0.20	0.22	2.31	0.11	0.09	0.12	0.08
Trade, catering and accommodation services	1.46	1.65	2.73	0.82	1.19	4.29	1.04	0.60	0.68
Transport, storage and communication	0.58	1.07	1.08	0.39	0.47	0.29	1.43	0.24	0.25
Financial intermediation, insurance, real estate and business services	1.54	1.94	3.15	1.08	1.57	1.25	1.19	3.58	1.01
Community, social and personal services	0.73	0.98	1.44	0.41	0.59	0.27	0.42	0.30	6.07
Total Backward Employment Multiplier	**16.15**	**13.96**	**19.81**	**7.06**	**10.50**	**7.90**	**7.06**	**6.35**	**9.93**
Direct Impact	8.344	4.476	4.474	1.029	2.308	4.287	1.432	3.580	6.074
Backward Indirect Impact	7.804	9.483	15.332	6.028	8.192	3.612	5.624	2.773	3.859
Forward Indirect Impact	9.158	9.694	9.689	0.653	1.081	10.173	4.379	12.734	5.145

Data Source: Quantec, 2013

The manufacturing sector has the highest total backward employment multiplier (19.21) which is more than three times the total employment multiplier of the financial sector (including business services) (6.35). This shows that the potential impact of manufacturing on employment generation in the South African economy when there is additional demand is therefore three times higher than financial sector's impact.

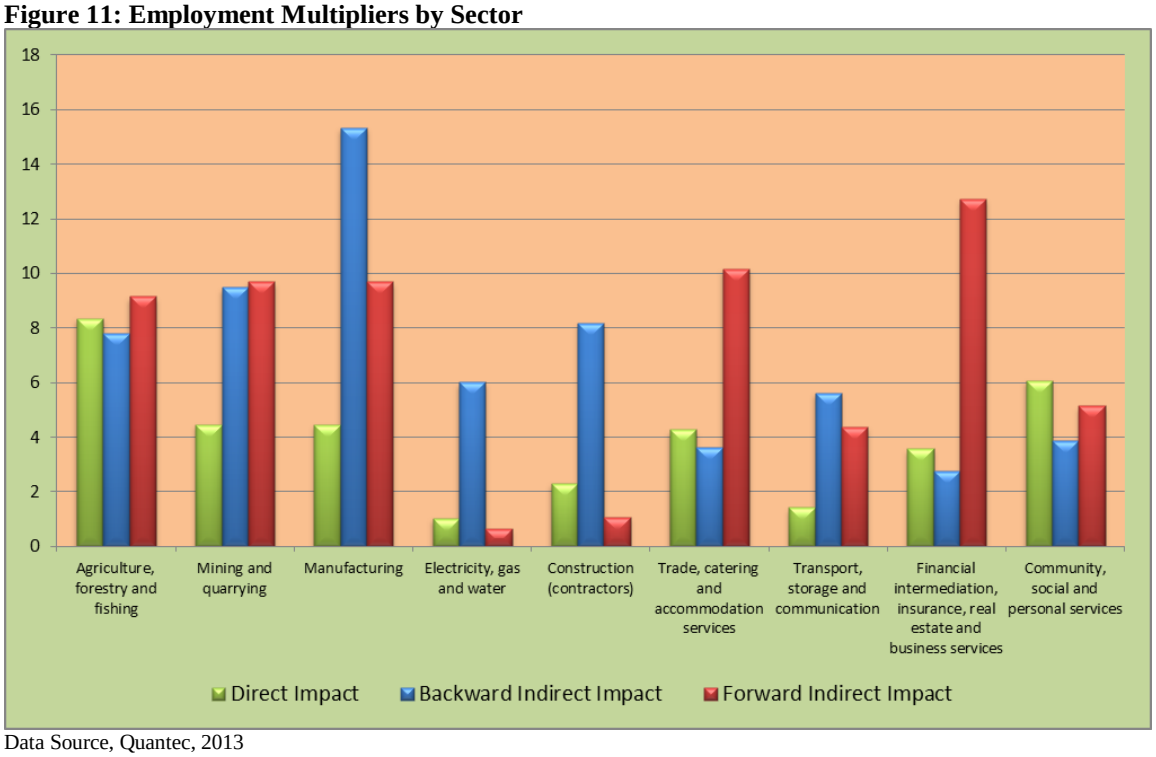
When looking to the backward indirect impact, the manufacturing's potential job creation impact on the rest of the economy is almost six times the potential impact of financial sector on other sectors of the economy. The direct employment impact of financial sector is 3.580 while its backward indirect employment impact is 2.773. This means that the financial sector has a higher impact on job creation within itself than it has on the rest of the economy. On the other hand, the manufacturing sector's direct impact is 4.474 (high than financial sector's direct impact) and the backward indirect impact is 15.332. The

implication is that manufacturing sector has a higher impact on the rest of the economy than it has on itself.

The forward indirect employment multiplier is the highest in the financial sector (12.734) of all sectors in the economy followed by trade, catering and accommodation services with 10.173. This measure indicates that the financial sector is the most dependent on development in other sector to support its employment. The financial sector depends largely on growth in manufacturing, as shown by the forward linkage of financial sector to manufacturing of 3.15, an impact potential competing closely with the direct linkage in financial sector (3.58). Therefore the negative trend observed in manufacturing employment while services portray a positive trend does not mean that manufacturing has become less significant in employment generation than financial sector. The two trends are related in the sense that when manufacturing had high employment (before 2000), the financial sector registered a lower employment in that same period. The inverse relation is actually observed as closely correlated when looking to the graph in Figure 11.

Tregenna (2008) suggests that the shift in the composition of the economy should not be interpreted as services taking over manufacturing. The increase in employment in services is related to the increased demand arising from manufacturing. Tregenna (2008) argues that manufacturing has taken on a greater service orientation, with services dimension that includes function such as marketing, human resources, and the granting of consumer credit within manufacturing, been outsourced to specialised service providers. Increasingly the focus among manufacturing firms remains on their core function and their core competencies (product differentiation and product specialisation) which require support of services-type activities.

Figure 11: Employment Multipliers by Sector



Data Source, Quantec, 2013

From Figure 11, the financial sector has a considerable lower multiplier effect on the rest of the economy and high dependency on the growth in the rest of the economy when compared to manufacturing sector. From a policy perspective and implication, the increase of employment and demand measured in services are created by growth in the manufacturing sector in particular as more and more manufacturing firms focus on product diversification and specialisation. Therefore the demand for related activities and employment in manufacturing has been relocated and counted in the services sector, thus reflecting growth in the services sector while showing up a relative decline in manufacturing. Tregenna (2008) called this shift a "statistical" rather than "real" change.

4.5. Impact Results of An Injection at 3 Digits SIC Code Level

Pons-Vignon (2011) using the case of Brazil, shows that industrial development is a deliberate and purposely effort where the state influences the industrial development strategy. In the case of Brazil, the Brazilian development bank (BNDES) became the cornerstone of industrialisation and development. Industrial diversification was made

possible through Import Substitution Industrialisation (ISI) policies which imposed investment discipline in line with manufacturing development objectives to both domestic capital and foreign direct investment (FDI).

Pons-Vignon (2011) and Shafaeddin (2006) suggest a selective industrialisation path that takes account of the opportunities for learning effects and linkages with the rest of industries. They suggest an import substitution industrialisation process that initially focuses on industries in non-durable consumer goods that are most demanded in the local market and involve significant learning effects for capacity building. The process should be accompanied by support and protection for selected infant industries. A provision of measures to allow firms to enter rapidly into foreign markets should be put in place through incentives in exchange for performance. The strategy will then include intermediate products that are needed in support of non-durable consumer goods industries. At a later stage, the industrialisation strategy should cater for industries in durable consumer goods such as chemical products and cement, steel, capital goods and high technology goods.

Table 6 below shows the results of the potential impact analysis of sectors in the South Africa's economy for growth enhancement. The Top 10 sectors with a greater growth multiplier effect on the rest of the economy at 3 digits sic code level of disaggregation, are Leather and leather products; Furniture; Tobacco; Footwear; Wearing apparel; Textiles; Electrical machinery and apparatus; Rubber products; Paper and paper products; and Motor vehicles, parts and accessories. All these sectors are sub-sectors of manufacturing.

Table 6: Sectoral Growth Multipliers at SIC code level 3

No.	Type of Impact / Sector	Direct Impact	Backward Indirect Impact	Forward Indirect Impact	No.	Type of Impact / Sector	Direct Impact	Backward Indirect Impact	Forward Indirect Impact
1	Leather and leather products	1.135	2.325	0.435	24	Plastic products	1.131	1.568	1.093
2	Furniture	1.007	2.203	0.075	25	Wood and wood products	1.346	1.558	0.920
3	Tobacco	1.001	2.147	0.001	26	Beverages	1.074	1.514	0.041
4	Footwear	1.078	2.130	0.024	27	Glass and glass products	1.135	1.509	0.233
5	Wearing apparel	1.002	2.108	0.128	28	Other manufacturing	1.014	1.506	0.321
6	Textiles	1.272	1.959	0.891	29	Building construction	1.389	1.463	1.163
7	Electrical machinery and apparatus	1.168	1.955	1.058	30	Television, radio and communication equipment	1.532	1.431	0.502
8	Rubber products	1.016	1.936	0.321	31	Agriculture, forestry and fishing	1.054	1.419	1.876
9	Paper and paper products	1.338	1.908	1.373	32	Excluding medical, dental and veterinary services	1.045	1.283	0.236
10	Motor vehicles, parts and accessories	1.696	1.834	1.028	33	Medical, dental and veterinary services	1.004	1.278	0.167
11	Basic iron and steel	1.089	1.813	2.076	34	Communication	1.237	1.201	1.432
12	Professional and scientific equipment	1.087	1.810	0.209	35	Catering and accommodation services	1.006	1.186	0.346
13	Other chemicals and man-made fibers	1.209	1.805	2.927	36	Coal mining	1.012	0.967	1.339
14	Metal products excluding machinery	1.084	1.768	1.238	37	Transport and storage	1.058	0.956	5.125
15	Printing, publishing and recorded media	1.073	1.762	0.415	38	Other mining	1.062	0.934	7.872
16	Coke and refined petroleum products	1.063	1.699	1.967	39	Electricity, gas and steam	1.057	0.926	1.755
17	Food	1.133	1.672	0.932	40	Business services	1.236	0.857	8.611
18	Basic chemicals	1.328	1.671	2.916	41	Wholesale and retail trade	1.109	0.774	8.061
19	Other transport equipment	1.295	1.640	0.217	42	Other producers	1.015	0.726	1.381
20	Non-metallic minerals	1.057	1.611	0.553	43	Water supply	1.585	0.724	0.501
21	Machinery and equipment	1.226	1.606	1.711	44	General government services	1.457	0.715	0.037
22	Civil engineering and other construction	1.027	1.580	0.138	45	Gold and uranium ore mining	1.000	0.574	0.035
23	Basic non-ferrous metals	1.273	1.578	0.937	46	Finance and insurance	1.258	0.487	3.461

Data Source: Quantec, 2013

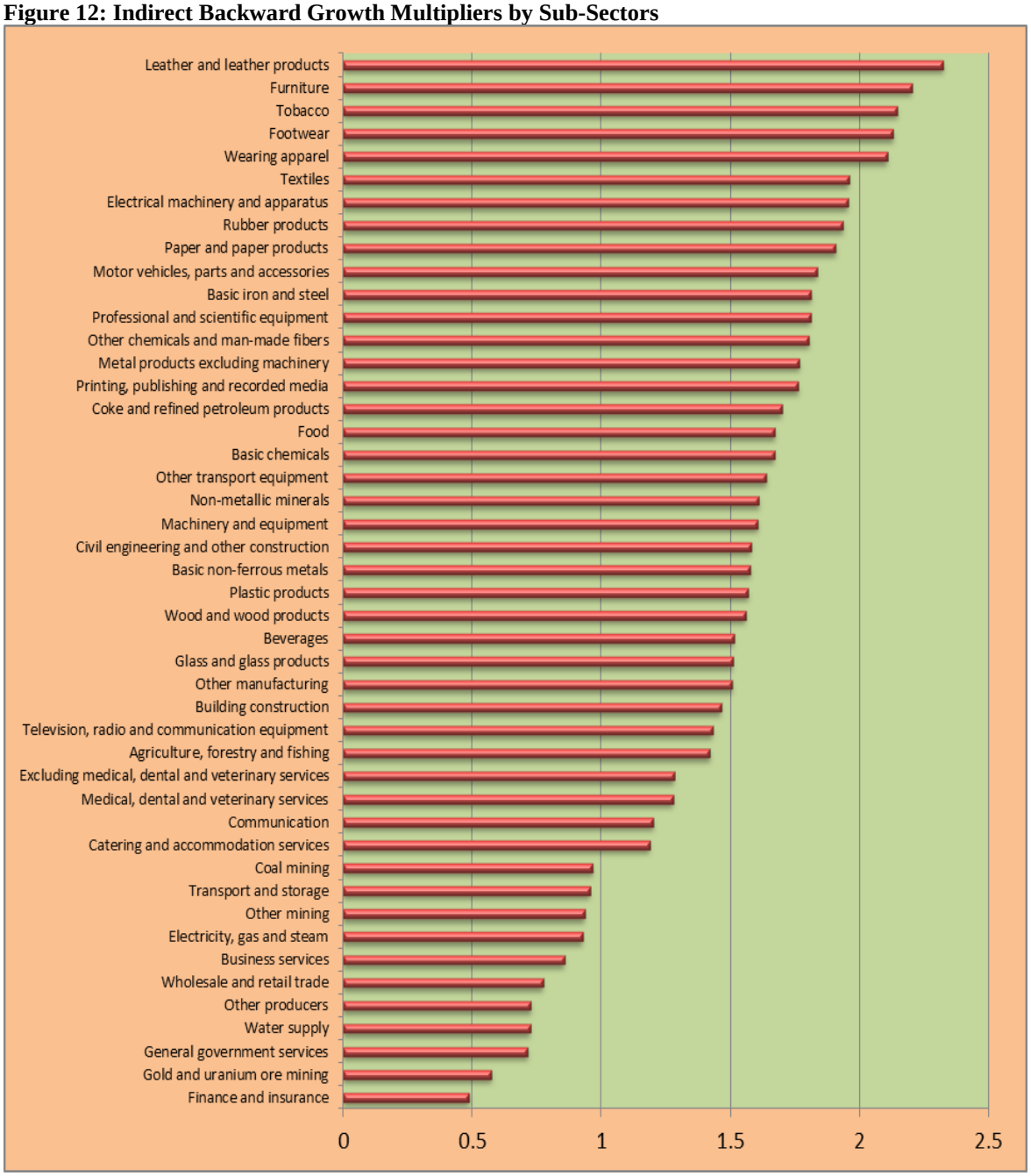
Furthermore, Table 7 gives the ranking of sectors by their impact on employment in the backward value chains. The backward employment multipliers demonstrate the importance for employment creation of sub-sectors in the manufacturing. The Top 10 are all from manufacturing sector and includes Tobacco; Leather and leather products; Food; Wearing apparel; Furniture; Footwear; Textiles; Wood and wood products; Paper and paper products; and Beverages.

Table 7: Sectoral Employment Multipliers SIC code level 3

	Impact / Sector	Direct Impact	Backward Indirect Impact	Forward Indirect Impact		Impact / Sector	Direct Impact	Backward Indirect Impact	Forward Indirect Impact
1	**Tobacco**	0.176	3.980	0.000	24	**Non-metallic minerals**	1.161	1.955	0.607
2	**Leather and leather products**	0.724	3.374	0.278	25	**Coke and refined petroleum products**	0.218	1.914	0.404
3	**Food**	0.775	3.317	0.637	26	**Civil engineering and other construction**	1.383	1.901	0.185
4	**Wearing apparel**	2.184	3.276	0.278	27	**Plastic products**	1.304	1.885	1.261
5	**Furniture**	1.791	3.086	0.134	28	**Excluding medical, dental and veterinary services**	0.656	1.877	0.148
6	**Footwear**	1.306	2.832	0.029	29	**Building construction**	1.235	1.779	1.034
7	**Textiles**	1.492	2.823	1.045	30	**Other manufacturing**	0.637	1.773	0.201
8	**Wood and wood products**	1.348	2.784	0.921	31	**Basic non-ferrous metals**	0.484	1.741	0.357
9	**Paper and paper products**	0.599	2.746	0.614	32	**Medical, dental and veterinary services**	1.701	1.670	0.283
10	**Beverages**	0.533	2.609	0.020	33	**Catering and accommodation services**	2.780	1.643	0.957
11	**Motor vehicles, parts and accessories**	0.773	2.468	0.468	34	**Communication**	0.529	1.492	0.613
12	**Rubber products**	0.741	2.458	0.234	35	**Agriculture, forestry and fishing**	4.389	1.481	7.807
13	**Professional and scientific equipment**	1.406	2.373	0.270	36	**Coal mining**	0.829	1.259	1.096
14	**Printing, publishing and recorded media**	1.326	2.370	0.512	37	**Other mining**	0.969	1.187	7.181
15	**Electrical machinery and apparatus**	0.876	2.339	0.793	38	**Transport and storage**	0.852	1.135	4.127
16	**Other chemicals and man-made fibers**	0.508	2.256	1.229	39	**Electricity, gas and steam**	0.401	1.008	0.666
17	**Glass and glass products**	1.088	2.184	0.224	40	**Business services**	2.343	0.948	16.328
18	**Basic iron and steel**	0.352	2.173	0.671	41	**Wholesale and retail trade**	2.123	0.914	15.430
19	**Television, radio and communication equipment**	0.872	2.169	0.286	42	**General government services**	2.614	0.870	0.067
20	**Basic chemicals**	0.225	2.138	0.494	43	**Gold and uranium ore mining**	2.270	0.795	0.080
21	**Other transport equipment**	1.226	2.078	0.205	44	**Other producers**	12.118	0.791	16.496
22	**Metal products excluding machinery**	1.373	2.039	1.569	45	**Water supply**	0.488	0.775	0.154
23	**Machinery and equipment**	1.820	2.014	2.540	46	**Finance and insurance**	0.888	0.696	2.443

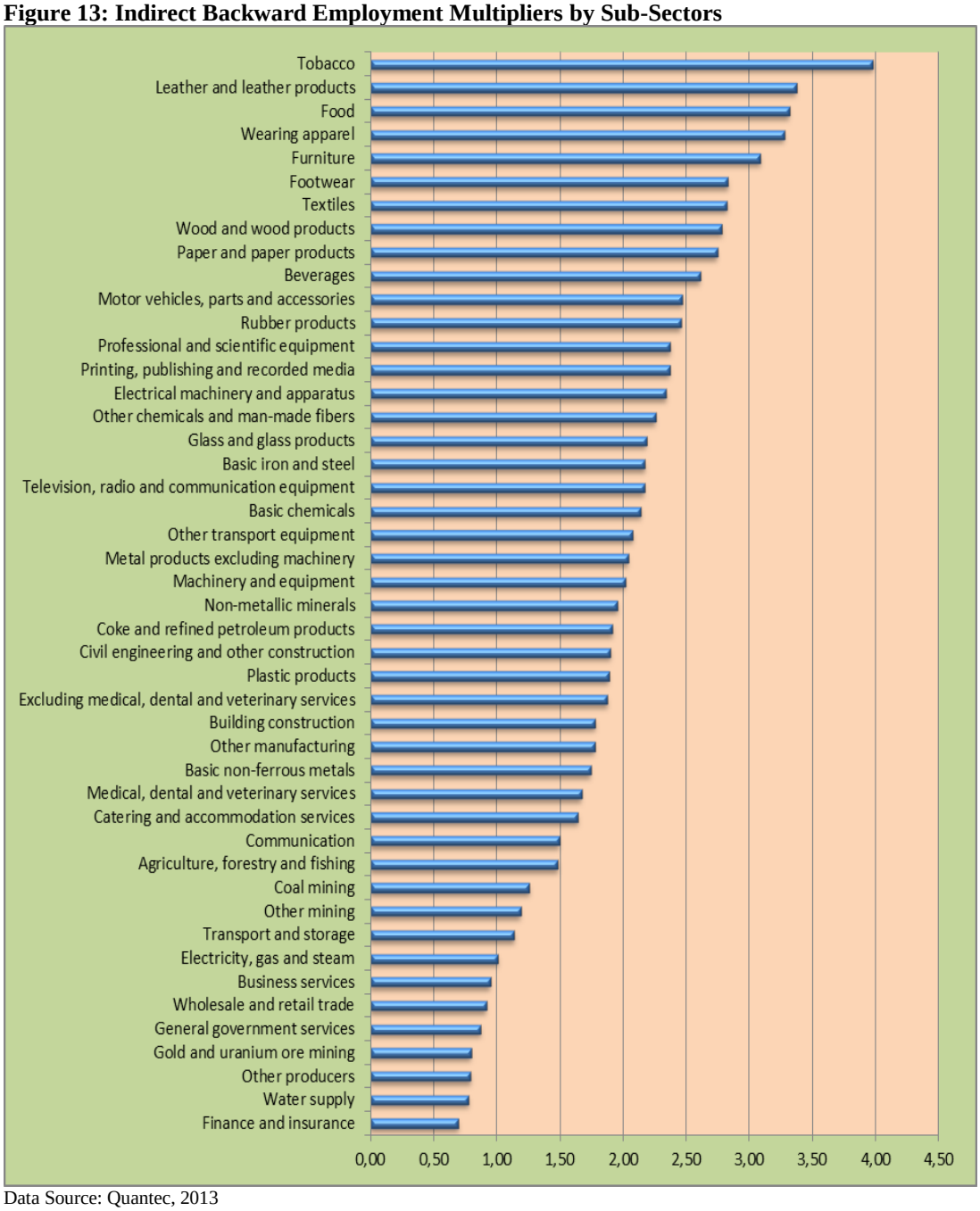
Data Source: Quantec, 2013

Figure 12: Indirect Backward Growth Multipliers by Sub-Sectors



Source: Quantec, 2013

Figure 13: Indirect Backward Employment Multipliers by Sub-Sectors



Data Source: Quantec, 2013

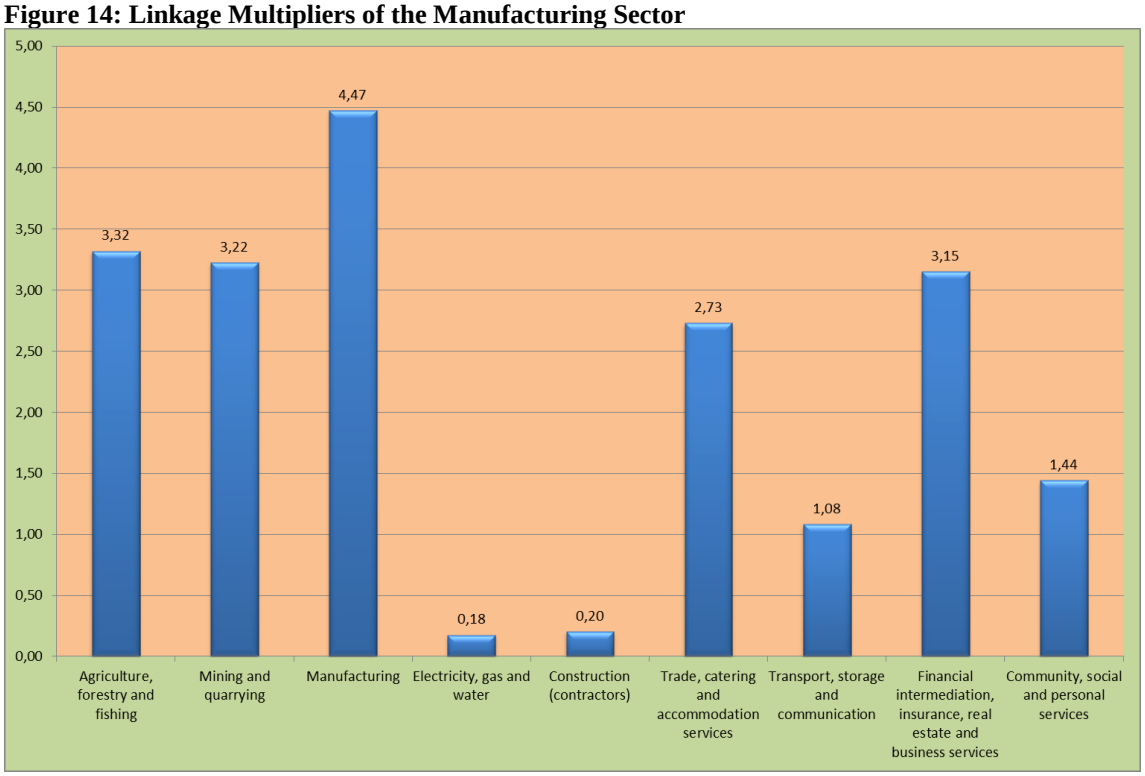
The general finding as shown in figures 12 and 13 above is that sub-sectors of manufacturing have the highest multiplier effects on both indirect backward growth and employment. Finance and insurance sub-sector has the lowest multiplier effects for both indirect backward growth (0.487) and employment (0.696). The services sub-sector dominate the list for the bottom 10 least employment multiplier effects and these include

finance and insurance; water supply; general government services; wholesale and retail trade; business services; and transport and storage. Again the same sectors are among the bottom 10 sectors with the least growth multiplier effects.

4.6. Analysis of the Manufacturing Sector and Policy Implications at Aggregate Level

South Africa's manufacturing sector as shown in the study is very important with a special attribute of pulling the rest of the economy into its growth momentum. The backward growth linkages and backward employment linkages of manufacturing as shown in Figure 8 and Figure 11 respectively, demonstrates the capacity of manufacturing to stimulate growth and employment in other sectors of the economy including the services sector. This observation is aligned with Tregenna (2008) who states that: "the linkages between manufacturing and services sectors, and between each of them and the rest of the economy… reveals that manufacturing is a source of demand for the services sectors as well as the rest of the economy through its strong backward linkages…"

Figure 14: Linkage Multipliers of the Manufacturing Sector



Source: Quantec, 2013

The employment multipliers values show that manufacturing has a linkage of 4.47 within manufacturing. The manufacturing direct impact (direct linkage) is the highest level of integration of the sector with itself in the South African economy. The employment multiplier value of manufacturing into financial sectors is the highest 3.15 (Table 5) of employment multipliers of manufacturing into other sectors. It is far higher than the total indirect employment backward linkage (with a multiplier of 2.773) of the financial sector on the rest of the economy. The backward growth multiplier of manufacturing is 5.448 (Table 4) or four times the sum of all backward multipliers of financial sector into other sectors (1.391). This demonstrates that the manufacturing sector has a higher impact on financial sector for growth and employment creation than the combined impact of financial sector on the rest of the economy.

This conclusion supports the assertion of Tregenna (2008) suggesting that a decline in manufacturing could negatively affect future growth of the South African economy. The policy implication thereof should be that despite a decline in employment, manufacturing should always be regarded as a pillar on which sustained and long-term growth of the South African economy should be based. South Africa's need for employment is greater for unskilled labour; and most services sector jobs are low paid and low skilled in sectors such as business services (cleaning and private security jobs) and wholesale and retail trade (Mohamed, 2010; Tregenna, 2008). This phenomenon explains why despite the growth in the services sectors, it is still difficult to reduce the level of unemployment in the country with the existing high level of unskilled unemployment.

Despite the decline in its share of GDP, the manufacturing sector continues to be an important indirect employment generator as a source of demand for outputs/ services across all sectors of the economy. Therefore the sector requires special attention to take advantage of its potential to drive long-term growth. It confirms that a decline in manufacturing even if replaced by services, could impact negatively in the medium- to long-term South African prospect for growth and employment.

4.7. Analysis of Manufacturing Sub-Sectors in the Economy for policy Direction

After evaluating the impact on the economy in the previous section, Table 6 ranks economic sectors in the South African economy. The ranking is by order of importance considering their total backward multipliers and their indirect backward multipliers on growth and employment. Among the Top 20 noted in the process of identifying nucleus[3] industries with higher growth potential, motor vehicles, parts and accessories (3.53); and leather and leather products (2.325) are the top sectors with respectively the highest total backward growth multipliers and indirect backward growth multipliers. On the other hand, other producers (12.909) and Tobacco sectors (3.980) were on respectively the top of the lists of total backward employment multipliers and indirect backward employment multipliers.

Table 8: Growth and Employment Multipliers Sectoral Ranking

Rank	Sector Ranking Based on the Importance of the Multiplier				
	Based on Growth Multipliers			Based On Employment Multipliers	
	Total Backward Growth Multipliers	Indirect Backward Multipliers		Total Backward Employment Multipliers	Indirect Backward Employment Multipliers
1	Motor vehicles, parts and accessories	Leather and leather products		Other producers	Tobacco
2	Leather and leather products	Furniture		Agriculture, forestry and fishing	Leather and leather products
3	Paper and paper products	Tobacco		Wearing apparel	Food
4	Textiles	Footwear		Furniture	Wearing apparel
5	Furniture	Wearing apparel		Catering and accommodation services	Furniture
6	Footwear	Textiles		Textiles	Footwear
7	Tobacco	Electrical machinery and apparatus		Tobacco	Textiles
8	Electrical machinery and apparatus	Rubber products		Footwear	Wood and wood products
9	Wearing apparel	Paper and paper products		Wood and wood products	Paper and paper products

[3] See Tables 6 and 7 for growth and employment multipliers respectively

10	Other chemicals and man-made fibers	Motor vehicles, parts and accessories		Leather and leather products	Beverages
11	Basic chemicals	Basic iron and steel		Food	Motor vehicles, parts and accessories
12	Television, radio and communication equipment	Professional and scientific equipment		Machinery and equipment	Rubber products
13	Rubber products	Other chemicals and man-made fibers		Professional and scientific equipment	Professional and scientific equipment
14	Other transport equipment	Metal products excluding machinery		Printing, publishing and recorded media	Printing, publishing and recorded media
15	Wood and wood products	Printing, publishing and recorded media		General government services	Electrical machinery and apparatus
16	Basic iron and steel	Coke and refined petroleum products		Metal products excluding machinery	Other chemicals and man-made fibers
17	Professional and scientific equipment	Food		Medical, dental and veterinary services	Glass and glass products
18	Building construction	Basic chemicals		Paper and paper products	Basic iron and steel
19	Metal products excluding machinery	Other transport equipment		Other transport equipment	Television, radio and communication equipment
20	Basic non-ferrous metals	Non-metallic minerals		Business services	Basic chemicals

After looking at the full ranking of the sectors (Table 8), the sectors that fared well in all the rankings for both growth and employment impacts are selected and shown in Table 9 below. These sectors are selected considering their multiplier effect.

Table 9: Ranking by Importance of Multipliers

Rank	Sector Ranking Based on the Importance of Multipliers		
	Growth Multipliers		**Employment Multipliers**
1	Leather and leather products		Wearing apparel
2	Furniture		Tobacco
3	Tobacco		Furniture
4	Footwear		Leather and leather products
5	Textiles		Textiles
6	Motor vehicles, parts and accessories		Food
7	Wearing apparel		Footwear
8	Electrical machinery and apparatus		Wood and wood products
9	Paper and paper products		Professional and scientific equipment

10	Rubber products		Paper and paper products
11	Other chemicals and man-made fibers		Printing, publishing and recorded media
12	Basic iron and steel		Motor vehicles, parts and accessories
13	Professional and scientific equipment		Machinery and equipment
14	Basic chemicals		Beverages
15	Metal products excluding machinery		Rubber products

Table 9 lists the strategic sectors in the Top 15 which can be the focus of an intervention in the economy, if the aim of the intervention is to boost growth or employment. The top 10 sectors selected for both growth and employment impact ranked are the following sectors:

- Leather and leather products;
- Furniture;
- Tobacco;
- Footwear;
- Textiles;
- Motor vehicles, parts and accessories;
- Wearing apparel;
- Paper and paper products ;
- Rubber products and;
- Professional and scientific equipment

It is important to note that the selected sectors above supports the argument of Pons-Vignon (2011) and Shafaeddin (2006), who argue that industrialisation should initially focus on industries in non-durable consumer goods that already have local demand but involving significant learning effects. For instance all top five sectors (Leather and leather products; Furniture; Tobacco; Footwear; Textiles) already have a local demand.
They also argue for a provision of measures to allow firms to enter rapidly into foreign markets and that can be achieved through incentives in exchange for performance.

4.8. Results Validation

This section uses the SAM approach and MEMSA modelling to check the robustness of the results discussed above. The results are discussed below using a methodology described earlier in chapter one.

4.8.1. SAM approach and implication on policy

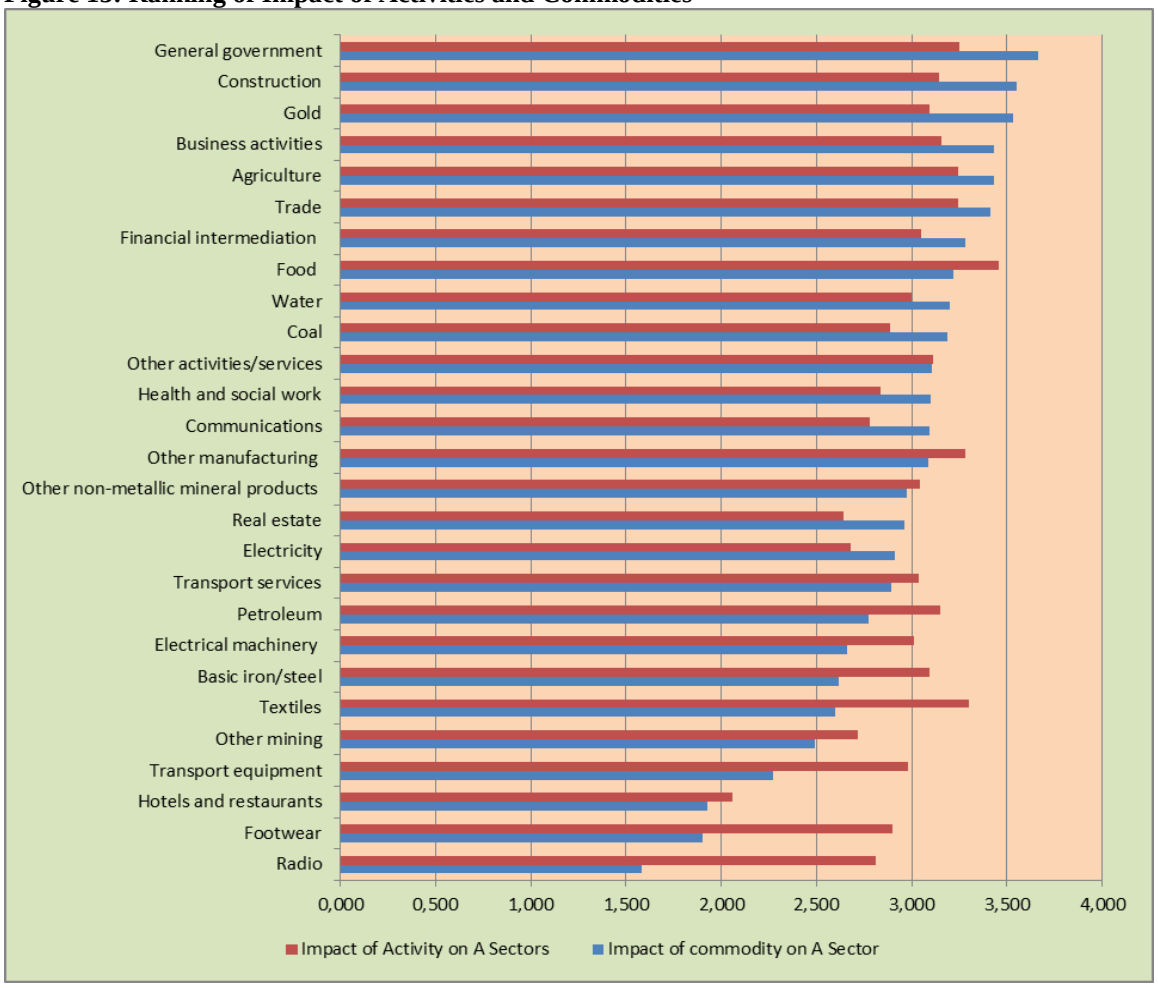
From Appendix 7, the table of multipliers derived from DySAM 2011 and the cumulative table by activities and commodity in the sector (Table 8), demonstrate that when an intervention is done in support of activities (meaning supply side), the impact is greater on sector activities than on sector commodity. The implication on policy is generally that, intervention on supply side does not create a proportional increase in demand. On the other side, when the intervention is in support of commodity (meaning demand side), the impact of the intervention is greater on sector commodity than on sector activities. As shown in Table 10, sector activities increase more with intervention targeting demand side than interventions targeting supply side intervention. For equivalent interventions, the impact on aggregate level, does not create a higher increase of activities or demand when addressing supplier side as addressing demand side. The result is consistent with Kaleckian theory advocating for demand side support for a sustainable growth, implying that an increase in supply does not create its own demand (Taylor, 2004; Amsden, 2010 and Amsden, 2012).

Table 10: Total Impact of Intervention on Commodities and Activities

		On Sector Commodity	On Sector Activities
Commodity	Co	78,846	65,241
Activities	A	64,708	80,951

Data Source: DySAM Training from ILO, 2012

Figure 15: Ranking of Impact of Activities and Commodities



Data Source: Adapted from DySAM Training from ILO, 2012

SAM results demonstrate that interventions that impact on demand side such as designation of product or sub-sector for local procurement by public entities, has greater impact than the support for growth of production, which is a supply side intervention. The impact of support on the supply side would have a greater impact on demand if it reduces the price in real terms. It implies that such support is afterward reflected on the purchasing power through sector recipient passing the benefit of such support on to the final consumer of the product or service.

4.8.2. Validation through MEMSA application

The MEMSA model is used to measure the impact of manufacturing sector in comparison to primary and services sectors. The three sectors of the economy were

compared in the analysis at 1 digit sic code level of aggregation. A scenario suggesting an increase in demand for output of the three sectors was introduced in the model as a shock in the system raising the level of output for each sector. The shock is introduced in one sector at the time as a once off intervention in 2015. Then the model is run to project the impact until 2020. Changes on a number of economic indicators are then considered over the model period (2015 – 2020). The results on indicators such as real expenditure, GDP at constant 2005 prices, GDP growth, export, and inflation are then compared function of intervention per the sector. For the purpose of the report the changes related to the contribution of the sector to the GDP are captured in the table below (Table 11).

The results show that the GDP at basic prices of the manufacturing sector grew by 3.07% on average during the period observed for the scenario suggesting a shock in demand in the manufacturing sector. The result of the same size of intervention in the primary and services sectors records on average a growth in manufacturing of 1.71% and 2.45% respectively (see appendix 10). Both results of interventions in the primary and services sectors recorded a lower growth than manufacturing. In addition while the difference might seem to be small it is important to highlight that it is an average for a single shock in 2015, with the impact lasting for a five year period. Furthermore, the percentage of growth is based on a GDP at constant 2005 prices of Rand million 1 873 542.22 in 2015; any small change in percentage of GDP leads to big differences in value terms. The manufacturing shock produces best results for primary, manufacturing and services sectors when compared to shock in other sectors of the economy. Manufacturing growth has a larger relative spillover effect on the rest of the economy.

Table 11: Impact of Interventions in sectors of the economy as % share of GDP

		2014	2015	2016	2017	2018	2019	2020	Average
Primary Sector	Primary	*10.74*	*11.53*	*10.98*	*11.01*	*10.63*	*9.96*	*9.88*	***10.68***
		10.74	11.82	11.25	11.26	10.45	10.3	9.92	**10.82**
	Manufacturing	*11.7*	*12.24*	*12.23*	*13*	*12.93*	*12.46*	*12.87*	***12.49***
		11.7	12.2	12.32	12.8	12.25	12.43	11.93	**12.23**
	Services	*77.79*	*76.24*	*76.4*	*76.97*	*76.84*	*77.58*	*75.72*	***76.79***
		77.79	76.07	76.42	77.29	77.63	79.1	78.12	**77.49**
Manufacturing Sector	Primary	*10.74*	*11.53*	*10.98*	*11.01*	*10.63*	*9.96*	*9.88*	***10.68***
		10.74	11.09	10.62	10.82	10.21	9.89	10.04	**10.49**
	Manufacturing	*11.7*	*12.24*	*12.23*	*13*	*12.93*	*12.46*	*12.87*	***12.49***
		11.7	12.38	12.51	13.16	12.84	13.2	13.87	**12.81**
	Services	*77.79*	*76.24*	*76.4*	*76.97*	*76.84*	*77.58*	*75.72*	***76.79***
		77.79	76.53	76.78	76	76.94	76.93	77.29	**76.89**
Services Sector	Primary	*10.74*	*11.53*	*10.98*	*11.01*	*10.63*	*9.96*	*9.88*	***10.68***
		10.74	10.87	10.26	10.09	10.26	10.41	9.83	**10.35**
	Manufacturing	*11.7*	*12.24*	*12.23*	*13*	*12.93*	*12.46*	*12.87*	***12.49***
		11.7	11.38	11.54	11.7	11.87	13.05	12.42	**11.95**
	Services	*77.79*	*76.24*	*76.4*	*76.97*	*76.84*	*77.58*	*75.72*	***76.79***
		77.79	77.77	78.78	78.23	77.94	82.42	76.91	**78.55**

Source: ADRS-Global

The result of scenario run using MEMSA on the ADRS-Global website suggests that the impact of interventions on the manufacturing sector on selected macroeconomic indicators, was higher than interventions on any other sector of the South African economy.

CHAPTER 5: CONCLUSION AND CONSIDERATIONS

The study analysed the potential impact that can be generated by the manufacturing sector through its intensity of links to the economy in comparison to the rest of sectors in South Africa. The hypothesis on which the analysis was built on is that the *Manufacturing sector has the highest growth and employment multipliers than any other sector in the South Africa's economy*. The study fails to reject the hypothesis as evidence based on empirical data of the South Africa's economy supports the assertion. The study analyses all sub-sectors of the South African economy at 3 digits sic code level of disaggregation, the highest level of disaggregation available with information on interactions between sub-sectors. The analysis suggests ten sub-sectors with the best ranking by importance of impact in both growth and employment multipliers in the economy, for intervention consideration. The manufacturing sector is the only sector which is represented in the top 10 sub-sectors with the highest impact on the rest of the economy. Therefore some considerations in line with the findings of the study are provided below.

African countries endowed with abundant natural resource depend generally on export of raw material and in most case with very limited or no value addition. Baran and Sweezy (1966) quoted by Di John (2011) suggests, in this context, that exports based on natural resources in African countries, are unlikely to stimulate growth. Industrialisation is achieved only through a deliberate, consistent, and state driven intervention in the economy. Pons-Vignon (2011) demonstrates that industrial development is only driven by a deliberate and purposely effort by the stateto influence the industrialisation path through an industrial development strategy. Therefore South African natural resource abundance even coupled with substantial growth in the financial sector and in the rest of services, without state driven industrial policy cannot achieve industrialisation of the economy. The deindustrialisation process of the economy will continue its course.

The fact that foreign multinationals dominate resource (mineral) extraction in African economies leads to the profits from such activities being repatriated without servicing the local economy. This constitutes a limitation to industrialisation (Di John (2011). Reinvestment of profit is almost non-existent and even when it takes place it is directed only toward extension or servicing of extraction activities of natural resources (Zalk, 2013). Multinationals have little interest in diversification of the domestic economy neither into beneficiation beyond what is needed for export of natural products.

The growth of the mining sector offers an opportunity for expansion in the MEC and the financial sector respectively related to support of the sector and transactions in the repatriation of profit from mineral resources related activities. The study has demonstrated that the industry around mineral extraction (MEC) and the financial sector have lesser linkage intensity (smaller multipliers) with the manufacturing sector and the rest of the economy. Therefore even in periods of resource booms, industrialisation is expected to be stimulated only by the non-mineral manufacturing sectors. The theory of resource curse finds its conception base with the deindustrialisation of the economy observed for many African countries endowed with abundant natural resources even after a period of resource boom. The resource curse theory ignores the role of industrial policy in the industrialisation process (Di John, 2011).

Thus the study advocates for the involvement of the state in promoting manufacturing as an imperative to address the challenge of deindustrialisation and structural change of the economy and identifies the nucleus sectors of the economy.

Industrial policy should be selective in targeting sub-sectors in the manufacturing mostly as capital investment in support for production sector is scarce. The importance of the sector's multipliers is determinant for such selection. The study suggests the following sub-sectors as having the highest growth and employment multipliers: leather and leather products; furniture; tobacco; footwear; textiles; motor vehicles, parts and accessories; wearing apparel; paper and paper products; rubber products; and professional and scientific equipment.

Industrial policy strategy will differ from one country to another across resource abundant countries in Africa. Shafaeddin (2006) suggests that government should initially play a key role in the early stages of industrialisation. His argument is based on the fact that in the early stage of development, the private sector is not prepared to take significant risks or externalities. Therefore the participation of public sector in the early stage of industrialisation is crucial to set the motion for industrial path and improve the learning capacity and efficiency of the state machinery. In the long-run, the private sector and the market will develop and establish themselves. Then the government role may gradually be reduced to the development of infrastructure and institutions, and back-up services.

Pons-Vignon (2011) and Shafaeddin (2006) suggest a selective industrialisation path that takes account of the opportunities for learning effects and linkages with the rest of industries. They suggest an import substitution industrialisation process that initially focuses on industries in non-durable consumer goods that are most demanded in the local market and involve significant learning effects for capacity building. As the study suggest, designation for local procurement by state entities, can be a tool that translates into import substitution. The process should be accompanied by support and protection for selected infant industries, Pons-Vignon (2011). A provision of measures to allow firms to enter rapidly into foreign market should be put in place through incentive in exchange for performance. The strategy will then include intermediate products that are needed in support for non-durable consumer goods industries. At a later stage, the industrialisation strategy should cater for industries in durable consumer goods such as chemical products and cement, steel, capital goods and high technology goods, Shafaeddin (2006).

It can therefore be concluded that the gradual decline in the manufacturing share of employment coupled with the steady increasing employment share of services should not be interpreted as takeover of manufacturing by services. Ehrlich (1996) and Tregenna (2008) suggests that if manufacturing is now purchasing services it once produced, then the reported decline in manufacturing employment is only a statistical change. Manufacturing growth creates employment in the service sectors.

Areas for Further Research

The study identified 10 sub-sectors in the manufacturing sector. The potential for growth in the identified sector is dependent on policies targeting growth of these sub-sectors. Although the study is useful in identifying the sub-sectors, it did not analyse possible policy interventions required to support these sectors. The study recommends a value chain analysis of each of the 10 identified sectors that will inform a comprehensive policy strategy for each sub-sector.

REFERENCES

ADRS website - http://www.adrs-global.com/models/index.php -Accessed 24 May 2013

Alarcon J.V., et al. (2011). *Dynamic Social Accounting Matrix (DySAM): Concept, Methodology and Simulation Outcomes – The Case of Indonesia and Mozambique*. Employment Intensive Investment Programme, International Labour Office (ILO), Geneva.

Alarcon J.V. (2013). *Country SAM Modelling Methodologies And Satellites With South Africa Case Study: 2005 Benchmark DySAM*, International Labour Office (ILO) Training Material for EDD and **the dti**, Leiden, The Netherlands.

Altman M. and Mayer M. (2003). *Overview of Industrial Policy, in Human Resources Development Review 2003: Education, Employment and Skills in South Africa.* HRSC Press, Cape Town.

Adelzadeh A. (2012). *The Leontief Input-Output Model*. Workshop on Input-Output Modelling, University of Witwatersrand – CSID: Presentation.

Amsden A.H. (1989). *Asia's Next Giant Step: South Korea and Late Industrialisation*. Oxford: Oxford University Press.

Amsden A.H. (2010a). *Say's Law, Poverty Persistence and Employment Neglect.* Journal of Human Development and Capability 11 (1).

Amsden A.H. (2010b). *Alice Amsden's public lecture.* Aporde. Johannesburg.

Amsden A.H. (2012). *Grass Roots War on Poverty*. World Economic Review (1) 114-131.

Arbache *et al*. (2008). *Is Africa's Economy At A Turning Point?* Policy Research Working Paper 4519. World Bank, Washington DC.

Bahta Y.T. (2013). *Modelling the Lesotho Economy: A Social Account Matrix Approach*. International Journal of Food and Agricultural Economics ISSN2147-8988 Vol. 1 No.1 pp. 49-62.

Bairoch P. and Goertz G (1985). *Factors of Urbanisation in the Nineteenth Century Developed Countries: A Descriptive and Econometric Analysis*. Urban Studies (1986) 23, 285-305, University of Geneva.

Ballance R.H. (1987). *International Industry and Business: Structural Change, Industrial Policy and Industrial Strategies.* Allen and Unwin.

Baran P. and Sweezy P. (1966). *Monopoly Capital.* New York: Monthly Review Press.

Bigsten A. and Soderbom M. (2010). *Industry Strategies for Economic Recovery and Long-term Growth in Africa*. Department of Economics & Gothenburg Centre of Globalization and Development – University of Gothenburg, Sweden.

Bijker A. (2012). *Social Account Matrix Analysis*. IHS-Global Insight Course delivered from 18 to 20 April 2012.

Chang, H-J. 2002. *Kicking Away the Ladder – Development Strategy in Historical Perspective*. Anthem Press, London.

CSID (2009). *DTI Report on Historical Trends of Industry Linkages: Key Sector Identification using (Input-Output Analysis).* Report prepared by CSID: Industrial Policy Research Support, University of the Witwatersrand for the Department of Trade and Industry.

CSID (2010). *The Development of an Industrial Policy for Gauteng Province.* Report prepared by CSID, University of the Witwatersrand for Gauteng Province, Department of Economic Development.

Di John J. (2011). *Is there really a resource curse? A critical Survey of Theory and Evidence*. Global Governance, 17, pp. 167-184.

DTI (2014). *Manufacturing Competitiveness Enhancement Programme: programme guidelines.* Department of Trade and Industry (**the dti**).

DTI (2013). *Industrial Policy Action Plan: IPAP, 2013/14-2015/16.* Department of Trade and Industry (**the dti**).

DTI (2009). *Industrial Policy Action Plan: IPAP, 2009/10-2010/11*. Department of Trade and Industry (**the dti**).

DTI (1998). *Industrial Policy and Programmes in South Africa: Discussion document.* Department of Trade and Industry (**the dti**).

Fine, B. and Rustomje Z. (1996). *The Political Economy of South Africa: From Minerals-Energy Complex to Industrialisation*. C. Hurst & Co. (Publishers) Ltd, London.

Johnson, S. *et al*. (2007). *The Prospects for Sustained Growth in Africa: Benchmarking the Constraints.* IMF Working Papers: 07/52

Kaldor, N. (1966). *Causes of the Slow Rate of Economic Growth of the United. Kingdom*. Cambridge: Cambridge University Press.

Khunen F. (1987). *Causes of underdevelopment and Concepts for Development: An Introduction to Development Theories*. The journal of Institute of Development Studies, NWFP Agricultural, Vol. VIII, 1986, 1987 University, Peshawar.

Maluleke M. (2012). *Using Multiplier Models: A beginner's Guide*. 2012 Slides Presentation to DTI: A Training on National Treasury multiplier model. National Treasury, Economic Policy's modelling unit.

Mohamed S. (2010). *The impact of capital flows on the South African economic growth path since the end of apartheid***.** New South African Review.

Namrata S. et al. (nd). *Theory of Unbalanced Growth*. Unpublished presentation

Ndulo M. and Mudenda D. *Trade Policy Reform and Adjustment in Zambia*. Accessed on line on 21 October 2014.

Noland M. (2004). *Selective Intervention and Growth: The Case of Korea. In Empirical Methods in International Trade*. Edition Michael G. Plummer. Cheltenham, UK: Edward Elgar.

Peet A. (1987). *Export-Led industrialization in the Third World: Manufacturing Imperialism, International Capital and Industrial Restructuration.* Boston: Allen and Unwin.

Pons-Vignon, N. (2011). *Brazil's industrial policy: Lessons for South Africa*. New Agenda, South African Journal of Social and Economic Policy, No. 42

Prebisch, R. (1950). *The Economic Development of Latin America and Its Principal Problems*. New York: UN.

Quantec website accessed on the 14 March 2014. http://quanis1.easydata.co.za/ReportFolders/reportFolders.aspx

Reinert E.S. (2007). *How Rich Countries got Rich… and Why Poor Countries stay Poor*. Constable, London; Public Affairs, New York; Anthem, Delhi; Third World Network, Penang.

Shafaeddin S.M. (2006). *The Space Question: An Alternative Approach to Trade and Industrial Policies; Implications for the World Trading System*. International Development Economics Associates (IDEAS) and United Nations Development Programme – Conference on 'Post Liberation Constraints on Macroeconomics Policies', Chennai - India.

StatsSA (2008). *Social Accounting Matrix: The Linking the Social Accounting Matrix to the existing Government Strategies for South Africa*. Discussion Document – D0403.1.

Statistics South Africa (2013). *Standard Industrial Classification of All Economic Activities Edition 5 and 7.* http://www.statssa.gov.za/additional_services/Web_SIC7/Memo%20publishing%20SIC%207_Feb2013.pdf

Stockhammer E. (2010). *Financialization and the Global Economy*. PERI Working paper series no. 240. University of Massachusetts.

Taylor L. (1983). *Structuralist macroeconomics: Applicable models for the Third world*. New York: Basic Books Inc.

Taylor L. (2004). *Reconstructing Macroeconomics: Structuralist Proposals and Critiques of the Mainstream.* Cambridge MA: Harvard University Press.

Tounsi S. *et al*. (2013). *Key Sectors in the Moroccan Economy: An Application of Input-Output Analysis*. Economics: The Open-Access, Open-Assessment E-Journal, Vol. 7, 2013-18.

Tregenna F. (2008). *The contributions of Manufacturing and Services to Employment* Creation and Growth in South Africa. South Africa Journal of Economics, Vol. 72(s2), pp s174-s204.

Tregenna F. (2005) "*Background Analysis: Changes in employment in South Africa, 1970-2004"*. HSRC Working Paper, Pretoria.

World Bank (1993). *The East Asian Miracle.* New York. Oxford University Press

Zalk N. (2013). *Industrial Policy in a harsh climate: The case of South Africa*.

APPENDIX

Appendix 1: SA Standardized Industry Input-Output Structure Format

No.	Input	Output
1	R111: Agriculture, forestry and fishing [1]	C111: Agriculture, forestry and fishing [1]
2	R1121: Coal mining [21]	C1121: Coal mining [21]
3	R1122: Gold and uranium ore mining [23]	C1122: Gold and uranium ore mining [23]
4	R1123: Other mining [22/24/25/29]	C1123: Other mining [22/24/25/29]
5	R12101: Food [301-304]	C12101: Food [301-304]
6	R12102: Beverages [305]	C12102: Beverages [305]
7	R12103: Tobacco [306]	C12103: Tobacco [306]
8	R12111: Textiles [311-312]	C12111: Textiles [311-312]
9	R12112: Wearing apparel [313-315]	C12112: Wearing apparel [313-315]
10	R12113: Leather and leather products [316]	C12113: Leather and leather products [316]
11	R12114: Footwear [317]	C12114: Footwear [317]
12	R12121: Wood and wood products [321-322]	C12121: Wood and wood products [321-322]
13	R12122: Paper and paper products [323]	C12122: Paper and paper products [323]
14	R12123: Printing, publishing and recorded media [324-326]	C12123: Printing, publishing and recorded media [324-326]
15	R12131: Coke and refined petroleum products [331-333]	C12131: Coke and refined petroleum products [331-333]
16	R12132: Basic chemicals [334]	C12132: Basic chemicals [334]
17	R12133: Other chemicals and man-made fibers [335-336]	C12133: Other chemicals and man-made fibers [335-336]
18	R12134: Rubber products [337]	C12134: Rubber products [337]
19	R12135: Plastic products [338]	C12135: Plastic products [338]
20	R12141: Glass and glass products [341]	C12141: Glass and glass products [341]
21	R12142: Non-metallic minerals [342]	C12142: Non-metallic minerals [342]
22	R12151: Basic iron and steel [351]	C12151: Basic iron and steel [351]
23	R12152: Basic non-ferrous metals [352]	C12152: Basic non-ferrous metals [352]
24	R12153: Metal products excluding machinery [353-355]	C12153: Metal products excluding machinery [353-355]
25	R12154: Machinery and equipment [356-359]	C12154: Machinery and equipment [356-359]
26	R1216: Electrical machinery and apparatus [361-366]	C1216: Electrical machinery and apparatus [361-366]
27	R12171: Television, radio and communication equipment [371-373]	C12171: Television, radio and communication equipment [371-373]
28	R12172: Professional and scientific equipment [374-376]	C12172: Professional and scientific equipment [374-376]
29	R12181: Motor vehicles, parts and accessories [381-383]	C12181: Motor vehicles, parts and accessories [381-383]
30	R12182: Other transport equipment [384-387]	C12182: Other transport equipment [384-387]
31	R12191: Furniture [391]	C12191: Furniture [391]
32	R12193: Other manufacturing [392-393]	C12193: Other manufacturing [392-393]
33	R1221: Electricity, gas and steam [41]	C1221: Electricity, gas and steam [41]
34	R1222: Water supply [42]	C1222: Water supply [42]
35	R1231: Building construction [51]	C1231: Building construction [51]
36	R1232: Civil engineering and other construction [52-53]	C1232: Civil engineering and other construction [52-53]
37	R1311: Wholesale and retail trade [61-63]	C1311: Wholesale and retail trade [61-63]

38	R1312: Catering and accommodation services [64]	C1312: Catering and accommodation services [64]
39	R1321: Transport and storage [71-74]	C1321: Transport and storage [71-74]
40	R1322: Communication [75]	C1322: Communication [75]
41	R1331: Finance and insurance [81-82]	C1331: Finance and insurance [81-82]
42	R1332: Business services [83-88]	C1332: Business services [83-88]
43	R13411: Medical, dental and veterinary services [93]	C13411: Medical, dental and veterinary services [93]
44	R13412: Excluding medical, dental and veterinary services [94-96]	C13412: Excluding medical, dental and veterinary services [94-96]
45	R1342: Other producers [98]	C1342: Other producers [98]
46	R1343: General government services [99]	C1343: General government services [99]
47	R2111: Compensation of employees	C21111: Durable goods
48	R21121: Net operating surplus	C21112: Semi-durable goods
49	R21122: Consumption of fixed capital	C21113: Non-durable goods
50	R2121: Other taxes on production	C21114: Services
51	R2122: Other subsidies on production	C2112: General government
52	R222: Subsidies on products	C21211: Buildings and construction works
53		C21212: Transport equipment
54		C21213: Machinery and other equipment
55		C21214: Transfer costs
56		C2122: Change in inventories
57		C213: Residual item
58		C224: Exports of goods and services
59		C225: Imports of goods and services

Source: Quantec, 2013 & StatsSA, 2013

Appendix 2: Input-Output Matrix at 1 digit SIC code level

Output / Input	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water	Construction (contractors)	Trade, catering and accommodation services	Transport, storage and communication	Financial intermediation, insurance, real estate and business services	Community, social and personal services
Agriculture, forestry and fishing	4140.010703	26.42525663	70736.48678	20.70141093	10.58005455	1152.327583	4.652086181	87.28466439	812.5954402
Mining and quarrying	1418.784715	841.4927796	153744.2512	12493.41417	13156.90984	74.87441569	887.2122152	2229.261196	3313.434319
Manufacturing	37607.94521	21206.87697	383739.5415	6365.036462	60202.61848	35748.34912	67714.95625	50480.02053	71055.01076
Electricity, gas and water	1279.661102	3218.994595	13856.67684	11370.24793	497.9074318	4673.065311	4704.056976	5034.36277	4326.94143
Construction (contractors)	627.8422476	661.5148271	26.4668017	4667.891365	52615.6411	9652.238537	2326.387352	22544.15726	7254.872509
Trade, catering and accommodation services	6641.009182	3543.218476	71875.1429	1543.467734	6176.980197	24026.27131	25637.63328	31069.29037	28995.1884
Transport, storage and communication	8436.42483	34342.08275	34995.77793	1253.808843	3321.07595	41502.63159	44184.33511	42124.34553	27245.37697
Financial intermediation, insurance, real estate and business services	3121.401976	5075.655584	91871.29049	4486.248472	20379.65205	101895.7391	31031.13907	201517.8529	86735.33538
Community, social and personal services	1817.554414	3427.10577	23846.97797	25.54379988	798.124061	1631.076901	1897.271728	10438.89103	112237.0755
Value added at factor costs	43554.94206	98441.34415	301425.9515	34622.20576	60251.62615	245612.8694	177918.0183	411915.8928	375165.8601
Government: Net indirect taxes on production	-103.7275742	568.0629018	-1065.357112	-351.7735947	548.607157	3713.500299	1897.795125	16035.80666	4172.860343
Indirect taxes on products	2447.689316	2909.870721	11168.15069	1003.616681	27029.26907	3546.855017	21500.4106	9056.995771	15960.86392
Subsidies on products	0	0	0	0	0	0	0	0	0
Imports of goods and services	-5809.634406	-101890.2424	-485330.423	-412.5826781	-530.2832381	-6795.443928	-26605.33682	-7108.923619	-6295.129914
Total	**105179.904**	**72372.402**	**670890.935**	**77087.826**	**244458.708**	**466434.355**	**353098.531**	**795425.238**	**730980.285**

Source: Quantec, 2013

Appendix 3: Identity Matrix

Identity Matrix (I)									
Output / Input	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water	Construction (contractors)	Trade, catering and accommodation services	Transport, storage and communication	Financial intermediation, insurance, real estate and business services	Community, social and personal services
Agriculture, forestry and fishing	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mining and quarrying	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Manufacturing	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Electricity, gas and water	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
Construction (contractors)	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Trade, catering and accommodation services	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
Transport, storage and communication	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Financial intermediation, insurance, real estate and business services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
Community, social and personal services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Value added at factor costs									
Government: Net indirect taxes on production									
Indirect taxes on products									
Subsidies on products									
Imports of goods and services									
Total	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**

Source: Quantec, 2013

Appendix 4: Leontief Invest

Leontief Inverse (I-A)^-1									
Output / Input	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water	Construction (contractors)	Trade, catering and accommodation services	Transport, storage and communication	Financial intermediation, insurance, real estate and business services	Community, social and personal services
Agriculture, forestry and fishing	1.251	0.228	0.498	0.114	0.184	0.076	0.126	0.066	0.081
Mining and quarrying	0.483	1.529	1.102	0.452	0.479	0.169	0.287	0.154	0.186
Manufacturing	1.901	2.057	4.510	1.025	1.666	0.663	1.141	0.592	0.722
Electricity, gas and water	0.109	0.163	0.212	1.236	0.088	0.049	0.075	0.041	0.046
Construction (contractors)	0.065	0.086	0.116	0.129	1.327	0.061	0.050	0.069	0.045
Trade, catering and accommodation services	0.405	0.458	0.759	0.229	0.332	1.193	0.291	0.167	0.188
Transport, storage and communication	0.581	1.084	1.091	0.397	0.479	0.296	1.445	0.241	0.252
Financial intermediation, insurance, real estate and business services	0.670	0.845	1.377	0.473	0.686	0.544	0.521	1.563	0.442
Community, social and personal services	0.148	0.199	0.293	0.082	0.121	0.054	0.085	0.062	1.233
Value added at factor costs									
Government: Net indirect taxes on production									
Indirect taxes on products									
Subsidies on products									
Imports of goods and services									
Total	**5.615**	**6.650**	**9.958**	**4.137**	**5.363**	**3.105**	**4.022**	**2.954**	**3.196**

Source: Quantec, 2013

Appendix 5: Growth Multipliers at 3 digit SIC code level

Rank	Total Growth		Direct Impact		Backward Indirect Impact		Forward Indirect Impact	
1	Motor vehicles, parts and accessories	3.530	Motor vehicles, parts and accessories	1.696	Leather and leather products	2.325	Business services	8.611
2	Leather and leather products	3.460	Water supply	1.585	Furniture	2.203	Wholesale and retail trade	8.061
3	Paper and paper products	3.246	Television, radio and communication equipment	1.532	Tobacco	2.147	Other mining	7.872
4	Textiles	3.231	General government services	1.457	Footwear	2.130	Transport and storage	5.125
5	Furniture	3.210	Building construction	1.389	Wearing apparel	2.108	Finance and insurance	3.461
6	Footwear	3.208	Wood and wood products	1.346	Textiles	1.959	Other chemicals and man-made fibers	2.927
7	Tobacco	3.148	Paper and paper products	1.338	Electrical machinery and apparatus	1.955	Basic chemicals	2.916
8	Electrical machinery and apparatus	3.123	Basic chemicals	1.328	Rubber products	1.936	Basic iron and steel	2.076
9	Wearing apparel	3.111	Other transport equipment	1.295	Paper and paper products	1.908	Coke and refined petroleum products	1.967
10	Other chemicals and man-made fibers	3.014	Basic non-ferrous metals	1.273	Motor vehicles, parts and accessories	1.834	Agriculture, forestry and fishing	1.876
11	Basic chemicals	2.999	Textiles	1.272	Basic iron and steel	1.813	Electricity, gas and steam	1.755
12	Television, radio and communication equipment	2.963	Finance and insurance	1.258	Professional and scientific equipment	1.810	Machinery and equipment	1.711
13	Rubber products	2.953	Communication	1.237	Other chemicals and man-made fibers	1.805	Communication	1.432
14	Other transport equipment	2.935	Business services	1.236	Metal products excluding machinery	1.768	Other producers	1.381
15	Wood and wood products	2.904	Machinery and equipment	1.226	Printing, publishing and recorded media	1.762	Paper and paper products	1.373
16	Basic iron and steel	2.902	Other chemicals and man-made fibers	1.209	Coke and refined petroleum products	1.699	Coal mining	1.339
17	Professional and scientific equipment	2.897	Electrical machinery and apparatus	1.168	Food	1.672	Metal products excluding machinery	1.238
18	Building construction	2.852	Glass and glass products	1.135	Basic chemicals	1.671	Building construction	1.163
19	Metal products excluding machinery	2.852	Leather and leather products	1.135	Other transport equipment	1.640	Plastic products	1.093
20	Basic non-ferrous metals	2.851	Food	1.133	Non-metallic minerals	1.611	Electrical machinery and apparatus	1.058
21	Printing, publishing and recorded media	2.835	Plastic products	1.131	Machinery and equipment	1.606	Motor vehicles, parts and accessories	1.028
22	Machinery and equipment	2.833	Wholesale and retail trade	1.109	Civil engineering and other construction	1.580	Basic non-ferrous metals	0.937
23	Food	2.805	Basic iron and steel	1.089	Basic non-ferrous metals	1.578	Food	0.932
24	Coke and refined petroleum products	2.762	Professional and scientific equipment	1.087	Plastic products	1.568	Wood and wood products	0.920
25	Plastic products	2.699	Metal products excluding machinery	1.084	Wood and wood products	1.558	Textiles	0.891

26	Non-metallic minerals	2.668	Footwear	1.078	Beverages	1.514	Non-metallic minerals	0.553
27	Glass and glass products	2.644	Beverages	1.074	Glass and glass products	1.509	Television, radio and communication equipment	0.502
28	Civil engineering and other construction	2.608	Printing, publishing and recorded media	1.073	Other manufacturing	1.506	Water supply	0.501
29	Beverages	2.588	Coke and refined petroleum products	1.063	Building construction	1.463	Leather and leather products	0.435
30	Other manufacturing	2.520	Other mining	1.062	Television, radio and communication equipment	1.431	Printing, publishing and recorded media	0.415
31	Agriculture, forestry and fishing	2.474	Transport and storage	1.058	Agriculture, forestry and fishing	1.419	Catering and accommodation services	0.346
32	Communication	2.437	Electricity, gas and steam	1.057	Excluding medical, dental and veterinary services	1.283	Rubber products	0.321
33	Excluding medical, dental and veterinary services	2.328	Non-metallic minerals	1.057	Medical, dental and veterinary services	1.278	Other manufacturing	0.321
34	Water supply	2.309	Agriculture, forestry and fishing	1.054	Communication	1.201	Excluding medical, dental and veterinary services	0.236
35	Medical, dental and veterinary services	2.282	Excluding medical, dental and veterinary services	1.045	Catering and accommodation services	1.186	Glass and glass products	0.233
36	Catering and accommodation services	2.192	Civil engineering and other construction	1.027	Coal mining	0.967	Other transport equipment	0.217
37	General government services	2.172	Rubber products	1.016	Transport and storage	0.956	Professional and scientific equipment	0.209
38	Business services	2.093	Other producers	1.015	Other mining	0.934	Medical, dental and veterinary services	0.167
39	Transport and storage	2.014	Other manufacturing	1.014	Electricity, gas and steam	0.926	Civil engineering and other construction	0.138
40	Other mining	1.997	Coal mining	1.012	Business services	0.857	Wearing apparel	0.128
41	Electricity, gas and steam	1.983	Furniture	1.007	Wholesale and retail trade	0.774	Furniture	0.075
42	Coal mining	1.979	Catering and accommodation services	1.006	Other producers	0.726	Beverages	0.041
43	Wholesale and retail trade	1.883	Medical, dental and veterinary services	1.004	Water supply	0.724	General government services	0.037
44	Finance and insurance	1.745	Wearing apparel	1.002	General government services	0.715	Gold and uranium ore mining	0.035
45	Other producers	1.741	Tobacco	1.001	Gold and uranium ore mining	0.574	Footwear	0.024
46	Gold and uranium ore mining	1.574	Gold and uranium ore mining	1.000	Finance and insurance	0.487	Tobacco	0.001

Source: Quantec, 2013

Appendix 6: Employment Multipliers at 3 digit SIC code level

Rank	Total Backward Impact		Direct Impact		Backward Indirect Impact		Forward Indirect Impact	
1	Other producers	12,909	Other producers	12,118	Tobacco	3,980	Other producers	16,496
2	Agriculture, forestry and fishing	5,870	Agriculture, forestry and fishing	4,389	Leather and leather products	3,374	Business services	16,328
3	Wearing apparel	5,460	Catering and accommodation services	2,780	Food	3,317	Wholesale and retail trade	15,430
4	Furniture	4,877	General government services	2,614	Wearing apparel	3,276	Agriculture, forestry and fishing	7,807
5	Catering and accommodation services	4,423	Business services	2,343	Furniture	3,086	Other mining	7,181
6	Textiles	4,315	Gold and uranium ore mining	2,270	Footwear	2,832	Transport and storage	4,127
7	Tobacco	4,156	Wearing apparel	2,184	Textiles	2,823	Machinery and equipment	2,540
8	Footwear	4,139	Wholesale and retail trade	2,123	Wood and wood products	2,784	Finance and insurance	2,443
9	Wood and wood products	4,133	Machinery and equipment	1,820	Paper and paper products	2,746	Metal products excluding machinery	1,569
10	Leather and leather products	4,098	Furniture	1,791	Beverages	2,609	Plastic products	1,261
11	Food	4,092	Medical, dental and veterinary services	1,701	Motor vehicles, parts and accessories	2,468	Other chemicals and man-made fibers	1,229
12	Machinery and equipment	3,834	Textiles	1,492	Rubber products	2,458	Coal mining	1,096
13	Professional and scientific equipment	3,779	Professional and scientific equipment	1,406	Professional and scientific equipment	2,373	Textiles	1,045
14	Printing, publishing and recorded media	3,696	Civil engineering and other construction	1,383	Printing, publishing and recorded media	2,370	Building construction	1,034
15	General government services	3,484	Metal products excluding machinery	1,373	Electrical machinery and apparatus	2,339	Catering and accommodation services	0,957
16	Metal products excluding machinery	3,412	Wood and wood products	1,348	Other chemicals and man-made fibers	2,256	Wood and wood products	0,921
17	Medical, dental and veterinary services	3,372	Printing, publishing and recorded media	1,326	Glass and glass products	2,184	Electrical machinery and apparatus	0,793
18	Paper and paper products	3,345	Footwear	1,306	Basic iron and steel	2,173	Basic iron and steel	0,671
19	Other transport equipment	3,304	Plastic products	1,304	Television, radio and communication equipment	2,169	Electricity, gas and steam	0,666
20	Business services	3,291	Building construction	1,235	Basic chemicals	2,138	Food	0,637
21	Civil engineering and other construction	3,284	Other transport equipment	1,226	Other transport equipment	2,078	Paper and paper products	0,614
22	Glass and glass products	3,272	Non-metallic minerals	1,161	Metal products excluding machinery	2,039	Communication	0,613
23	Motor vehicles, parts and accessories	3,241	Glass and glass products	1,088	Machinery and equipment	2,014	Non-metallic minerals	0,607
24	Electrical machinery and apparatus	3,215	Other mining	0,969	Non-metallic minerals	1,955	Printing, publishing and recorded media	0,512
25	Rubber products	3,198	Finance and insurance	0,888	Coke and refined petroleum products	1,914	Basic chemicals	0,494
26	Plastic products	3,189	Electrical machinery and apparatus	0,876	Civil engineering and other	1,901	Motor vehicles, parts and	0,468

					construction		accessories	
27	Beverages	3,142	Television, radio and communication equipment	0,872	Plastic products	1,885	Coke and refined petroleum products	0,404
28	Non-metallic minerals	3,116	Transport and storage	0,852	Excluding medical, dental and veterinary services	1,877	Basic non-ferrous metals	0,357
29	Gold and uranium ore mining	3,066	Coal mining	0,829	Building construction	1,779	Television, radio and communication equipment	0,286
30	Television, radio and communication equipment	3,041	Food	0,775	Other manufacturing	1,773	Medical, dental and veterinary services	0,283
31	Wholesale and retail trade	3,037	Motor vehicles, parts and accessories	0,773	Basic non-ferrous metals	1,741	Wearing apparel	0,278
32	Building construction	3,014	Rubber products	0,741	Medical, dental and veterinary services	1,670	Leather and leather products	0,278
33	Other chemicals and man-made fibers	2,764	Leather and leather products	0,724	Catering and accommodation services	1,643	Professional and scientific equipment	0,270
34	Excluding medical, dental and veterinary services	2,532	Excluding medical, dental and veterinary services	0,656	Communication	1,492	Rubber products	0,234
35	Basic iron and steel	2,526	Other manufacturing	0,637	Agriculture, forestry and fishing	1,481	Glass and glass products	0,224
36	Other manufacturing	2,410	Paper and paper products	0,599	Coal mining	1,259	Other transport equipment	0,205
37	Basic chemicals	2,363	Beverages	0,533	Other mining	1,187	Other manufacturing	0,201
38	Basic non-ferrous metals	2,225	Communication	0,529	Transport and storage	1,135	Civil engineering and other construction	0,185
39	Other mining	2,156	Other chemicals and man-made fibers	0,508	Electricity, gas and steam	1,008	Water supply	0,154
40	Coke and refined petroleum products	2,132	Water supply	0,488	Business services	0,948	Excluding medical, dental and veterinary services	0,148
41	Coal mining	2,087	Basic non-ferrous metals	0,484	Wholesale and retail trade	0,914	Furniture	0,134
42	Communication	2,022	Electricity, gas and steam	0,401	General government services	0,870	Gold and uranium ore mining	0,080
43	Transport and storage	1,987	Basic iron and steel	0,352	Gold and uranium ore mining	0,795	General government services	0,067
44	Finance and insurance	1,584	Basic chemicals	0,225	Other producers	0,791	Footwear	0,029
45	Electricity, gas and steam	1,409	Coke and refined petroleum products	0,218	Water supply	0,775	Beverages	0,020
46	Water supply	1,262	Tobacco	0,176	Finance and insurance	0,696	Tobacco	0,000

Source: Quantec, 2013

Appendix 7: SAM Result on Activities and Commodities impact potential on Sectors

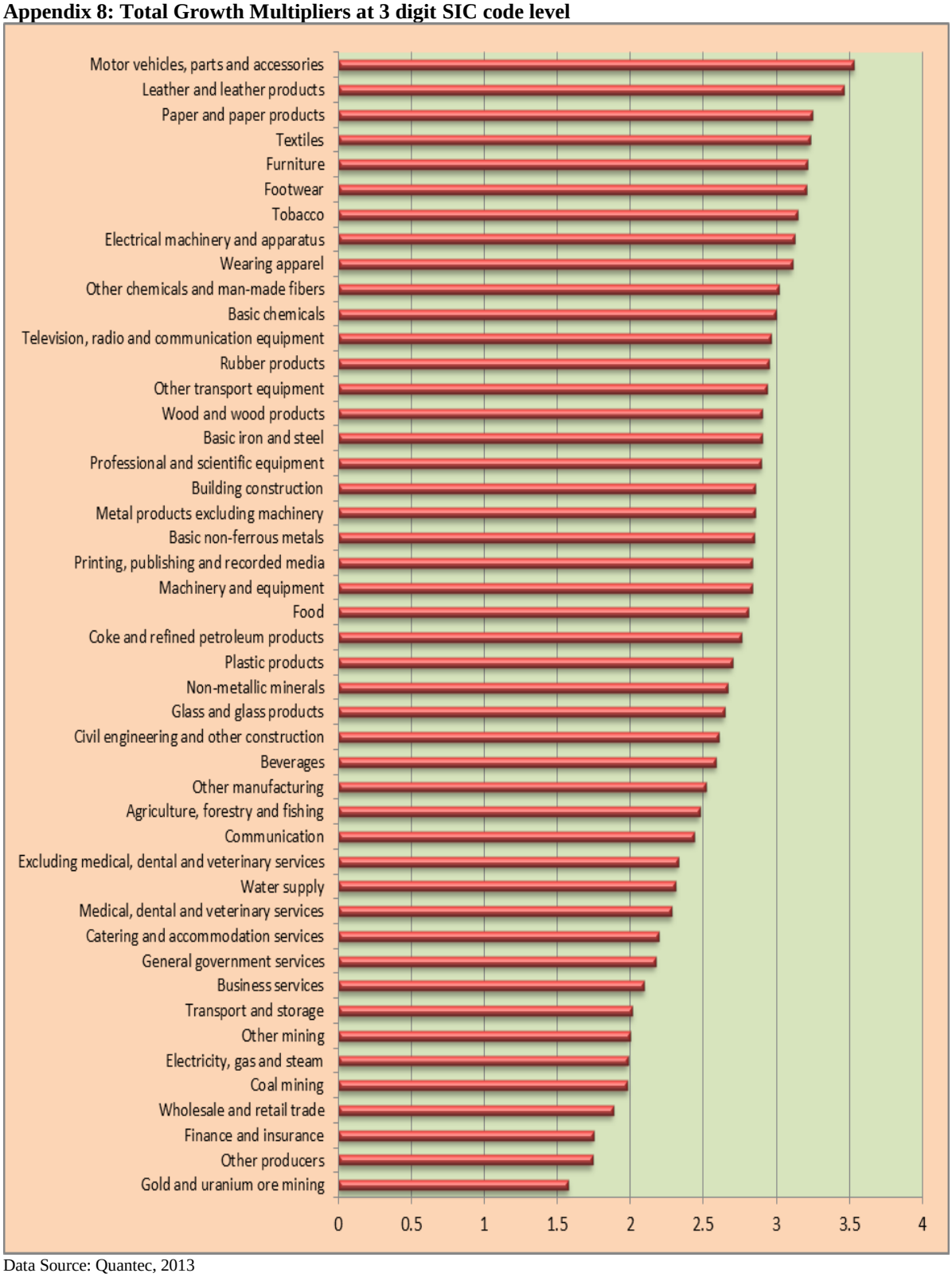
			1	2	3	4	5
			Commodity	Activities	Factors	Institutions - HH	Total
		"x3 (All, All) r0 c0"[ALL r0,ALL c0]	Co	A	FP	In- HH	Total
1	Agriculture	c Agriculture c0	3,431	2,900	1,182	1,728	**9,241**
2	Coal	c Coal c0	3,185	2,769	1,127	1,641	**8,721**
3	Gold	c Gold c0	3,531	3,092	1,757	2,561	**10,941**
4	Other mining	c OthMining c0	2,494	1,967	0,792	1,159	**6,413**
5	Food	c Food c0	3,216	2,625	0,819	1,180	**7,840**
6	Textiles	c Textile c0	2,601	1,874	0,592	0,847	**5,914**
7	Footwear	c Footwear c0	1,901	1,086	0,280	0,400	**3,667**
8	Petroleum	c Petroleum c0	2,773	2,136	0,648	0,934	**6,491**
9	Other non-metallic mineral products	c OthMineralProd c0	2,973	2,415	0,759	1,094	**7,240**
10	Basic iron/steel	c IronSteel c0	2,617	1,924	0,597	0,858	**5,997**
11	Electrical machinery	c ElecMach c0	2,660	1,953	0,573	0,816	**6,002**
12	Radio	c Radio c0	1,581	0,685	0,215	0,307	**2,788**
13	Transport equipment	c TransEquip c0	2,270	1,475	0,402	0,575	**4,722**
14	Other manufacturing	c OthManuf c0	3,088	2,493	0,814	1,169	**7,563**
15	Electricity	c Electricity c0	2,910	2,595	0,885	1,274	**7,665**
16	Water	c Water c0	3,197	2,872	0,729	1,051	**7,848**
17	Construction	c Construction c0	3,548	3,082	0,979	1,418	**9,027**
18	Trade	c Trade c0	3,413	3,026	1,303	1,889	**9,630**
19	Hotels and restaurants	c Hotels c0	1,929	1,519	0,425	0,618	**4,491**
20	Transport services	c Transport c0	2,893	2,372	0,884	1,274	**7,423**
21	Communications	c Communication c0	3,092	2,721	0,955	1,385	**8,153**
22	Financial intermediation	c FinIntrmd c0	3,281	2,927	1,237	1,786	**9,231**
23	Real estate	c RealEstate c0	2,960	2,642	1,033	1,515	**8,149**
24	Business activities	c BusinessSrv c0	3,433	2,995	1,080	1,555	**9,063**
25	General government	c GenGovt c0	3,664	3,236	1,382	1,961	**10,243**
26	Health and social work	c Health c0	3,101	2,721	0,836	1,214	**7,871**
27	Other activities/services	c OthSrv c0	3,103	2,607	1,012	1,449	**8,172**
28	Agriculture	a Agriculture c0	2,717	3,241	1,326	1,938	**9,222**
29	Coal	a Coal c0	2,278	2,886	1,174	1,710	**8,047**

30	Gold	a Gold c0	2,533	3,093	1,760	2,564	**9,950**
31	Other mining	a OthMining c0	2,061	2,714	1,092	1,597	**7,464**
32	Food	a Food c0	2,919	3,453	1,073	1,548	**8,993**
33	Textiles	a Textile c0	2,832	3,301	1,052	1,502	**8,687**
34	Footwear	a Footwear c0	2,406	2,901	0,745	1,066	**7,119**
35	Petroleum	a Petroleum c0	2,612	3,147	0,954	1,375	**8,089**
36	Other non-metallic mineral industries	a OthMineralProd c0	2,476	3,045	0,960	1,385	**7,866**
37	Basic iron/steel	a IronSteel c0	2,597	3,093	0,964	1,384	**8,038**
38	Electrical machinery	a ElecMach c0	2,560	3,012	0,884	1,256	**7,713**
39	Radio	a Radio c0	2,394	2,809	0,904	1,292	**7,400**
40	Transport equipment	a TransEquip c0	2,578	2,982	0,794	1,137	**7,491**
41	Other manufacturing	a OthManuf c0	2,748	3,281	1,073	1,541	**8,643**
42	Electricity	a Electricity c0	1,973	2,679	0,914	1,316	**6,882**
43	Water	a Water c0	2,296	3,002	0,762	1,098	**7,158**
44	Construction	a Construction c0	2,599	3,143	0,997	1,444	**8,184**
45	Trade	a Trade c0	2,663	3,246	1,458	2,114	**9,480**
46	Hotels and restaurants	a Hotels c0	1,249	2,058	0,566	0,823	**4,696**
47	Transport services	a Transport c0	2,427	3,035	1,135	1,635	**8,231**
48	Communications	a Communication c0	2,139	2,782	0,976	1,416	**7,313**
49	Financial intermediation	a FinIntrmd c0	2,369	3,051	1,322	1,910	**8,652**
50	Real estate	a RealEstate c0	1,921	2,643	1,042	1,535	**7,142**
51	Business activities	a BusinessSrv c0	2,518	3,153	1,115	1,599	**8,385**
52	General government	a GenGovt c0	2,674	3,248	1,388	1,968	**9,278**
53	Health and social work	a Health c0	2,190	2,836	0,871	1,265	**7,162**
54	Other activities/services	a OthSrv c0	2,515	3,114	1,221	1,744	**8,595**
55	Net operating surplus and net mixed income	Fk OsMxY c0	1,460	1,219	1,440	2,162	**6,281**
56	T: Legislators (4)	FL Legislator c0	2,434	2,041	1,741	2,430	**8,646**
57	T: Professionals (4)	FL Professional c0	2,447	2,045	1,737	2,426	**8,655**
58	T: Technicians (3)	FL Technician c0	2,452	2,048	1,738	2,433	**8,671**
59	T: Clerks (2)	FL Clerk c0	2,463	2,055	1,738	2,438	**8,693**
60	T: Service workers (2)	FL SrvWork c0	2,485	2,065	1,737	2,453	**8,739**
61	T: Skilled agricultural workers (2)	FL SkAgWork c0	2,533	2,098	1,747	2,507	**8,886**
62	T: Craft workers (2)	FL Craftsman c0	2,486	2,067	1,738	2,456	**8,747**
63	T: Plant and machine operators (2)	FL Machinist c0	2,491	2,069	1,738	2,457	**8,755**

64	**T: Elementary occupations (1)**	**FL ElementaryWork c0**	2,544	2,108	1,750	2,513	**8,916**
65	**T: Domestic workers (1)**	**FL DomesticWork c0**	2,443	2,025	1,722	2,413	**8,603**
66	**T: Occupation unspecified (1)**	**FL Others c0**	2,509	2,082	1,742	2,475	**8,808**
67	**T: P1**	**iH HNP01 c0**	2,715	2,243	0,795	2,403	**8,156**
68	**T: P2**	**iH HNP02 c0**	2,694	2,227	0,791	2,668	**8,380**
69	**T: P3**	**iH HNP03 c0**	2,639	2,180	0,774	2,646	**8,239**
70	**T: P4**	**iH HNP04 c0**	2,617	2,160	0,767	2,630	**8,174**
71	**T: P5**	**iH HNP05 c0**	2,599	2,145	0,763	2,607	**8,113**
72	**T: P6**	**iH HNP06 c0**	2,592	2,138	0,760	2,583	**8,074**
73	**T: P7**	**iH HNP07 c0**	2,532	2,088	0,742	2,493	**7,855**
74	**T: P8**	**iH HNP08 c0**	2,500	2,066	0,735	2,430	**7,730**
75	**T: P9**	**iH HNP09 c0**	2,487	2,062	0,735	2,440	**7,725**
76	**T: P10**	**iH HNP10 c0**	2,482	2,072	0,738	2,439	**7,732**
77	**T: P11**	**iH HNP11 c0**	2,508	2,101	0,749	2,456	**7,813**
78	**T: P12**	**iH HNP12 c0**	2,438	2,044	0,743	2,435	**7,661**
79	**Non-financial corporations**	**iE NonFinancial c0**	0,875	0,731	0,264	2,026	**3,896**
80	**Financial corporations**	**iE Financial c0**	1,845	1,542	0,556	3,078	**7,022**

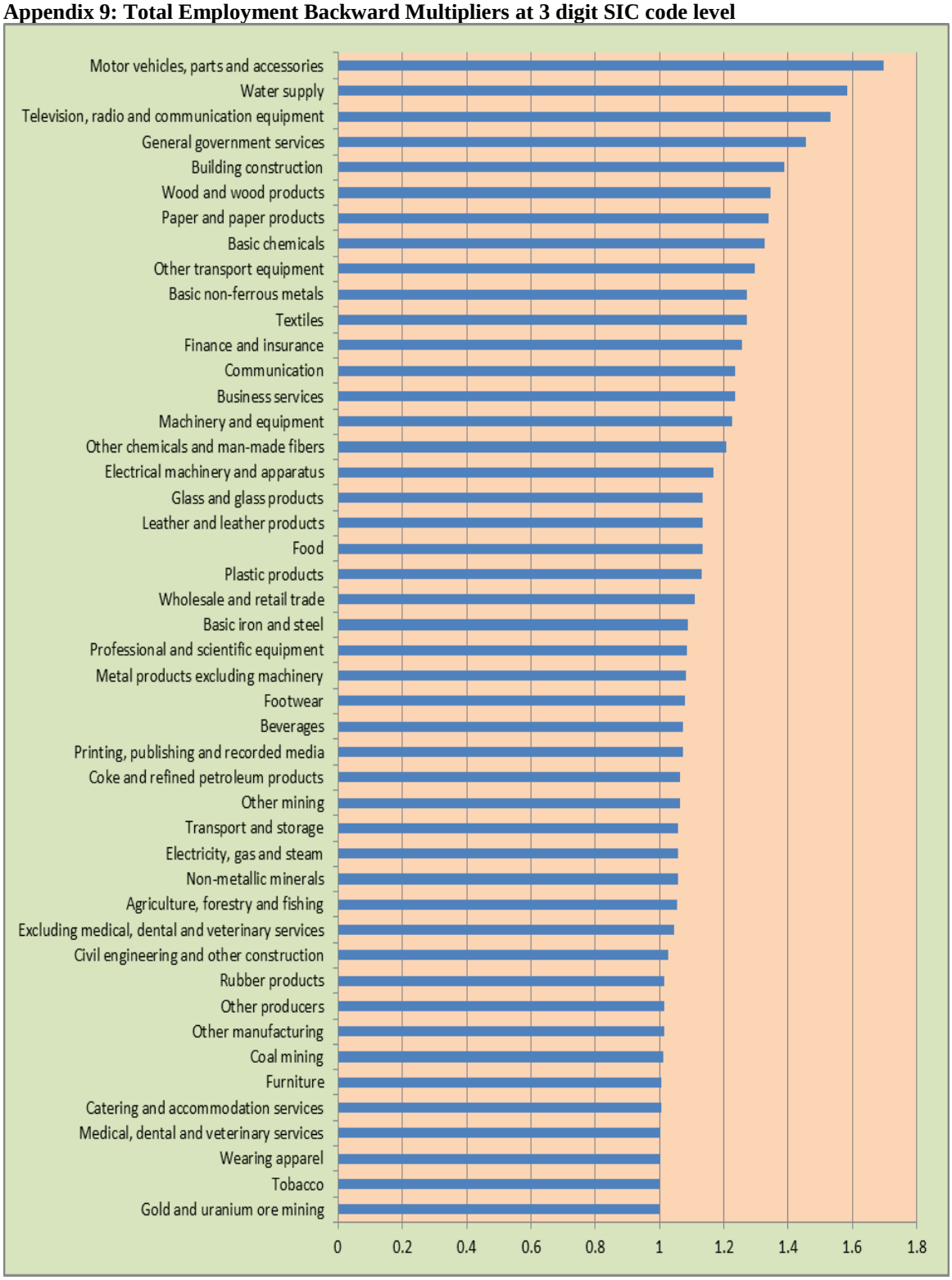
Source: Alarcon, 2011

Appendix 8: Total Growth Multipliers at 3 digit SIC code level



Data Source: Quantec, 2013

Appendix 9: Total Employment Backward Multipliers at 3 digit SIC code level



Data Source: Quantec, 2013

Appendix 10: MEMAS Impact of Interventions on Selected Indicators

			2014	2015	2016	2017	2018	2019	2020	Average
Primary	Origin of GDP (Rmn at constant 2005 prices)	GDP at basic prices	1 825 726.94	1 873 542.22	1 921 301.85	1 972 064.36	2 033 536.89	2 082 766.35	2 179 367.70	**1 984 043.76**
			1 825 726.94	1 881 066.29	1 930 547.78	1 979 364.70	2 033 956.67	2 082 076.21	2 160 264.96	**1 984 714.79**
		Primary	143 181.88	145 902.74	138 505.68	138 686.57	135 859.29	132 857.73	138 996.00	**139 141.41**
			143 181.88	149 013.52	141 645.67	140 733.19	134 592.35	135 540.47	137 177.14	**140 269.17**
		Manufacturing	306 115.53	314 622.73	317 624.09	326 309.26	330 630.86	330 730.36	355 748.55	**325 968.77**
			306 115.53	314 183.86	318 278.25	326 054.62	330 996.17	333 982.35	344 731.13	**324 905.99**
		Services	1 376 429.53	1 413 016.75	1 465 172.08	1 507 068.53	1 567 046.74	1 619 178.26	1 684 623.15	**1 518 933.58**
			1 376 429.53	1 417 868.90	1 470 623.86	1 512 576.90	1 568 368.15	1 612 553.39	1 678 356.69	**1 519 539.63**
	Origin of GDP (% share)	Primary	10.74	11.53	10.98	11.01	10.63	9.96	9.88	**10.68**
			10.74	11.82	11.25	11.26	10.45	10.30	9.92	**10.82**
		Manufacturing	11.70	12.24	12.23	13.00	12.93	12.46	12.87	**12.49**
			11.70	12.20	12.32	12.80	12.25	12.43	11.93	**12.23**
		Services	77.79	76.24	76.40	76.97	76.84	77.58	75.72	**76.79**
			77.79	76.07	76.42	77.29	77.63	79.10	78.12	**77.49**
Manufacturing	Origin of GDP (Rmn at constant 2005 prices)	GDP at basic prices	1 825 726.94	1 873 542.22	1 921 301.85	1 972 064.36	2 033 536.89	2 082 766.35	2 179 367.70	**1 984 043.76**
			1 825 726.94	1 906 008.15	1 957 257.25	2 001 548.42	2 053 163.42	2 094 737.64	2 167 726.11	**2 000 881.13**
		Primary	143 181.88	145 902.74	138 505.68	138 686.57	135 859.29	132 857.73	138 996.00	**139 141.41**
			143 181.88	146 422.27	139 706.33	138 557.69	135 295.93	135 270.31	137 113.77	**139 364.03**
		Manufacturing	306 115.53	314 622.73	317 624.09	326 309.26	330 630.86	330 730.36	355 748.55	**325 968.77**
			306 115.53	334 446.37	340 793.33	350 147.07	359 041.04	364 318.03	378 321.10	**347 597.50**
		Services	1 376 429.53	1 413 016.75	1 465 172.08	1 507 068.53	1 567 046.74	1 619 178.26	1 684 623.15	**1 518 933.58**
			1 376 429.53	1 425 139.51	1 476 757.60	1 512 843.65	1 558 826.45	1 595 149.30	1 652 291.23	**1 513 919.61**
	Origin of GDP (% share)	Primary	10.74	11.53	10.98	11.01	10.63	9.96	9.88	**10.68**
			10.74	11.09	10.62	10.82	10.21	9.89	10.04	**10.49**
		Manufacturing	11.70	12.24	12.23	13.00	12.93	12.46	12.87	**12.49**
			11.70	12.38	12.51	13.16	12.84	13.20	13.87	**12.81**
		Services	77.79	76.24	76.40	76.97	76.84	77.58	75.72	**76.79**
			77.79	76.53	76.78	76.00	76.94	76.93	77.29	**76.89**
Services	Origin of GDP (Rmn at constant 2005 prices)	GDP at basic prices	1 825 726.94	1 873 542.22	1 921 301.85	1 972 064.36	2 033 536.89	2 082 766.35	2 179 367.70	**1 984 043.76**
			1 825 726.94	1 931 234.40	1 983 396.62	2 028 642.79	2 075 939.89	2 129 756.42	2 182 731.48	**2 022 489.79**
		Primary	143 181.88	145 902.74	138 505.68	138 686.57	135 859.29	132 857.73	138 996.00	**139 141.41**
			143 181.88	147 006.99	139 893.15	137 640.00	139 815.83	133 784.47	131 398.99	**138 960.19**
		Manufacturing	306 115.53	314 622.73	317 624.09	326 309.26	330 630.86	330 730.36	355 748.55	**325 968.77**
			306 115.53	315 760.47	320 988.26	331 941.73	334 581.34	348 223.13	355 528.46	**330 448.42**
		Services	1 376 429.53	1 413 016.75	1 465 172.08	1 507 068.53	1 567 046.74	1 619 178.26	1 684 623.15	**1 518 933.58**
			1 376 429.53	1 468 466.94	1 522 515.21	1 559 061.05	1 601 542.72	1 647 748.83	1 695 804.04	**1 553 081.19**
	Origin of GDP (% share)	Primary	10.74	11.53	10.98	11.01	10.63	9.96	9.88	**10.68**
			10.74	10.87	10.26	10.09	10.26	10.41	9.83	**10.35**
		Manufacturing	11.70	12.24	12.23	13.00	12.93	12.46	12.87	**12.49**
			11.70	11.38	11.54	11.70	11.87	13.05	12.42	**11.95**
		Services	77.79	76.24	76.40	76.97	76.84	77.58	75.72	**76.79**
			77.79	77.77	78.78	78.23	77.94	82.42	76.91	**78.55**

Data Source: ADRS-Global