

THE RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT AND
MANUFACTURING SECTOR GROWTH: EVIDENCE FROM SOUTHERN AFRICAN
CUSTOMS UNION COUNTRIES

by

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DECLARATION

Except for references specifically indicated in the text, and such help as has been acknowledged, this thesis is wholly my own work and has not been submitted to any other Tertiary Institution for degree purposes.

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ABSTRACT

Extensive research has been done on the relationship between financial development (FD) and growth (with the main focus on economic growth). Theoretical models and most of the conclusions reached stipulate that the development of a financial system is one of the essential ingredients for economic growth. A developed financial system is able to provide financial services efficiently to the real sector. This study examines the relationship between FD and manufacturing sector growth of the SACU countries.

The study first reviews the theoretical and empirical literature of FD and growth (economic and manufacturing sector). This gives a full understanding of the topic before attempting to empirically study it. It also helps in the selection process of the model and variables to be employed in the study. A balanced panel for four SACU countries, namely Botswana, Lesotho, RSA and Swaziland, for the period 1976 to 2008 was estimated using Zellner's Seemingly Unrelated Regression Estimation (SURE) method. Namibia was omitted because of limited data. The SURE model was selected because it performs better than ordinary least squares (OLS) estimation of individual equations in cases where the countries studied can be affected by similar external shocks because they are in the same economic region and also have country specific structural differences which could affect their economic growth. Two measures of FD were used: credit to the private sector provided by commercial banks (FIC) and the ratio of liquid liabilities of commercial banks to GDP (LL). Manufacturing sector growth was measured by manufacturing value added to GDP.

The results of the relationship between manufacturing growth and FD were very weak across the countries. The model that used FIC performed better, there was a negative significant relationship found in RSA and Swaziland, while with the model that used LL, all the countries gave an insignificant relationship. The results for Swaziland were very consistent with the past findings of the relationship between FD and economic growth in the country (for example Aziakpono (2005a)). This may be because of the high share of the manufacturing sector in GDP. Theory suggests that a well-developed financial system will have a positive impact on growth, but this was not the case in RSA and Botswana, where in some cases FD had a negative impact on the growth of the sector.

The analysis of the countries' manufacturing sector development shows that the sector plays an important role in the economies of the SACU countries, especially in terms of employment and exports. The coefficients of trade openness are generally positive, though not significant in some cases. The other control variables gave mixed results across the countries and across the models.

Based on the findings, the countries have to develop strategies that will improve entrepreneurial skills. Also the financial development in the small SACU countries is essential in order for all the sectors in the economy to benefit from the financial sector and in turn increase economic growth.

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LIST OF ACRONYMS

AGOA	Africa Growth and Opportunity Act
ARDL	Autoregressive Distributed Lag
BC	Bank Credit
BLS	Botswana, Lesotho and Swaziland
BON	Bank of Namibia
BO	Botswana
CBS	Central Bank of Swaziland
CF	Cash Flow
CMA	Common Monetary Area
CPI	Consumer Price Index
CPS	Credit to Private Sector
DEF	Dependency on External Finance
DLR	Deposit Liability Ratio
ERSA	Economic Research Southern Africa
FD	Financial Development
FDI	Foreign Direct Investment
FI	Financial Intermediation
FIC	Commercial banks as a percentage of GDP
GDP	Gross Domestic Product
GLS	Generalized Least Squares
GMM	Generalised Methods of Moments
JSE	Johannesburg Stock Exchange
LDC	Less Developed Countries
LE	Lesotho
LL	Ratio of liquid liabilities of commercial banks to nominal GDP
LM	Lagrange Multiplier
LSN	Lesotho, Swaziland and Namibia
M2	Broad money
MAN	Manufacturing
NAM	Namibia
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares

RMA	Rand Monetary Agreement
RSA	Republic of South Africa
RSS	Residual Sums of Squares
SADC	Southern African Development Community
SACU	Southern African Customs Union
SARB	South African Reserve Bank
SURE	Seemingly Unrelated Regression Estimation
SW	Swaziland
TFP	Total Factor Productivity
US	United States
USA	United States of America
VEC	Vector Error Correction
VECM	Vector Error Correction Model

CHAPTER ONE:

INTRODUCTION

1.1 CONTEXT OF THE RESEARCH

Financial development¹ plays a vital role in the economic growth of a country through efficient allocation of financial resources to the most productive projects; it has also been proven to reduce poverty through its impact on growth (Ali and Hassan, 2008:5). Schumpeter (1911) argued that the financial system is important for technological innovation and economic development through allocation of savings, monitoring of projects and management of risk (Levine, 1997:688; Vazakidis and Adamopoulos, 2009:1410). Ever since Schumpeter's Theory of Economic Development in 1911, a lot of research has been, and still is, being done to investigate the possible relationship between financial development (FD) and growth and also the industrial sector development's dependency on credit, hence its relationship with the financial sector.

Most African countries were initially dependent mainly on agriculture, but for the past years there has been a gradual structural shift to sectors such as manufacturing, services, retail and wholesale trade, tourism and construction. Various factors could have caused this: modernisation of the economies, urbanisation, diversification and the need to link up with global commerce and value chain imperatives (Todaro, 1987:116). At the beginning of this transition most of the national manufacturing sectors were dominated by agricultural products, but they are now more diversified. The manufacturing sector is generally one of the most capital intensive sectors and requires high financial resources for its development. Thus it can be assumed that a well-developed domestic financial system can lead to manufacturing sector growth. The manufacturing sector experienced great expansion in some African countries from 2001 following the promulgation of the Africa Growth and Opportunity Act (AGOA) signed by the United States of America (USA) in 2000. The act gave the developing African countries the opportunity to export selected products duty free to the USA (Schaefer and Markheim, 2006).

¹ Although the definitions of financial development (FD) and financial intermediation (FI) are not exactly the same, they are used synonymously in the literature because they are often measured using the same indicators. For the purpose of this study, FD will represent both terms.

Within the financial sector, financial intermediaries,² such as banks and insurance companies, and capital markets mobilise excess funds from surplus units and make them available to the deficit units. This impact on productivity by making the excess funds available to investment projects with good growth prospects (Arizala *et al.*, 2009:7-9). In order to achieve efficient allocation of resources, the financial sector has to be well developed, that is, able to acquire required information cost-effectively, have good accounting standards and regulations, provide the services at a reasonable cost and also be able to pool the risk across investment projects in order to deliver high returns to the investors (Eichengreen *et al.*, 2009:1). The financial sector in an economy promotes specialisation, since it makes it easier to obtain the required funds for investments in productive projects, allowing borrowers to concentrate on their own areas of expertise.

1.2 MOTIVATION FOR THE STUDY

Some literature supports the view that there is a relationship between financial development and economic growth regardless of the causal direction, these include Levine *et al.* (2000), Padachi *et al.* (2007), Arizala *et al.* (2009), and Vazakidis and Adamopoulos (2009). Others such as Von Furstenburg (2004), Aziakpono (2005b) and Gries *et al.* (2009) found an insignificant relationship or no relationship at all. Also there is wide literature that finds mixed results, such as Allen and Ndikumana (2000), Kemal *et al.* (2004), Jalil and Ma (2008) and Aziakpono (2008). There are various reasons why the findings of the existing literature are inconsistent, to mention a few, the variables used to measure FD differ in most studies, the choice of countries (either developed or developing)³ and different methodologies used.

Recent research done on the African countries, SACU in particular, has examined the relationship between financial development and aggregate economic growth (real GDP) (Aziakpono, 2005a and 2005b; Mohapi and Motelle, 2006). To our knowledge, there is no study that has investigated the relationship between FD and sectoral growth in Africa. This study will add to the existing literature by looking at manufacturing sector growth in so far as it relates to financial sector development in the SACU countries.

² Financial intermediaries form part of the country's financial system.

³ Developed countries may have a highly developed financial system which stimulates productivity while developing countries may have an underdeveloped financial system because of low incomes and this may hinder productivity growth or even have negative effects.

This study was mainly inspired by the study of Neusser and Kugler (1998). They carried out co-integration tests to investigate the link between manufacturing sector growth and financial development in 13 Organisation for Economic Co-operation and Development (OECD) countries, and also tested for causality between the two sectors. This study will investigate the relationship between the development of similar sectors (manufacturing sector growth and financial sector development) given the lack of such studies in the SACU countries, but it will adopt a different methodology.

1.3 THE OBJECTIVES OF THE RESEARCH

The main aim of this research is to examine the relationship between the growth of the manufacturing sector and financial development in SACU member countries, specifically:

- To analyse manufacturing sector development and structure in the SACU countries.
- To analyse the level of financial development in the SACU countries.
- To identify whether there is a relationship between selected measures of manufacturing growth and selected indicator(s) of financial development in the SACU countries.
- To analyse the relationship between manufacturing sector growth and financial system development in selected SACU countries.
- Based on the results, to propose policy measures that could improve the development of both the financial and the manufacturing sectors and also the relationship between the two sectors.

1.4 METHODOLOGY

There are various measures of financial development, such as the supply of credit to the private sector as a proportion of total domestic credit or as a ratio of GDP, the number of listed companies and the capitalization of listed companies (as a ratio of total volume or as ratio of GDP) and the value of shares traded (ratio of volume or GDP) and the turnover ratio (Ndikumana, 2001:7). Based on the recent research done in SACU countries, they are more bank-based than market-based (except RSA), while Lesotho does not even have a stock market. As a result the FD measures used in this study will be bank-based and they are: the ratio of credit extended to the private sector by commercial banks as a percentage of GDP (FIC) and the ratio of liquid liabilities of commercial banks to nominal GDP (LL). The choice

of these measures is also influenced by the data availability and the fact that they are the commonly used indicators in the literature⁴ (e.g. Rioja and Valev, 2003; Khan and Qayyum, 2006; Aziakpono, 2008; Jalil and Ma, 2008). Also influenced by data availability, manufacturing sector growth was measured by manufacturing value added to GDP.

Studies carried out using cross-section analysis or dynamic panel data methods such as generalised methods of moments (GMM) have been criticised on the basis of failure to control effectively for cross-country heterogeneity and interdependence (Ghirmay, 2006:24, Kemal *et al.*, 2004:2). Because of the above criticism and the fact that the data available for most of the SACU countries is not adequate to perform time series, this study will apply panel data analysis using the Seemingly Unrelated Regression Estimation (SURE) model.

The sample period will be from 1980 to 2008 and the data will be sourced from the IMF International Financial Statistics, World Banks' World Development Indicators, Thompson DataStream, various countries' departments of statistics and the various countries' central bank websites.

1.5 ORGANISATION OF THE STUDY

The thesis is organised as follows: the next chapter reviews the existing literature, both theoretical and empirical. It looks at the background of a financial system and the evidence of its relationship with growth, either economic growth or industrial sector growth, in industrialised and developing countries. Chapter Three provides an overview of the SACU countries in terms of the SACU agreement, economic performance, manufacturing sector growth and financial sector development. Chapter Four describes the data, variable selection and their sources and econometric methods used for the analysis. Chapter Five discusses the results and Chapter Six concludes the study.

⁴ This will help in comparing the results obtained from this study with the findings in the past literature.

CHAPTER TWO:

THEORETICAL REVIEW AND EMPIRICAL LITERATURE

2.1 INTRODUCTION

The aim of this chapter is to provide a conceptual, theoretical and empirical literature review of the link between FD and growth, looking first at economic growth in general, and then, more narrowly, at sectoral (industrial and manufacturing) growth. The chapter is structured into four sections, starting with this introduction. Section two discusses the conceptual framework of the financial system, the effects of FD on growth using the endogenous growth model and the effects of FD on manufacturing sector growth. Section three reviews the existing empirical studies examining the relationship of FD and growth (either economic, industry or manufacturing). This section is categorised according to the countries included in the studies. The last section concludes the chapter.

2.2 THEORETICAL BACKGROUND

What is a financial system? What services does it provide? How does the development of a financial system affect growth? What effect does financial system development have on the manufacturing sector? This section attempt to answer the above questions based on the literature.

2.2.1 Conceptual Framework

i) Defining a financial system

A financial system has become the cornerstone of most economies around the world and as a result it has gained a lot of attention from economists, who research mainly the causes and impacts of its development. It is essential to first understand the meaning of a financial system and its key participants.

According to Hubbard (1997:4) a financial system is “a network of markets and institutions that bring savers and borrowers together”. The main function of a financial system which is bringing savers and borrowers together can be performed either through direct financing or indirect financing. Direct financing takes place through financial markets (such as stock markets, bond markets, and derivatives markets), deficit spending units who issue debt (direct

securities) and surplus spending units who buy and hold these financial assets (Gurley and Shaw, 1955:518). While indirect financing is done through financial intermediaries (such as banks, mutual funds, and insurance companies), they issue their own debt in seeking loanable funds from surplus units and allocate them to deficit units (Gurley and Shaw, 1955:519). The potential savers and borrowers consist of households, businesses and governments.

From the definitions above, it is evident that the participants in a financial system are financial markets, financial intermediaries, borrowers and savers.

ii) The purpose of a financial system

In the absence of a financial system, there is inefficiency in the mobilisation of funds caused by market imperfections such as the cost of acquiring information and enforcing contracts. A financial system addresses these market frictions by (i) assessing investment opportunities and providing corporate control, (ii) managing risk, and (iii) lowering transaction costs (Levine, 1996:8).

A well-developed financial system is able to provide these financial services efficiently to the real sector. Ali and Hassan (2008:9) define FD as “a measure of the growth of a financial sector of an economy or a measure of the degree of financial intermediation by financial intermediaries in an economy”. According to Calderon and Liu (2002) “financial development is the improvement in quantity, quality and efficiency of financial intermediary services”. An efficient financial system is identified by low transaction costs, low interest rate spread between lending and borrowing rates, low risk, easily accessible services and a wide range of financial products. The factors that contribute to this efficiency are a good accounting system and disclosure rules, better corporate governance, minimal government intervention and a strong legal system (Gries *et al.*, 2009:1849).

iii) The structure of a financial system

A financial system can be classified as either bank-based or market-based. A bank-based system highlights the positive role of banks in the allocation of funds in the economy, while a market-based system highlights the positive role of the financial markets emphasising their comparative advantage over banks in allocation efficiency (Beck and Levine, 2002:2). Comparing the two systems in order to evaluate which one performs better is outside the scope of this study. We concentrate on the bank-based system because the SACU countries financial systems (except RSA) are bank-based. In the countries where there are stock

exchanges (Botswana, Namibia and Swaziland), they are characterised by small market capitalisation and limited trading activity compared to RSA. This will be evident as we discuss the structure of the financial systems of the countries in Chapter Three.

The following section illustrates the relationship between finance and growth using the simple endogenous growth model and the role of a financial system in the economy.

2.2.2 Endogenous growth model

Following Pagano (1993), Murinde (1996) and Aziakpono (2008), this sub-section presents a simple endogenous growth model to show how FD affects growth. In Pagano (1993), the endogenous growth model is referred to as the ‘AK’ model and it is illustrated as follows:

$$Y_t = AK_t \quad (2.1)$$

In this equation, aggregate output Y_t , is a linear function of the aggregate capital stock⁵, K_t , and marginal productivity of capital, A . It is assumed that population growth is constant and that the economy produces a single good that can be invested or consumed. In the case of the good being invested, it is assumed that it depreciates at the rate of δ per period (Pagano, 1993:614). Following these assumptions, the gross investment, I_t , is equivalent to:

$$I_t = K_{t+1} - (1 - \delta)K_t \quad (2.2)$$

The focus of this study is on the domestic financial systems of the SACU countries, therefore the model will also assume a closed economy. The main participants are households and firms, as a result gross savings equal gross investments, I_t , at equilibrium (Murinde, 1996:95). It is assumed that part of the savings $(1 - \theta)$ is absorbed in the process of financial intermediations, i.e. total savings do not all go to investments. This is shown as:

$$\theta S = I_t \quad (2.3)$$

where θ is the proportion of savings invested, S is savings and I is investments.

Using equations (2.1) and (2.2) and dropping the time indices, the steady state growth rate can be expressed as:

⁵ Aggregate capital stock is physical capital, human capital, knowledge and public infrastructure (Aziakpono, 2008:19).

$$g = A\theta s - \delta \quad (2.4)$$

In these cases FD can affect growth through an increase of θ , the proportion of savings invested, and A , the marginal productivity of capital. It can also affect it by influencing s , the private savings rate (Pagano, 1993:615, Murinde, 1996:96, Aziakpono, 2008:21). These effects of FD on growth are now explained in more detail.

The role of a financial system

a) Channelling savings into investments

There are two aspects from domestic resources in which a country can be developed: through encouraging savings and through financing investments (Thirlwall, 1994:273). Financial intermediaries encourage savings by offering surplus units comprising the household sector and corporate sector attractive returns for forfeiting consuming their excess funds now for later (Branson, 1972:36). They then channel those savings from surplus units to investments and in the process they absorb a fraction of these savings $(1-\theta)$ as commission and fees, spread between lending and borrowing rate and many other expenses. As a result a rand saved generates less than a rand invested ($\theta S = I_t$) (Murinde, 1996:96; Pagano, 1993:615). If the portion of savings that is absorbed in the process of intermediation is high, it is a sign of inefficiency in the financial sector. In order for FD to increase growth rate, it has to raise the portion of savings invested, which is θ in equation 2.4 (Pagano, 1993:615). As the financial system becomes more developed, the proportion of savings channelled to investment increases, thereby stimulating growth. In the absence of financial intermediaries, mobilisation of savings is usually expensive because of the presence of information asymmetries and transaction costs resulting from direct financing (Ghirmay, 2006:26).

b) Improving the allocation of capital

Capital is allocated more efficiently by financial intermediaries to projects with a high marginal product of capital: they are able to increase productivity of capital, A , which will in turn increase growth. They achieve this through (i) collection of information to evaluate alternative investment projects, (ii) enabling savings to be used in other sectors besides the sectors in which they originate, and (iii) by providing risk sharing which enables individuals to invest in riskier but productive projects (Murinde, 1996:96).

c) Savings mobilisation

FD can both increase or decrease the savings rate and, depending on its impact, growth will either decline or improve respectively. The qualities of a developed financial system that can have a positive effect on savings rate are: improved expected returns, diversified investment risk, easily and cheaply available credit, and decreased interest rate spread. The effects of these factors on the savings behaviour are evident but the sign of the relationship is ambiguous (Pagano, 1993:615).

As mentioned in (b) above, financial intermediaries provide risk sharing. They do so by pooling individual savings and investing them in productive long-term projects. The expected effect of decreased risk resulting from FD is a higher return at any level of risk (Rother, 2001:80). This effect can inspire individuals either to save more due to attractive returns or to save less because they now need a smaller amount of savings in order to achieve their future consumption: the effect depends on the individual saver's risk preference (Rother, 2001:80).

Easily accessible and cheap credit resulting from FD can affect growth positively when more firms and individuals apply for it, either to develop or establish businesses instead of using it for consumption. However this cheap and easily accessible credit can also discourage savings because it means it will be easy to get funds for future plans (Valverde *et al.*, 2004:13).

In summary, increased savings leads to increased investments which will also result in increased growth; most importantly, if positive effects on the saving rate outweigh the negative ones. For all these to take place an efficient financial system is required so that it can make sure that savings are channelled to productive investment projects.

2.2.3 *FD and manufacturing sector development*

The manufacturing sector in less developed countries (LDC) is made up of small-scale producers and a few large firms because these countries face major difficulties that hinder them from accessing high technological intensity markets such as autos, electronics and computers. The obstacles include high costs of acquiring raw materials, limited skills, high cost of credit, restrictive government policies and intense competition from established markets (Schmitz, 1982:433). As a result countries import these products (in this case, the small SACU countries import mainly from RSA) because their national markets are too small to support efficient manufacturing and compete with established industries (Kobrin, 1987:615).

The manufacturing sector consists of a continuum of firms and each firm has a project(s) that requires investment. The projects can be either good or bad: a good project has a probability of being a success and giving good returns, while a bad project only has a probability of zero returns (Boot and Thakor, 1997:697). The probability of a good project failing may be caused by bad management and other unanticipated problems such as low levels of demand. What and who contribute to making sure that the project selected is a good project and that it becomes a success? The main influence can come from the source of financing and its intermediation.

Firms' capital expenditure arising from investment opportunities can be financed by internal and/or external funds⁶. The internal funds are the firm's cash flows (CF), the retained earnings after paying dividends to shareholders, while external funds are debt and equity. In most cases, especially where the manufacturing sector is dominated by small firms, internal funds are not sufficient for investment opportunities arising and therefore external funds are needed. Financial intermediaries, more specifically banks, facilitate the financing of viable projects at a fee, which is the interest rate. This option of financing is expensive, especially in an environment where there are inefficiencies such as information asymmetries, bankruptcy costs and law enforcement problems (Gelos and Werner, 2002:8).

The relationship between the manufacturing sector and FD mainly develops from the function of banks as credit providers (Tuan and Ng, 1998:12). Banks first gather information about the firms and their projects before financing them. They assess the firms' default risk by looking at their current debt servicing capabilities and long-term ability to repay its debts (Rajan and Zingales, 1998:473), and then they allocate funds based on their assessment. After the projects have started, banks monitor their performance and how they are managed. This helps avoid good projects going bad. In the absence of financial intermediaries, individual savers would have to perform the acquiring of information for all the firms they view as good investments as well as monitoring the one they have selected, which would be a very costly and time-consuming task, hence the importance of a financial system.

Firms can have a close relationship with banks, either because they have frequently used banks in the past or because there are ownership links (Rajan and Zingale, 2001:473). This may improve the firm's access to capital, especially if it has a good record. However, based

⁶ External funds/finance equals the difference between investments and cash generated from operations (Rajan and Zingales, 2001:469).

on their study in Japan, Weinstein and Yafeh (1998:639) argue that this does not necessarily guarantee high growth rates in the manufacturing sector. They suggest two main reasons for their finding: (i) banks are more risk averse than equity holders, and (ii) the cost of bank financing is high, especially in less developed financial systems, which can inhibit the development of the manufacturing sector in countries which depend mainly on bank financing, which is the case in most African countries.

In the next section the empirical literature on the relationship between financial development and economic growth and manufacturing growth is reviewed.

2.3 EMPIRICAL EVIDENCE

Both theoretical and empirical literature support the existence of a relationship between financial development (FD) and economic or productivity growth. The results found in the past literature on the relationship between FD and economic growth or industry growth can be summarised as follows:

a) There is a relationship between FD and growth

i. *The relationship is from FD to growth*

This is known as the supply leading hypothesis because the resources needed for growth are mobilised by the financial sector from low growth sectors to productive sectors (Ali and Hassan, 2008:11). The literature that supports this relationship include Levine *et al.* (2000), Rioja and Valev (2003), and Jeanneney *et al.* (2005).

ii. *The relationship is from growth to FD*

This is called the demand leading hypothesis as it is believed that the development of a financial sector is a response to the demand for the modern financial services from the individuals and firms in the real economy (Vazakidis and Adamopoulos, 2009:1416). Hurlin and Venet (2004) and Vazakidis and Adamopoulos (2009) are among other researchers who found that financial development follows growth.

iii. *The relationship is bi-directional*

In this case the research results (e.g. Calederon and Liu (2002); Luintel and Khan (1999); Abu-Bader and Abu-Qarn (2008)) show that the relationship is reciprocal: economic growth develops the financial system and the efficient financial system stimulates growth.

b) There is no relationship between FD and growth

The development of a financial system does not always have an impact on growth. Some studies found a negative relationship or no relationship at all, these include Von Furstenburg (2004), Gries *et al.* (2009), Aziakpono (2005a; 2005b) and Mohapi and Motelle (2006). In this case, the effects on the development of financial sector and growth are caused by different external factors.

Empirical analysis will be presented in four sub-sections, firstly we review studies using developed countries. The second sub-section looks at the results from studies on developing countries (outside Africa), then the third sub-section will review results from studies that used both industrialised and developing countries. Lastly, studies on African countries including SACU will be reviewed.

2.3.1 Studies of developed/high income countries

Some of the literature that studied finance-growth nexus in developed countries find the evidence of a positive significant relationship regardless of whether they used aggregate or industry/manufacturing level data as a measure for growth (e.g. Neusser and Kugler, 1998; Kemal *et al.*, 2004; Ghirmay, 2006; Shyn *et al.*, 2008; Vazakidis and Adamopoulos, 2009). Kemal *et al.* (2004) carried out panel causality methodology for the dynamic heterogeneous panel data model of 19 high income countries focusing on the period from 1971 to 2001. Six measures of FD were used: the size of indirect finance (liquid liabilities to GDP ratio), the activity of indirect finance (the private sector credit to GDP ratio), the size of direct finance (stock market capitalization to GDP ratio), the activity of direct finance (total value of the shares traded in the stock market to GDP ratio), the size of the overall financial sector (combination of the size of direct and indirect finance) and the activity of the overall financial sector (combination of the activities of direct and indirect finance). They found mixed results: the relationship between indirect finance and economic growth was not significant, while direct finance is significantly and positively related to economic growth; and the causality results were not conclusive across the countries.

On the other hand, Ghirmay (2006) and Vazakidis and Adamopoulos (2009) used time series methodologies to analyse the relationship between FD and economic growth. Ghirmay (2006) used Granger non-causality tests and a sample period of 1970-2001. Measuring FD with

financial sector GDP (which is a measurement of value added provided by the financial system), they conclude that FD affects growth by increasing the level of investment and its productivity in USA, and there was no evidence for reverse causality from economic growth to FD. However, Vazakidis and Adamopoulos (2009) showed that the relationship runs from economic growth to FD in Greece. They used annual data for the period 1978-2007 and Granger causality tests based on the Vector Error Correction Model (VECM). The authors measured FD with domestic bank credits to private sector (BC) as a percentage of GDP and stock market index, and they also included the Industrial Production Index in their analysis as a measure of industrial sector growth and its effect on economic growth. They conclude that economic growth has a positive effect on FD through industrial production growth.

Sectoral growth

Assessing the relationship of FD and sectoral growth, in the manufacturing sector in particular, Neusser and Kugler (1998) adopted the heterogeneous panel data approach and individual country causality analysis for 13 OECD countries using annual data covering the period 1960 to 1994. They criticised the commonly used measures of FD such as the liquid liability ratio and bank credit to private sector credit on the basis that they do not include a wide range of activities and therefore are biased. As a result the authors employ the financial sector GDP as an FD indicator, and this covers a wide range of activities in the financial sector such as the deposit and credit business by commercial banks, service charges and commissions related to stocks and bonds issues and off balance sheet activities. As they noted, the measure is however not perfect, it has its drawbacks. It does not enable one to differentiate between bank-based and market-based financial systems because it is too broad. Also because of its broadness, it is difficult to identify the specific intermediation functions of the financial system that promote economic growth. In measuring manufacturing growth, both logs of manufacturing GDP and manufacturing total factor productivity were used.

The results in Neusser and Kugler (2008) were mixed across the countries. When using logged manufacturing GDP and logged financial GDP, the null hypothesis of no co-integration was not rejected for half of the countries. On the other hand, when manufacturing total factor productivity (TFP)⁷ was used instead of GDP, the hypothesis of no co-integration was rejected more than in the case of manufacturing GDP, meaning there is more evidence of

⁷ TFP is the ratio of real value added to a geometric weighted average of capital stock and total employment (Neusser and Kugler, 2008:640).

a long-run relationship between FD and technical progress (measured with TFP) in the manufacturing sector. They found that the causal relationship is weak for most of the small countries, which can be explained by different degrees of capital mobility.

Also looking at the sectoral growth, Shyn *et al.* (2008) analysed the relationship between technological external finance dependency, growth opportunities, and industrial growth in Korea. They used panel data and two periods, 30 industrial sectors in the 1980s and 34 industrial sectors in the 1990s. External finance dependency was measured by the portion of external finance in each industry's total capital expenditures and industrial growth was proxied by the share of each industry to real GDP. They found that as financial markets develop, funds flow to industries with high growth opportunities and high dominance at each stage of economic development.

Summary

Despite the inconsistent results obtained in these studies, there are some facts that can be drawn from the conclusions reached by the authors. Firstly, there is evidence of a positive relationship between finance and growth in developed countries, although in some cases the results are mixed. Secondly, the level of the development of the financial system in the economy affects the finance-growth relationship. Thirdly, high capital intensive advancements such as industrial progress are related to FD because of their dependence on external finance⁸. Lastly, developed financial markets enable funds to be channelled to industries with high growth opportunities.

2.3.2 Studies of emerging markets/developing countries

The expectation from theoretical literature and most of the past empirical works is that financial development can enhance productivity growth by improving capital allocation and stimulating technological progress (Jeanneney *et al.*, 2005:47). Jeanneney *et al.* (2005) apply these theoretical insights to the case of China, applying Generalised method of moment (GMM) system estimators for panel data analysis to examine the relationship between FD and productivity growth in 29 Chinese provinces for the period between 1993 and 2001. Total factor productivity (TFP) was decomposed into two components – technical efficiency and technical progress – which were used as dependent variables. FD was measured by three

⁸ Reference can also be made to De Guevara *et al.* (2009), who found that firms in industries with a greater dependence on external finance grow faster in more financially developed provinces.

indicators: private credit, bank competition⁹ and public credit. The results coincide with the literature, and show that FD significantly contributes to China's productivity growth through efficiency.

Nasri and Mouawiya (2005) could not come to a conclusion about the direction of causality. They investigated the linkage between FD and economic growth both in the short and long run. They used panel co-integration to test 10 Middle East countries as a group and also time series methodologies such as Johansen's co-integration, Granger causality, and variance decompositions to look at individual countries. FD was measured by the ratio of private sector credit to base money. The results show that, in the long run, financial development and economic growth may be related to some degree. In the short run, the panel causality tests indicate that real economic growth causes changes in financial development while individual countries' causality tests fail to give conclusive results of the direction of causation.

Khan and Qayyum (2006) applied a bound testing approach to co-integration within the framework of Autoregressive Distributed Lag (ARDL) to investigate the joint impact of trade liberalization and FD on growth in Pakistan. This approach does not need specific identification of the order of integration of the underlying data. They used annual observations over the period 1961-2005 and measured FD with total bank deposit liabilities relative to GDP, the ratio of private sector credit to GDP, the amount of money cleared through clearing house relative to GDP, and the ratio of stock market capitalization to GDP. Results show that there is a relationship between real GDP, trade liberalization, financial development and the real interest rate in the long run. Jalil and Ma (2008) also used ARDL to explore the relationship between FD and growth using two developing countries, China and Pakistan. In the case of Pakistan, they found a significant impact on economic growth when using both deposit liability ratio (DLR) and credit to private sector (CPS) as FD indicators, while for China only DLR had significant impact. They suggested that their results could have been affected by the fact that data for CPS was not complete and therefore the proxy was not very accurate.

Sectoral growth

Wang (2000) employs a two-sector model¹⁰ based on production theory to analyse the causality relationship between growth and FD. The study uses the Seemingly Unrelated

⁹ Measured by the share of credit issued by banks and financial institutions other than the four major state-owned banks in China.

Regression Estimation (SURE) method and the Generalized Least Squares (GLS) method for testing the time series of externalities in Taiwan for the period 1961-1996. Results indicate that inter-sectoral externality of the finance-supply-leading version (FD causes growth) is greater than that of the real-demand-following version (FD follows growth), meaning the supply leading force dominates at the beginning of development in Taiwan, which is in line with the hypothesis of Patrick (1966).

Based on common claims from the literature that states that have high rate of FD should benefit industry sectors that dependent on external finance, Von Furstenburg (2004) used 19 manufacturing sectors in Poland for the period 1990-2001 to research the contribution of rapid FD to asymmetric growth of manufacturing industries. The aim of the paper was to see whether common claims that rapid financial development should contribute to the growth of manufacturing industries, which are sectors that depend on external finance, are true. Von Furstenburg's reason for choosing Poland was because it has experienced a high rate of financial development within a few years. He measured FD with net life premiums, net non-life premiums, net total premiums, life insurance investment, non-life insurance investment, total insurance investment, M2 and domestic credit excluding government, all expressed as a percentage of GDP.

Results in Von Furstenburg (2004) show that the widely-used Rajan and Zingales (1998) measures of young (exchange-listed US) companies' dependence on external finance¹¹ had no explanatory power for the structure of industry growth in Poland. One of the reasons behind these results may be the fact that these measures were not good for Poland but only for the US. This study is one of the few that used sectoral growth to investigate the relationship between FD and growth.

2.3.3 *Studies combining both developing and industrialised countries*

The combination of developed and developing countries in one study can increase the possibility of getting conflicting results because of the different levels of FD, different economic environments and different regulations. Based on their results, De Gregorio and Guidotti (1995) suggest that FD stimulates economic growth but the important factor in this relationship is not the level of investment but its efficiency. They used both cross-country

¹⁰ The model illustrates the direction of growth between two sectors: the financial sector and the real goods (industrial) sector.

¹¹ Firm's dependence on external finance equals sum of firm's use of external finance divided by sum of capital expenditure.

growth regression and panel data set in 98 countries and 12 Latin American countries for the period 1960-1985 to investigate this relationship. Measuring FD with bank credit to the private sector as a share of GDP, they found a positive relationship in a large cross-country sample, but the impact changes across countries and over time. They also found that the relationship is negative in panel data for Latin America. Their supporting argument for the negative results is the impact of financial liberalization in a poorly regulated environment and expectations of government bailouts.

Levine *et al.* (2000) address some of the unanswered questions from the past research on the relationship between FD and economic growth. They assess whether the exogenous component of FD influences economic growth and also whether cross-country differences in legal and accounting systems explain differences in the level of financial development. Using both GMM five yearly dynamic estimators and a cross-sectional instrumental variable estimator, their results show that FD is positively related to economic growth. For the first method they used a panel data set for 74 countries and for the second method they used data for 71 countries, and the sample period was 1960-1995 in both cases. The results showed that cross-country differences in legal and accounting systems help to explain the differences in financial development. They conclude that legal and accounting reforms that strengthen creditor rights, contract enforcement, and accounting practices can enhance financial development and speed up economic growth.

Calderon and Liu (2002) find evidence of bi-directional causality between economic growth and FD using Granger causality: the causal relationship from finance to TFP¹² growth is stronger for developing countries, and the opposite is true for industrial economies. They also find that financial intermediaries have larger relative effects in less-developed economies than in more developed ones. This study was performed on 109 developing and industrial countries for the period 1960 to 1994. FD was measured by the ratio of broad money (M2) to GDP and the ratio of credits provided by financial intermediaries to the private sector to GDP.

Rioja and Valev (2003) show that finance has a strong positive influence on productivity growth mostly in more developed economies, while in less developed economies, the effect of finance on output growth is observed mainly through capital accumulation. The measures

¹² TFP (A in the equation) measure is consistent with the neoclassical production function $Y=AK^\theta L^{1-\theta}$ with physical capital (K) and labour (L).

of productivity and capital accumulation were derived from the neoclassical productivity function. They stipulate that developing countries follow a capital accumulation strategy (investment-based growth) while developed/industrialised countries pursue innovation-based growth. They carried out their study using a panel data set of 74 developing and industrial countries for the period 1961-1995 using a GMM dynamic panel technique.

Sectoral growth

Galindo and Micco (2004) used data for the period 1970-1990 of 20 industries in 33 countries and investigated the efficiency of different structures of bank ownership in terms of its ability to target manufacturing sectors in need of credit, with the aim of seeing whether there are different effects from privately owned banks and government owned banks on the performance of firms that rely on external finance and firms that do not have collateral. They used the growth rate of real value added for each sector in each country as the dependent variable and the standard ratio of credit to the private sector to GDP as a measure of FD. For measuring the impact of credit from government owned banks, they used the ratio of credit to private sector to GDP by publicly owned institutions. They found that state-owned banks do not increase growth rates of manufacturing industries that rely on external finance or those industries that lack collateral, but private banking has a significant effect on both types of industry.

Arizala *et al.* (2009) conducted a study on the effect of financial development and TFP growth, using a panel of 77 countries with data for 26 manufacturing industries for the period 1963-2003. Ratio of private credit to GDP was used as proxy for FD. They found a relationship between industry level TFP and financial development. They state that FD can cause the growth of TFP to increase by up to 0.6 percent but the main influence on this growth is the dependency of the industry on external finance. This means that an industry that is characterised by high dependency on external finance (DEF) is the one that is expected to benefit from financial development. Their results also indicate that increased volatility of inflation can have a negative effect on FD's impact on industry level TFP growth.

Summary

From the above analysis, it is evident that studies with a sample of both developed and developing countries are highly likely to get results that differ across the countries because of differences in factors such as financial liberalization, level of regulation (accounting and

legal), and level of government intervention (De Gregorio and Guidotti, 1995; Levine *et al.*, 2000). Also developing countries tend to follow a capital accumulation strategy (investment-based growth) while developed countries follow innovation-based growth. Lastly, evidence shows that private banks perform better than state-owned banks in allocating excess funds to firms that rely on external finance.

The effect of FD on growth may also come from external sources of financing other than domestic savings. Some of the literature shows that other factors such as foreign borrowing, trade openness, and foreign direct investment (FDI) have a positive impact on economic growth or industry productivity growth in countries with a well-developed financial system (e.g. Eichengreen *et al.*, 2009; Alfaro *et al.*, 2008).

2.3.4 *Studies of African countries including SACU*

Allen and Ndikumana (2000) tested whether there is a positive relationship between FD and economic growth using countries in the regional integrated group of the Southern African Development Community (SADC). Their results were positive and significant when liquid liabilities of financial institutions were used as a measure for the size of the financial system. This relationship is more evident in regressions that use pooled cross-sections and this indicates that FD has an impact on economic growth in the long run. When credit by banks and credit to the private sector are used as measures for FD, the results are less conclusive. Their interpretation of the mixed results is that aggregate indicators of FD in their sample of countries do not fully capture the positive effects that the expansion of financial systems has on the allocation of resources into productive activities, or they may be an illustration of low efficiency of the financial systems.

Motivated by the fact that evidence from African countries is still very limited, Aziakpono (2005a) used two indicators of financial intermediation and the Zellner seemingly unrelated regression estimation method to study effects of FD on economic growth in the SACU countries. The results were mixed across countries, and suggest that for South Africa the relationship between FD and economic growth is strong, while it is very weak for Botswana and Lesotho. On the other hand, evidence in the case of Swaziland is very weak. The study concludes that domestic financial intermediation is important in financially integrated markets, but SACU countries with less developed financial institutions such as Lesotho and Swaziland need to develop their financial systems and attend to other institutional and structural problems in their economies in order to benefit from FD. In Botswana more effort

should be directed to changing the pattern of credit to the private sector so that it is more skewed to businesses for productive investments than to households for consumption.

Aziakpono (2005b) focused on financial development and economic growth in Lesotho using co-integration and the vector error correction model (VECM) for the period 1980-2001. The results still indicate a weak relationship between financial intermediation and growth as found in his earlier study (2005a). The results show a lack of mutual causality between the two variables but they do not rule out the importance of FI in enhancing economic growth. The low and declining level of FI in Lesotho has resulted in a decelerated economic growth process. Also growth plays little or no role in stimulating the development of FI in the economy; instead it hinders the development (Aziakpono, 2005b:24). Mohapi and Motelle (2006) researched the causality between financial intermediation and real GDP growth in Lesotho using the Granger causality test and the VECM based causality test. Their results coincided with Aziakpono (2005b): they also found no co-integration between these variables.

African countries literature that has investigated this relationship and found positive results include Abu-Bader and Abu-Qarn (2008) and Padachi *et al.* (2007). Results for Egypt strongly support a relationship between FD and economic growth in the study carried out by Abu-Bader and Abu-Qarn (2008). They found that FD causes economic growth through increasing investment efficiency or through increasing resources for investment. They apply a trivariate VAR framework and Granger causality tests using the co-integration and vector error correction (VEC) methodology. The aim of Padachi *et al.* (2007) was to investigate the empirical link between financial development and economic performance for 44 African countries for the period 1979-2002 using panel data regression techniques. Results show that financial development has a positive and significant effect on the level of economic growth but its contribution is very small compared to the other explanatory variables such as investment, openness and quality of human capital.

In a recent study on African countries Gries *et al.* (2009) did not find a significant relationship between FD and economic growth. They applied the Hsiao-Granger method using bivariate and trivariate vector autoregressive model for 16 sub-Saharan African countries. Their results suggests that there is limited support for the relationship between FD and growth, as all the countries they studied have failed to benefit from financial deepening.

In general, studies done on African countries find either mixed results or an insignificant relationship between FD and growth. The scarcity of African literature in this research area, especially the relationship between FD and sectoral growth, still needs more exploration, hence the motivation for this study.

2.4 CONCLUSION

This chapter reviewed both theoretical and empirical literature on the relationship between FD and economic or industry growth, and paves the way for the following chapters of this study. The first section discussed the theoretical relationship while the second section reviewed the empirical literature according to the choice of countries in the studies. The empirical review shows the impact of sample size, choice of countries, methodology and variables of the results. It also highlighted different explanations given in the literature in support of the results achieved.

It is quite evident that there is a relationship between growth and FD, but this relationship differs across countries because of various factors which include regulation, level of government participation in the economy, finance openness, trade openness, level of income, time periods etc. (De Gregorio and Guidotti, 1995:437). A number of studies have been carried out especially in developed countries on this relationship, but there is no consensus as to whether FD spurs or follows growth.

The following chapter builds upon what has been discussed in this chapter by looking specifically at the background and development of the countries to be used in this study. It will assist in identifying variables suitable for these countries which will be included in the model specified in Chapter Four.

CHAPTER THREE:

AN OVERVIEW OF THE SACU COUNTRIES

3.1 INTRODUCTION

This chapter presents an overview of the SACU agreement, the economic, manufacturing and financial sector performance in the SACU countries. The development of these countries is compared using macroeconomic indicators, manufacturing growth and FD indicators. The chapter gives an analysis of whether there is any sign of a relationship between manufacturing growth and FD indicators. It is divided into six sections: Section 3.2 provides the background for the SACU agreement and its objectives. Sections 3.3, 3.4 and 3.5 analyse comparatively the countries' economic performance, manufacturing sector development and financial sector development respectively. Section 3.6 examines the banking sector development in relation to manufacturing sector growth. Lastly, Section 3.7 concludes the chapter.

3.2 BACKGROUND OF THE SOUTHERN AFRICAN CUSTOMS UNION (SACU) AGREEMENT

The SACU agreement was first signed on June 29, 1910, then again on December 11, 1969. The problem with these first two agreements was that South Africa had a lot of power over the other countries; it was the sole decision-maker over custom policies (SACU website, 2010). It also reserved open entry to the BLS¹³ market and the high common tariff made it very difficult for Southern African neighbouring countries to export to SACU (SACU website, 2010). As a result of all these factors, only South African manufacturers benefited from this agreement. For these reasons, BLS launched a complaint against the way in which the agreement was run and this led to the third agreement which was signed in 2002 and still operates today (SACU website, 2010). It addressed the three main factors which were an issue in the last two agreements: joint decision making processes, new revenue sharing formula and improved external trade. Currently the member countries are Botswana, Lesotho, Namibia, South Africa and Swaziland, and the SACU Secretariat is located in Windhoek, Namibia (SACU website, 2010).

The objectives of SACU as laid out in Article 2 of the 2002 SACU Agreement are¹⁴:

¹³ Botswana, Lesotho and Swaziland. At that time Namibia was still administered as part of South Africa.

¹⁴ The objectives are sourced from the SACU website: <http://www.SACU.int/>

- a. To facilitate the cross-border movement of goods between the territories of the Member States;
- b. To create effective, transparent and democratic institutions which will ensure equitable trade benefits to Member States;
- c. To promote conditions of fair competition in the Common Customs Area;
- d. To substantially increase investment opportunities in the Common Customs Area;
- e. To enhance the economic development, diversification, industrialization and competitiveness of Member States;
- f. To promote the integration of Member States into the global economy through enhanced trade and investment;
- g. To facilitate the equitable sharing of revenue arising from customs, excise and additional duties levied by Member States; and
- h. To facilitate the development of common policies and strategies.

Four of the SACU countries are also in the Common Monetary Area (CMA) which is a common currency and exchange control arrangement allowing free movement of capital, a currency peg by small members to the anchor country's currency, and harmonised exchange control on the capital account. The CMA countries are Lesotho, Namibia, RSA and Swaziland. The agreement was signed in 1986 replacing the former Rand Monetary Agreement (RMA), Namibia only joined in 1992 after its independence (Aziakpono, 2005a:9). Botswana left the RMA in 1976 and issued its own currency, Pula (Bank of Botswana, 2010). These three countries pegged their currencies to the RSA rand on a ratio of 1:1. In Lesotho, Namibia and Swaziland, the RSA rand is legal tender (US Department of State, 2010).

Implications of SACU agreement and CMA

Although integration of the countries is outside the scope of this study, it is imperative to highlight some important points under the topic that affect the choice of the model to be employed and also have an impact on the results. The SACU agreement resulted in highly interdependent economies: goods can be easily moved across the countries, as a result the small SACU countries represent a significant market for RSA goods and services (Kirk and Stern, 2005:172). Also because of the CMA, the countries are financially integrated, there is free cross-border capital flow, and local borrowers and lenders are free to use markets and intermediaries across the countries.

Following this integration and interdependency, the countries are likely to be affected by similar external shocks. With a 1:1 ratio of their currencies to the RSA rand, any movement in its value will also affect the value of the other currencies. The countries also forego individual monetary autonomy, except RSA because it leads monetary policy formula. Although Botswana has its own independent exchange rate system, since 1990 the Rand has carried a weight of approximately 60 to 70 percent of the currency basket to which the Pula is linked and as a result the Pula will also be similarly affected by the movements of the Rand like the other CMA member countries' currencies (Aziakpono, 2008:8).

3.3 ECONOMIC PERFORMANCE

The South African economy ranked number one in Southern Africa¹⁵, it falls under the 20 largest economies in the world (US Department of State, 2010). Since it is the most industrialized economy in the region, it supplies most of the services and goods to the rest of sub-Saharan African countries. Its annual GDP growth for 2008 was 3.7 percent, it had dropped from 5.5 percent in 2007 and went down by a further 1.8 percent in 2009 because of the global financial crisis (Statistics South Africa, 2009:1). In 2009, the largest industries in terms of nominal value added were Finance, real estate and business services: 21.7 percent; general government: 15.4 percent; and manufacturing: 15.1 percent (Statistics South Africa, 2009).

The economies of Lesotho, Swaziland and Namibia (LSN) have been affected by wars, political instability, droughts, bad economic policy, and other internal and external constraints (Allan and Ndikumana, 2000), and as a result they still remain highly dependent on RSA in terms of trade, investment and employment (Aziakpono, 2005a:12). For example in 2008 about 90 percent of imports in Swaziland came from RSA, while about 50 percent of exports go to RSA (CBS Annual Report, 2009). In the case of Namibia about 80 percent of imports come from RSA and most of its exports (about 23.5 percent) are to RSA or at least in transit through RSA (BON Annual Report, 2008). While in Lesotho about 78.2 percent of imports come from RSA and about 17.6 percent of total exports go to RSA (Masha and Kpodar, 2009:3). An extensive source of revenue in Lesotho and Swaziland is represented by

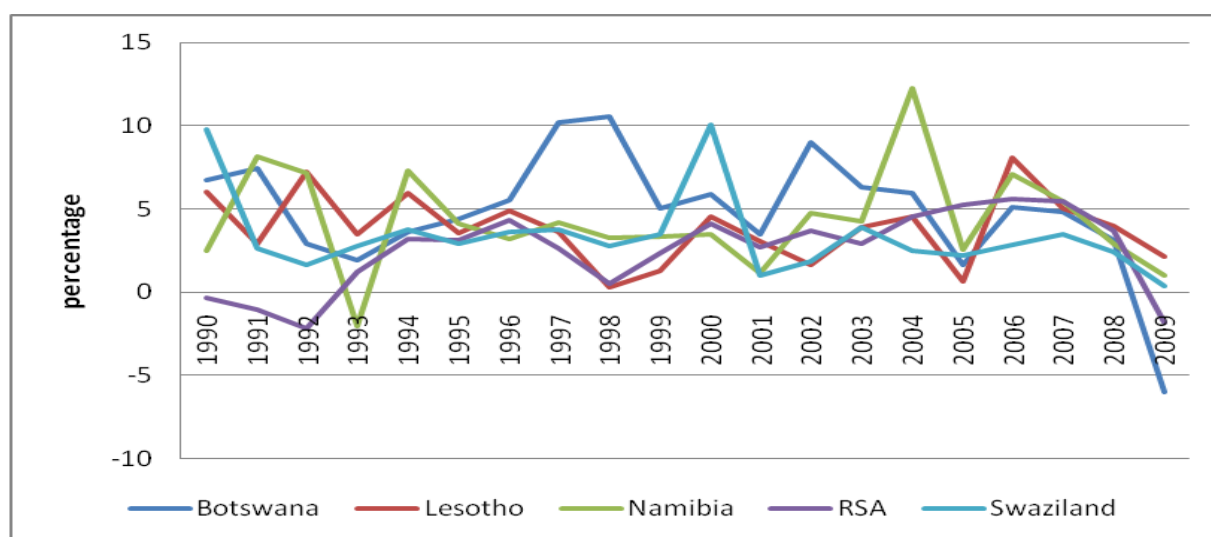
¹⁵ South Africa's GDP accounts for almost 25 percent of the entire African continent GDP (CIA world Factbook, 2010:1).

worker remittances from RSA, and Customs duties from SACU represent a large portion of their government revenue (CIA World Factbook, 2010).

Although Botswana also depends on RSA, especially with trade (about 83.5 percent of its imports are from RSA), it is one of the few African countries that have experienced rapid economic growth in the last decade because of a stable political and microeconomic environment and high diamond exports (Allan and Ndikumana, 1998). Its GDP at current prices rose by 11.1 percent from 2006/07 to 2007/08 financial year (Central Statistics Office, 2008:3). Despite this great performance, GDP reached a negative number of -6 percent in 2009 falling from 3.1 percent in 2008 because of the decreased demand for exports caused by the global recession (Central Statistics Office, 2008:4).

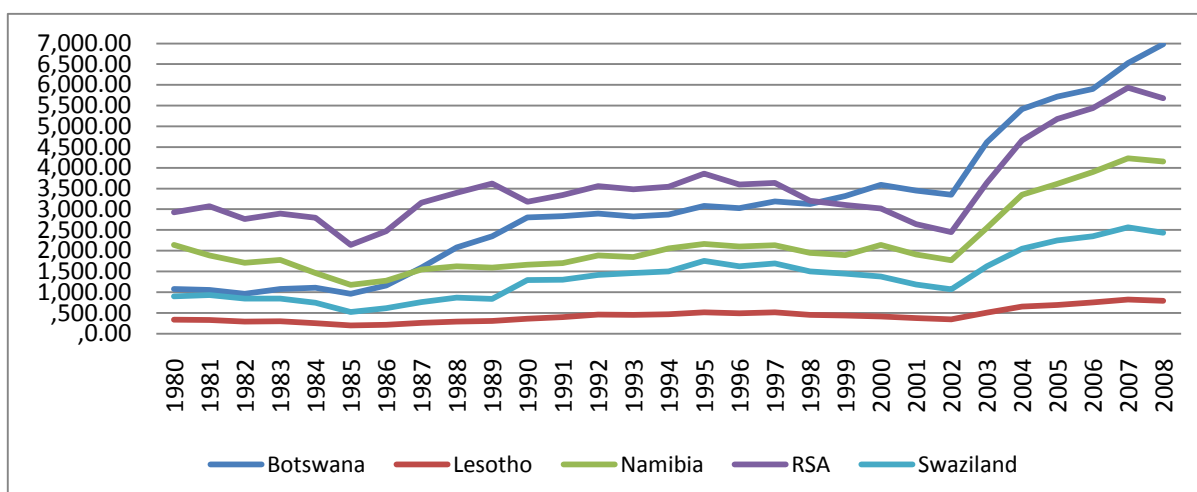
Figures 3.1 and 3.2 below present annual GDP growth and GDP *per capita* in the SACU countries. Lesotho and Swaziland have achieved positive economic growth in the past years, but regardless of this great performance, they have failed to reduce their poverty levels. Their GDP *per capita* has remained low, hence one of the reasons why they fall under the low income countries. On the one hand, Botswana, RSA and Namibia have shown a good performance except during the global financial crisis period.

Figure 3.1: Annual GDP growth



Computed by author based on data from world development indicators, 2010

Figure 3.2: GDP per capita

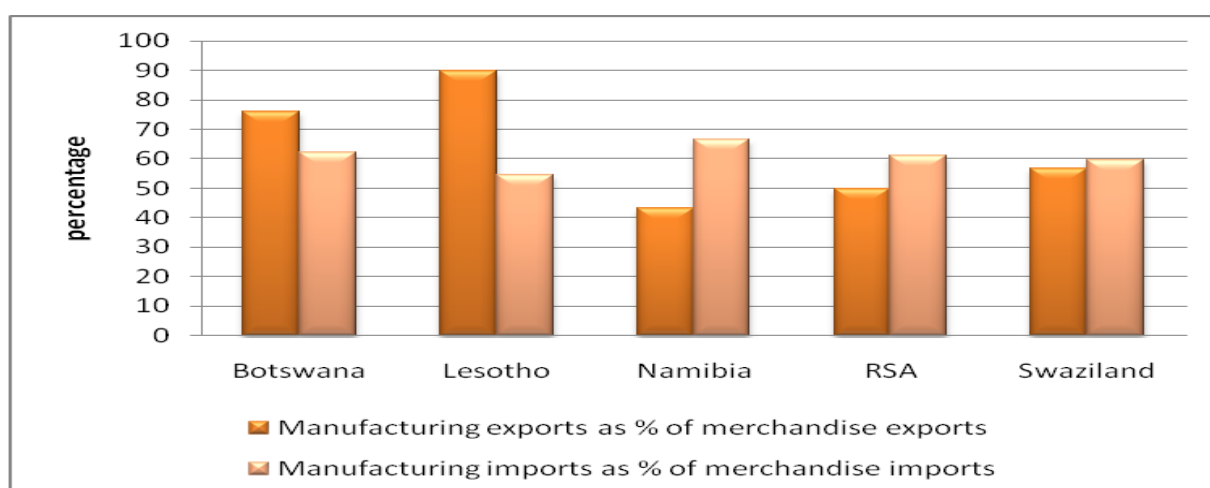


Source: Computed by author based on data from world development indicators (World Bank, 2010)

3.4 MANUFACTURING SECTOR GROWTH

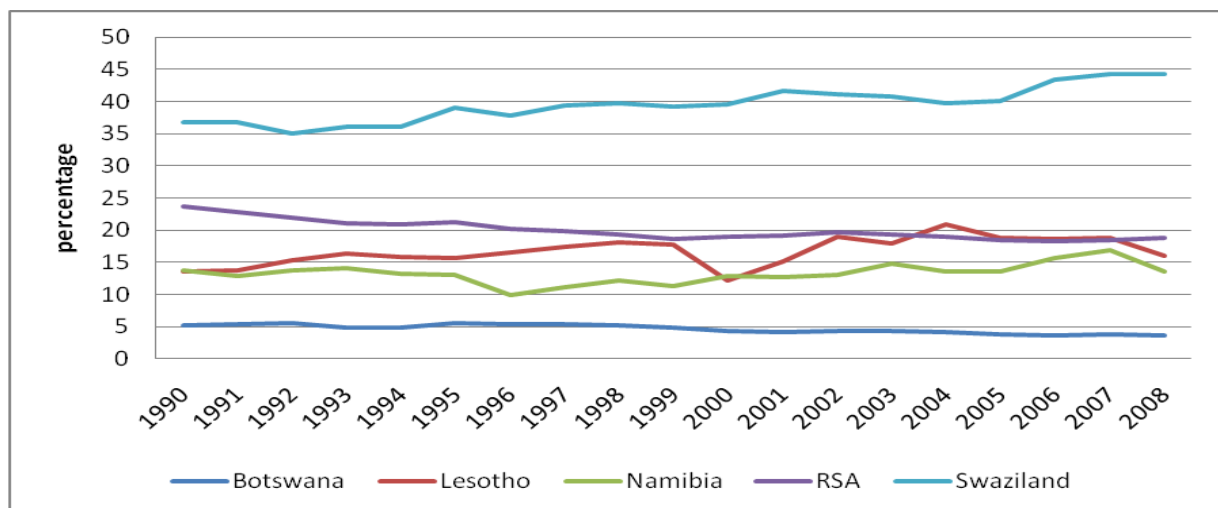
In most developing countries, the manufacturing sector plays an important role in job creation, trade and modernization of the economy. The development of the manufacturing sector differs across countries because of the business environment, which can be assessed by its market size, access to manufacturing inputs, infrastructure, price volatility, governance (legal system and crime prevention) and human capital (Tybout, 2000:14). These factors are usually very poor in the developing countries, hence low investment levels.

Figure 3.3: Manufacturing exports and imports, 2000-2008



Computed by author based on data from world development indicators, 2010

Figure 3.4: Manufacturing value added as percentage of GDP



Source: Computed by author based on data from world development indicators (World Bank, 2010)

The South African manufacturing sector has performed in a relatively disappointing manner when looking at the value of its exports (see Figure 3.3) and production since 2004 (Faulkner and Makrelov, 2008:1). Production was stagnant between 2004 and 2007, and then in 2008 it went down drastically following the world economic crisis (Statistics South Africa, 2010). Namibia's manufacturing sector has also experienced very slow growth because of various reasons including dependence on imported goods, limited funding for manufacturing investments, widely dispersed population, lack of skilled labour force and high relative wage rates, and competition from South Africa (CIA World Factbook, 2010). It contributed about 16.9 percent of GDP in 2007 and it went down to 13.5 percent in 2008 as seen in Figure 3.4 below (BON Annual Report, 2008:183). Research has shown that the Namibian manufacturing sector has a great potential to boost the economic growth (BON Annual Report, 2008).

In Botswana the manufacturing sector is relatively small due to small domestic market, weak infrastructure and small skilled labour (Central Statistics Office, 2008). The manufacturing sector accounted for an estimated 3.53 percent of Botswana's GDP in 2008 (see Figure 3.4 below), but it employed more labour than the mining sector which contributed about 38 percent of GDP in 2008. The total employment in manufacturing sector was 35,888 while in mining and quarrying it was 11,673 in 2008 (Central Statistics Office, 2008:77).

The manufacturing sector in Lesotho has experienced significant growth in the past years through an increased number of Asian textile and clothing factories. The reason behind this

development was the African Growth and Opportunity Act (AGOA) signed by America in 2000 which gave developing African countries the opportunity to export selected products duty free to the USA (Schaefer and Markheim, 2006). The agreement caused Asian firms to relocate their production to the least developed countries, including Lesotho, and made a great impact on the countries' growth and export revenue (Majoro, 2006:5). The direct impact of this move was increased employment in the country. In 2008 textile and clothing factories employed approximately 41,753 out of a total manufacturing employment of about 46,925 (Bureau of Statistics Lesotho, 2009). The lower unit labour cost in the country enhanced the domestic competitiveness and increased productivity (Majoro, 2006:5). Figure 3.4 below indicates that after 1998 a downturn in manufacturing value added as percentage of GDP was the result of the 1998 political unrest in the country. In 2005, the sector experienced a decline in total employment and value added as a percentage of GDP because of the removal of textile quotas, and a lot of firms shut down, but in 2006 there was a slow recovery (Bureau of Statistics Lesotho, 2009).

In Swaziland the manufacturing sector forms a substantial part of GDP as shown in Figure 3.4, even during the years that its GDP growth was declining (between 2007 and 2009 as shown in Figure 3.1), manufacturing value added per GDP was still increasing and this shows that the manufacturing sector contributes a substantial amount to the country's economic growth. It is also a major employer, second only to agriculture: it employed about 26 percent of the work force in 2009. The textile manufacturing industry flourished when RSA still had high tariffs because they had a competitive advantage, but after equalising them, the growth of the sector started to diminish (Swaziland Business Year Book, 2002).

3.5 FINANCIAL SECTOR DEVELOPMENT

i. Financial sector background

The financial systems of LSN are underdeveloped and as a result provide inefficient services which leads to citizens crossing the border to RSA. They are characterized by limited financial products and financial innovation, wide interest rate spreads, weak legal systems and low levels of competition (Gries *et al.*, 2009:1850). The fact that they are members of SACU and CMA enable the citizens to take advantage of interest rate differential, find investment opportunities and spend their income across the border, especially in RSA. In

addition, the high credit cost scares away entrepreneurs and as a result development of the private sector is stagnant.

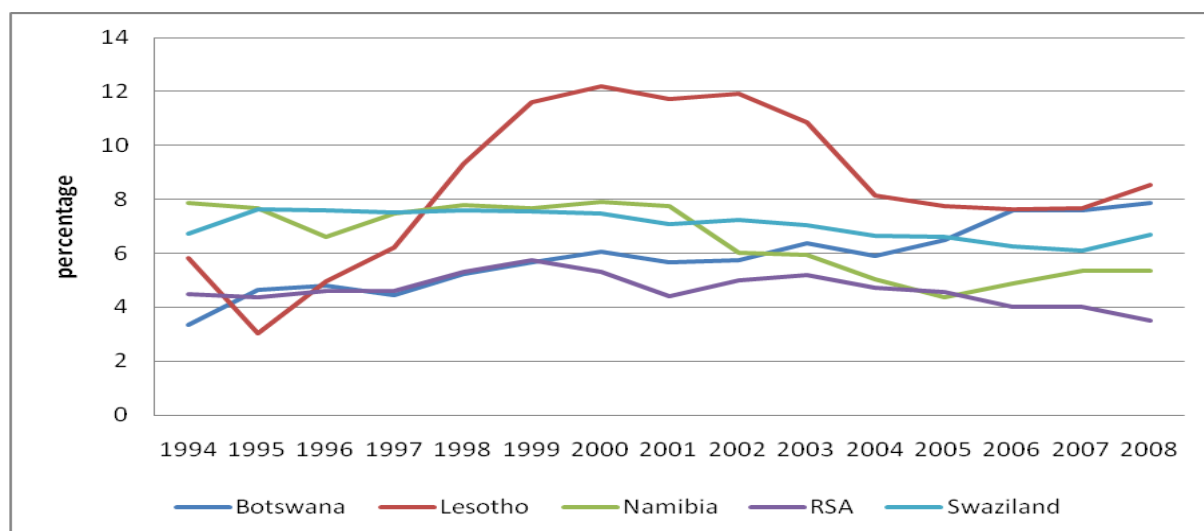
The financial sector in RSA is very large compared to the other SACU countries and it offers a competitive return on investments: its deposit rate was 11.61 percent in 2008 compared to 8.67, 7.64, 8.38 and 8.17 percent respectively in BLNS (World Bank, 2010). It comprises an independent reserve bank (SARB)¹⁶, 35 domestic banks of which the five largest account for over 80 percent of the banking operations, well-developed capital markets centred around the JSE, short-term and long-term insurers (South Africa Online, 2010). The banking system was not severely affected by the global crisis because it was not exposed to the high risk securities that caused the crisis. Following RSA in the SACU region is Botswana. Its banking system is one of the most advanced systems in Africa: it is sound and competitive. The banking sector was also not shattered by the global recession: in 2008 it still reflected satisfactory results (Heritage, 2010). In 2006 the banks accounted for 46 percent of financial sector assets (US Department of State, 2010). The government abolished exchange controls in 1999, and this gave birth to new portfolio investment options and also contributed to the growth of the Botswana Stock Exchange. The central bank is called the Bank of Botswana and was established in 1976 after withdrawing from the Rand Monetary Area (Bank of Botswana, 2010).

ii. Banking sector development

Several indicators can be used to gauge the development of the banking sector, including interest rate spread, domestic credit, liquid liability of banks etc. Interest rate spread is used as the measure of the level of efficiency in the banking sector: high spread is a sign of inefficiency in the banking sector and low levels of FD (Aziakpono, 2005a:11). Figure 3.5 below shows interest rate spread over time for the SACU countries and emphasises what has just been discussed above, that RSA has the most developed financial sector in the SACU region.

¹⁶ South African Reserve Bank.

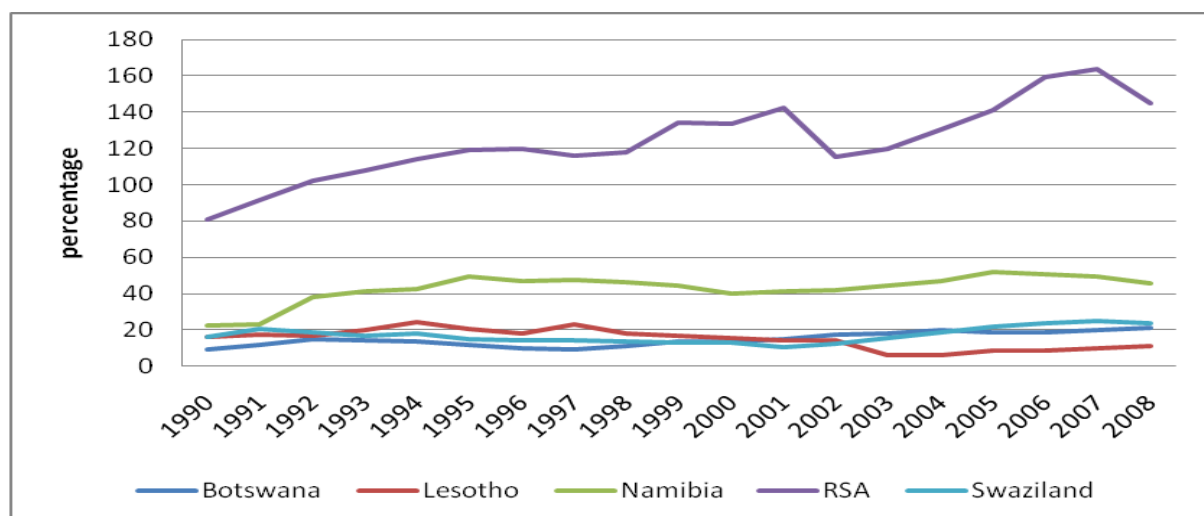
Figure 3.5: Interest rate spread



Source: Computed by author based on data from world development indicators (World Bank, 2010)

Domestic credit provided by commercial banks to the private sector (FIC) excludes credit issued to government agencies and public enterprises. Credit to the private sector has a more positive impact on the investment level and productivity, and as a result it is a good measure of FD (Ali and Hassan, 2008:10). Also, the allocation of credit to the private sector first goes through a strict detailed screening process, and as a result funds are allocated to productive investment projects (Ali and Hassan, 2008:10). Figure 3.6 shows the level of FIC of the SACU countries and it can be seen that the RSA ratio is by far the highest in all the years, showing high levels of FD. Namibia comes second after RSA, while Botswana, Lesotho and Swaziland appear to have similar levels of FIC.

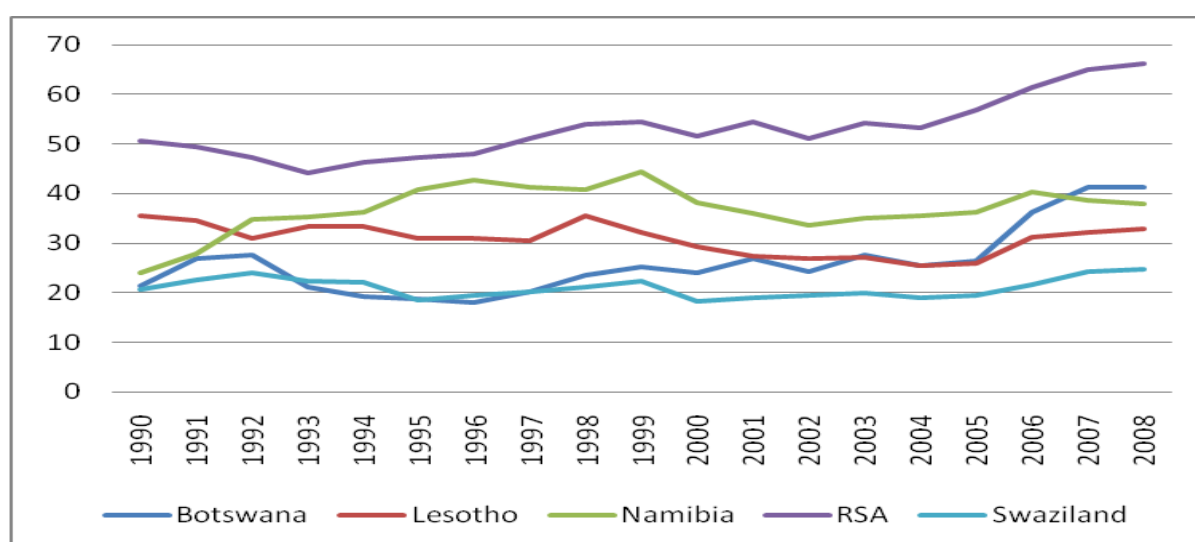
Figure 3.6: Credit to the private sector as percentage of GDP



Source: Computed by author based on data from world development indicators (World Bank, 2010)

The liquid liabilities ratio is represented by demand deposits plus time and savings deposits as a percentage of GDP. The liquid liabilities ratio is a widely used indicator for FD and in some studies it is measured using broad money ratio, either M2 or M3. The broad money ratio shows the real size of a growing economy in which money gives a valuable payment and saving service (Ali and Hassan, 2008:10). The main criticism behind this ratio is that currency held outside the banking sector forms a great part of broad money in developing countries and therefore it may indicate extensive use of currency instead of growth in the amount of bank deposits (Aziakpono, 2005a; Ali and Hassan, 2008). As a result, demand deposits plus time and savings deposits is a better measure over broad money for this study. Figure 3.7 below shows that RSA is still in the lead for all countries, followed by Namibia, but after 2007, Botswana rises above Namibia.

Figure 3.7: Liquid liabilities as percentage of GDP



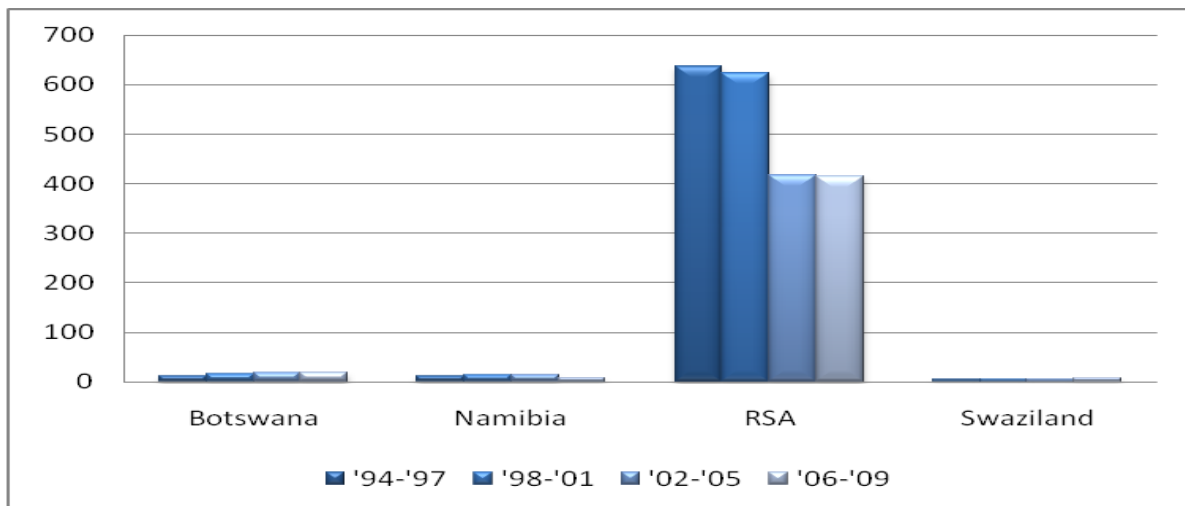
Source: Computed by author based on data from Thompson DataStream

iii. Capital markets development

BLSN financial systems are dominated by commercial banks which are dominantly owned by RSA; from Figures 3.8 and 3.9 below, it is evident that the stock markets in Botswana, Swaziland and Namibia are very small (measured by market capitalisation as percentage of GDP and number of domestic companies listed) compared to the RSA JSE. The RSA stock market¹⁷ is by far the largest in this region and in sub-Saharan Africa as a whole. Lesotho does not have a stock market.

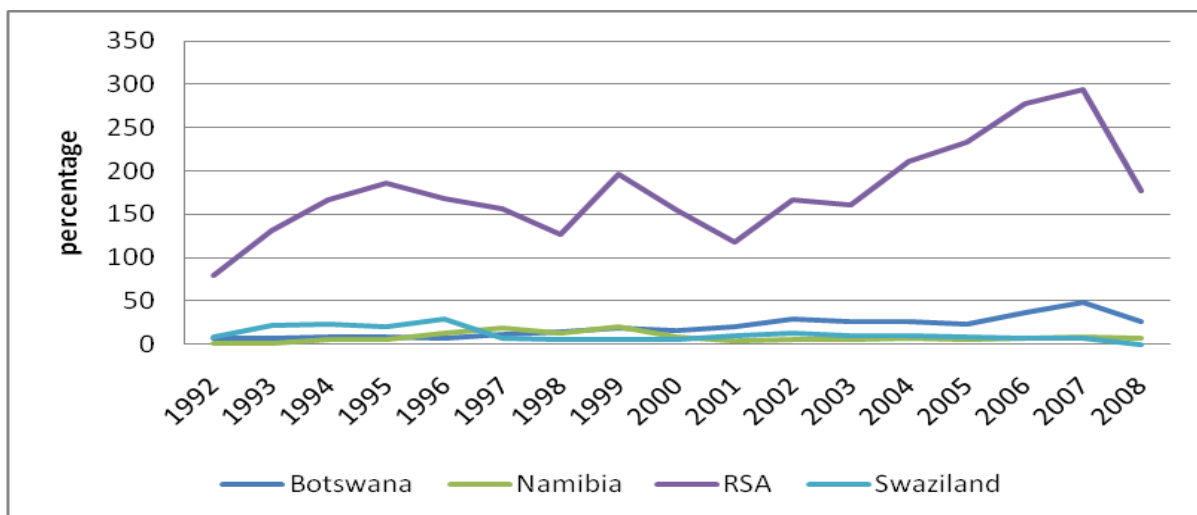
¹⁷ It ranks 17 in the world in terms of market capitalisation (World Bank, 2010).

Figure 3.8: Domestic listed companies



Source: Computed by author based on data from world development indicators (World Bank, 2010)

Figure 3.9: Market capitalisation as percentage of GDP



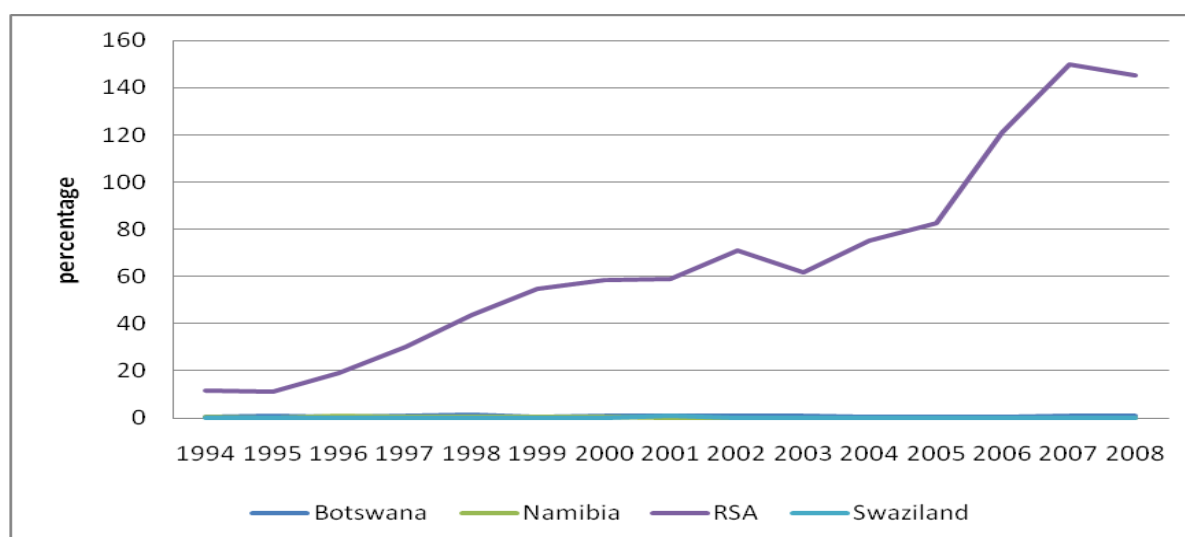
Source: Computed by author based on data from world development indicators (World Bank, 2010)

With reference to Figure 3.9 above, from 2001 to 2007 RSA and Botswana have reflected an upward trend, although the growth was very small in Botswana, while Namibia and Swaziland do not show a significant growth at all. After 2007, the trends of RSA and Botswana market capitalisation as a percentage of GDP start to show a downward movement because of the effects of the global crisis.

The total value traded is a measure of the stock market liquidity. The higher the value of stock traded, the more liquid is the stock market: it is an indication of the prevailing demand and supply of securities in the stock market. Illustrated by Figures 3.10 and 3.11 below, RSA is the most liquid market measured by total value of stock traded as percentage of GDP and

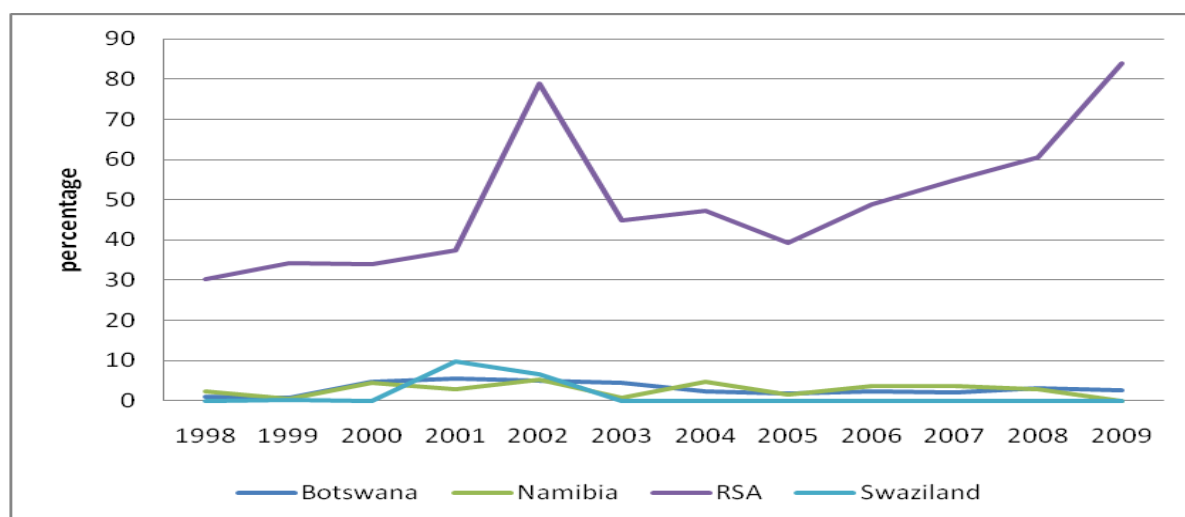
turnover ratio (total value of stock traded divided by market capitalisation). The other three markets have very insignificant ratios. All the indicators used to show the development of a capital market show that the RSA capital market is highly developed and very active compared to the other SACU countries.

Figure 3.10: Total value of stock traded as a percentage of GDP



Source: Computed by author based on data from world development indicators (World Bank, 2010)

Figure 3.11: Turnover ratio (%)



Source: Computed by author based on data from world development indicators (World Bank, 2010)

3.6 BANKING SECTOR DEVELOPMENT AND MANUFACTURING GROWTH

Table 3.1 presents the correlation results between FD indicators and manufacturing sector growth (manufacturing value added, annual growth). RSA is the only country which has a high correlation of 0.66 between manufacturing sector growth and private sector credit.

Lesotho has a positive insignificant correlation coefficient of 0.011, while Botswana, Namibia and Swaziland have negative correlation coefficients. The correlation results between manufacturing growth and liquid liabilities of banks also reveal a weak relationship. RSA and Namibia has positive correlation coefficients of 0.253 and 0.021 respectively. In Botswana, Lesotho and Swaziland, the correlation coefficients are negative. RSA has maintained a positive correlation coefficient for both indicators though it was very small for liquid liabilities. Botswana and Swaziland maintained negative correlation coefficients for both indicators while Lesotho and Namibia gave mixed results.

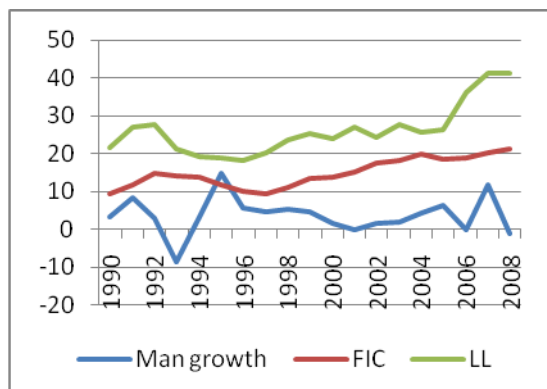
Table 3.1: Correlation results between FD and manufacturing sector growth

	MAN_BO	MAN_LE	MAN_NA	MAN_SA	MAN_SW
BO_FIC	-0.171	0.113	-0.066	0.296	-0.427
LE_FIC	0.061	0.011	0.025	-0.164	0.195
NAM_FIC	0.115	-0.060	-0.095	0.637	-0.536
RSA_FIC	0.047	-0.088	0.088	0.661	-0.500
SW_FIC	0.128	-0.364	-0.248	-0.032	-0.025
BO_LL	-0.044	-0.141	-0.070	0.056	-0.207
LE_LL	0.032	-0.430	-0.129	-0.472	0.411
NAM_LL	0.141	-0.085	0.021	0.491	-0.534
RSA_LL	0.074	-0.277	-0.058	0.253	-0.127
SW_LL	-0.128	-0.266	-0.310	-0.491	-0.010

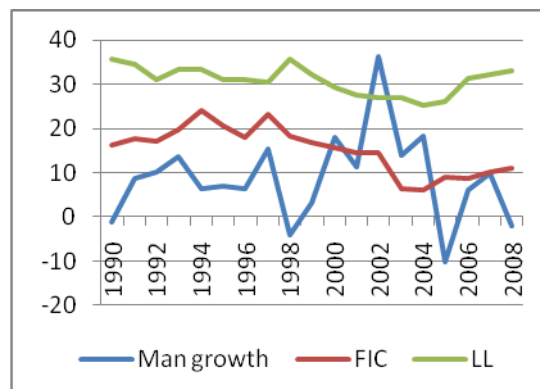
The link between manufacturing sector growth and FD was further demonstrated using graphs below, which confirm the results of the correlation coefficient: RSA is the only country that shows similar trends between FD indicators (especially FIC) and manufacturing sector growth. With the rest of the countries, the financial sector movements do not explain the whole period movement of manufacturing sector growth, although some similar trends in certain periods can be discerned.

Figure 3.12: Manufacturing sector growth and FD indicators

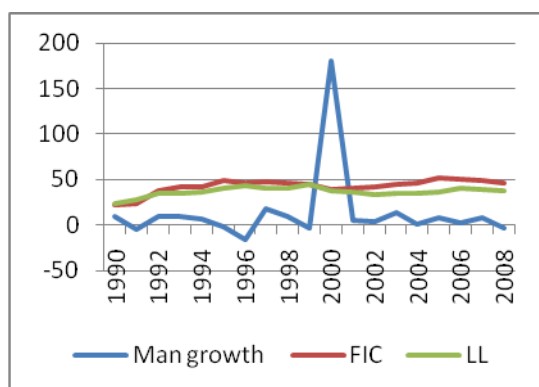
(a) Botswana



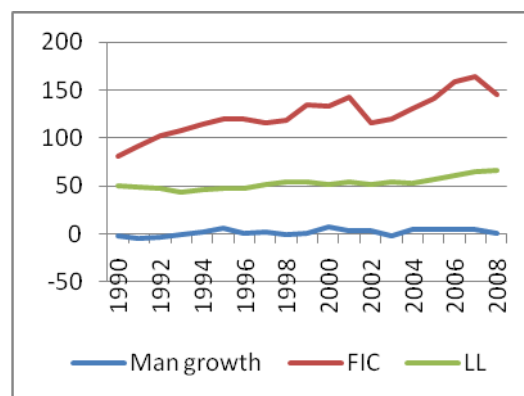
(b) Lesotho



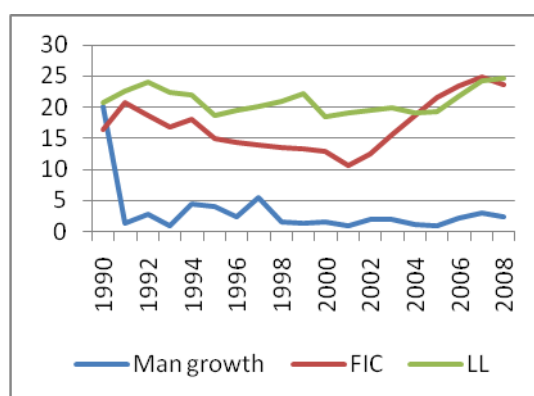
(c) Namibia



(d) RSA



(e) Swaziland



Source: Computed by author based on data from world development indicators (World Bank, 2010)

3.7 CONCLUSION

This chapter looked at the SACU countries background, and used historic data of the countries to build up on what to expect in the next chapters. Section 3.2 looked at the SACU

agreement background, what led to these countries being so integrated and dependent on each other, especially on RSA. Then the following three sections compared the performance of the countries using their economic performance, manufacturing sector growth and financial sector development. The graphs in this section indicate that RSA has a more developed financial system than the other SACU countries. Lesotho and Swaziland have the most underdeveloped financial systems. Section 3.6 examined whether there is a possible link between FD indicators and manufacturing sector growth. Findings indicate that the link is very weak and in most cases negative. RSA is the only country with a positive significant relationship.

As the theoretical and empirical literature reviewed in Chapter 2 suggests, industries that depend highly on external finance, such as the manufacturing sector, are expected to grow fast in countries with well developed financial systems (Arizala *et al.*, 2009:13). Looking at the above analysis, RSA has a well-developed financial sector, but growth in the manufacturing sector is very small. This is also evident in the case of Botswana, while the countries with underdeveloped financial systems (Lesotho and Swaziland) experience high growth rates in the manufacturing sector. This observation raises questions of whether the growth of the manufacturing sector in these countries was a result of development in their financial sector. .

The following chapter will outline the methods, variables and data to be used to address the goals of this study.

CHAPTER FOUR:

METHODOLOGY AND DATA DESCRIPTION

4.1 INTRODUCTION

The main aim of this study is to determine if there is a relationship between FD and manufacturing sector growth in the SACU countries. This chapter outlines the analytical framework that will be used to achieve this objective and the others mentioned in Section 1.3. It builds on the previous chapters which provided the theoretical and empirical background on the relationship and also the background of the countries under study. These laid a foundation and helped in the selection of the model and the variables to be used.

The chapter is divided into four sections. Section 4.2 discusses the model that is used in this study and discusses the variables that will be included in the model, how they are going to be measured and the expected impact of the control variables on manufacturing growth. Section 4.3 reviews the estimation techniques, and all the steps that will be carried out in order to reach a conclusion concerning the relationship are stipulated. The last section concludes the chapter.

4.2 MODEL SPECIFICATION

4.2.1 The model

Following Murinde (1996), Aziakpono (2005a) and Ekberg *et al.* (2007), this study will employ Zellner's seemingly unrelated regressions estimation (SURE) method for the empirical analysis. The advantage of this approach over a cross-country panel data approach or dynamic panel data used by several authors (e.g. De Gregorio and Guidotti, 1995; Levine *et al.*, 2000; Rioja and Valev, 2003) is that it takes into account any possible heterogeneity across countries and cross-country interdependence (contemporaneous correlation). This estimation procedure is based on the assumption that countries can be affected by similar external shocks because they are in the same economic region¹⁸ and therefore very integrated. At the same time the countries have structural differences that affect the manufacturing sector growth endogenously, thus there is a potential for heterogeneity across countries (Murinde, 1996:101). As a result, individual country equations will be specified and estimated simultaneously. These single equations can be estimated separately using OLS, but because

¹⁸ SACU and CMA in the case of this study as outlined in Chapter 3.

of the high possibility of statistically significant correlation between the errors in the equations, this method will be inefficient (Ekberg *et al.*, 2007:9). The SURE model gives better and more reliable results than single equation least squares estimators.

The system of equations can be written in a simple notation as:

$$Y_i = X_i \beta_i + e_i \quad i=1, 2, \dots, N \quad (4.1)$$

where:

Y_i = Tx1 vector of observations on manufacturing sector growth,

X_i = T x k_i matrix with rank p_i of observation on p_i independent non-stochastic variables,

β_i = $k_i \times 1$ vector of regression coefficients,

e_i = Tx1 vector of random error terms, each with mean zero, i.e. $E(e_i) = 0$ but $E(e_i e_j) \neq 0$,

N = number of equations (which is four in this study, representing the four SACU countries namely Botswana, Lesotho, RSA and Swaziland),

T is the number of observations per equation (the sample period), and

k_i is the number of rows in the vector β_i . Y_i , the dependent variables. The matrix X_i is the exogenous and lagged independent variables including FD indicators.

The system of equations can also be presented by a common matrix notation as follows:

$$\begin{pmatrix} Y_1 \\ \vdots \\ Y_M \end{pmatrix} = \begin{pmatrix} X_1 & 0 \\ \vdots & \vdots \\ 0 & X_M \end{pmatrix} \begin{pmatrix} \beta_1 \\ \vdots \\ \beta_M \end{pmatrix} + \begin{pmatrix} e_1 \\ \vdots \\ e_M \end{pmatrix} \quad (4.2)$$

Matrix 4.2 consists of four individual country equations. The errors from each equation statistically conform to the standard linear regression model when taken separately, but the errors may also be correlated to the contemporaneous errors of the other countries (Aziakpono, 2005a:16). Although the countries may be influenced by common factors, there

are still structural differences and degrees of manufacturing sector development across the countries and these can result in variation of the coefficients, β_i in the model.

It is essential to test the two assumptions before estimating SURE. This is explored under the estimation technique below.

4.2.2 *Measuring financial development and manufacturing sector growth*

Amongst the various measures of FD used in the literature, the choice of indicators in this study was based on data availability and commonly used measures to enable comparison of results. Also, following the analysis in the previous chapter, it is evident that the financial systems in the SACU countries except RSA are bank-based therefore market-based indicators are not included in the study. The indicators used are the ratio of credit extended to private sector by commercial banks as a percentage of GDP (FIC) and the ratio of liquid liabilities of commercial banks to nominal GDP (LL). The log forms of these measures are used thus, LFIC and LLL. The disadvantage of using only bank-based measures is that they exclude other activities in the financial sector; for example RSA has a well-functioning stock exchange which has a significant impact on the financial system as a whole, therefore excluding the market-based indicators might not give a true picture of the development of its financial sector (Aziakpono, 2008:173). To be consistent with other SACU countries, measures applicable to all of them are used.

Different measures of manufacturing sector performance have been used across studies: manufacturing GDP (Neusser and Kugler, 1998); manufacturing/industry level TFP (Neusser and Kugler, 2008 and Arizala *et al.*, 2009); growth rate of manufacturing value added (Galindo and Micco, 2004). Due to data availability across the countries, this study will use log of manufacturing value added to GDP as a measure of growth in the manufacturing sector. The annual growth of manufacturing value added, used to perform correlation analysis in Chapter 3 was not included in the SURE analysis because it was only available from 1990 while the study time period is from 1976.

4.2.3 *Control variables*

The empirical review of FD and growth suggests various control variables relevant in studying this relationship, including inflation, population growth, trade openness, human capital, investment, interest rate spread, exchange rate and government expenditure. The

choice of the control variables included in this study was mainly influenced by data availability for all the countries and for the sample period selected. They are: inflation, government consumption, trade openness and investment. The expected effect of each control variable on manufacturing growth and how they are measured will be discussed.

i. Inflation

Inflation volatility is used to measure the degree of macroeconomic stability: a less volatile inflation is more desirable for the growth of an economy (Aziakpono, 2008:175). High rates of inflation alter economic activity and reduce investments in productive projects and therefore have a negative impact on growth (Allen and Ndikumana, 2000:144; Aziakpono, 2008:175). In this study inflation is measured by percentage change in CPI.

ii. Government consumption

Government consumption can affect growth negatively by crowding out private investment and inflationary effects resulting from its fiscal policy (Allen and Ndikumana, 2000:145). This will be measured as the log of percentage share of government expenditure in GDP.

iii. Trade Openness

Trade Openness can affect growth either positively or negatively. If exports increase the market for domestic products and also create foreign exchange reserve which can be used to import capital goods, then a positive effect on growth can be achieved. Also the positive effect of trade openness can arise if an increase in imports is associated with capital goods. The net effect can only be determined empirically (Allen and Ndikumana, 2000:145). It was established in the previous chapters that imports (generally from RSA) of finished consumer goods constitute a substantial amount of the small SACU countries' trade (Aziakpono, 2008:176). This can have a negative impact on the manufacturing sector growth by decreasing demand for domestic products and as a result discouraging growth. Trade openness is measured by the log of the sum of exports and imports as a percentage of GDP.

iv. Investment

Investment is expected to have a positive effect on growth as explained in Chapter Two when the role of a financial system was analysed. It will be measured by the log of the ratio of gross fixed capital formation to GDP.

Data sources

The study uses annual data sourced from the World Bank Development Indicators (2010), IMF IFS, Central Bank of Lesotho and Thompson DataStream. Following most studies, the lagged values of explanatory variables were used in order to avoid simultaneity bias (Aziakpono, 2005:175). Different combinations of lags were used to estimate the system of equations using least squares and the best performing combination was selected. Some of the variables (FIC, LL, inflation and government spending) performed well at the third lag, while others (trade and investment) performed better at lag two. Contemporaneous values of manufacturing value added to GDP were used. The time period is from 1976 to 2008, which gives 33 observations, but after being adjusted by the highest lag length in the equation (which is 3), they are reduced to 30 observations. The available data for Namibia for most of the variables mentioned above does not cover the sample period, it is available from 1990¹⁹ onwards. In order to have a balanced panel and reliable results, Namibia is not included in this analysis.

4.3 ESTIMATION TECHNIQUES

Following Hsiao (2003) we first start by stating a separate regression for each country:

$$y_{it} = \alpha_i^* + B_i'x_{it} + u_{it} \quad \begin{matrix} i=1, \dots, N \\ t=1, \dots, T \end{matrix} \quad (4.3)$$

where y_{it} is the natural logarithm of manufacturing value added as a ratio of GDP and x_{it} is the vector of explanatory variables including FD indicators.

The first step is to test whether a contemporaneous correlation exists. The assumption in this step is that the four equations are related through the non-zero covariance associated with the error term, meaning that each country error term may be correlated with the contemporaneous errors of the other country (Aziakpono, 2005a:14). Given that the covariances between the different equations are denoted by δ_{ij} , the null and alternative hypothesis will then be as follows:

$$H_0 = \delta_{12} = \delta_{13} = \delta_{14} = \delta_{23} = \delta_{24} = \delta_{34} = 0$$
$$H_1 = \text{at least one covariance is non-zero} \quad (4.4)$$

¹⁹ This is the year that Namibia gained its independence.

The Lagrange multiplier statistics suggested by Breusch and Pagan (1980) will be adopted in this step (Judge *et al.*, 1988:456). In our four equation case, the test statistic is:

$$\lambda = N(r_{21}^2 + r_{31}^2 + r_{41}^2 + r_{32}^2 + r_{42}^2 + r_{43}^2) \quad (4.5)$$

where r_{ij}^2 is squared correlation,

$$r_{ij}^2 = \frac{\delta_{ij}^2}{\delta_{ii}\delta_{jj}} \quad (4.6)$$

Under H_0 , λ has an asymptotic χ^2 distribution with 6 degrees of freedom. H_0 is rejected if a value of λ is greater than the critical value from a $\chi^2_{(6)}$ -distribution for a specified significance level (Ekberg *et al.*, 2007:10).

The second step is to test for homogeneity of the countries and it can be tested in two ways: the homogeneity of regression slope coefficients and the homogeneity of regression intercept coefficients. The test is performed in three steps: the first step is to test whether or not the slopes and intercepts are simultaneously homogenous among different countries, the second step is to test whether or not the regression slopes collectively are the same and the intercepts are not, while the last step tests whether or not the regression intercepts are the same, but the slopes are not.

If in the first step we accept the hypothesis (hypothesis of overall homogeneity), there will be no need to continue with the testing procedure. On the other hand, if we reject the first hypothesis, then we continue to step two in order to decide whether the regression slopes are the same. If the second hypothesis is not rejected, then we proceed to the last step, to establish the equality of regression intercepts.

In this step, we use one-way analysis of covariance following Hsiao (2003). The three types of restrictions that can be imposed on Equation (4.3) in order to test the sets of hypothesis are:

H_1 : regression slope coefficients are identical, and intercepts are not, i.e.

$$y_{it} = \alpha_i^* + B'x_{it} + u_{it} \quad (4.7)$$

H_2 : regression intercepts are the same, and slope coefficients are not, i.e.

$$y_{it} = \alpha^* + B_i'x_{it} + u_{it} \quad (4.8)$$

H₃: both slope and intercept coefficients are the same, i.e.

$$y_{it} = \alpha^* + B'x_{it} + u_{it} \quad (4.9)$$

The second hypothesis is seldom meaningful and therefore was ignored. The regression model (4.3) is referred to as unrestricted model, then (4.7) is the individual mean or cell mean corrected regression model while (4.9) is referred to as pooled regression. The least squares regressions of the three models were estimated and the corresponding residual sums of squares (RSS), (S1, S2 and S3) were obtained.

The F tests can be used to test hypotheses H₁ and H₃ under the assumption that u_{it} are independently normally distributed over i and t with mean zero and variance σ_u^2 . In effect, (4.7) and (4.9) can be viewed as (4.3) subject to different types of restrictions. For example, Equation (4.7) can be reformulated as Equation (4.3) subject to (N-1)K linear restrictions:

$$H_1: B_1=B_2=....=B_N \quad (4.10)$$

while Equation (4.9) can be reformulated as (4.3) subject to (K+1)(N-1) linear restrictions thus:

$$H_3: \alpha_1^*=\alpha_2^*=....=\alpha_N^*$$

$$B_1=B_2=....=B_N \quad (4.11)$$

The corresponding F statistics which can be used to test H₁ and H₃ respectively are:

$$F_1 = \frac{(S_2 - S_1)/[(N-1)K]}{S_1/[NT - N(K+1)]} \quad (4.12)$$

$$F_3 = \frac{(S_3 - S_1)/[(N-1)(K+1)]}{S_1/[NT - N(K+1)]} \quad (4.13)$$

F₁ has (N-1)K and NT-N(K+1) degrees of freedom. If F₁ is significant, the parameters are not homogenous, but if it is not significant, it means they are significant and therefore the extent of the intercepts heterogeneity can now be determined. The degrees of freedom for F₃ is (N-1)(K+1) and N(1-K-1); given this, if F₃ is not significant, the data can be pooled and a single

Equation (4.9) estimated. If it is significant, further tests are performed to find out if the non-homogeneity can be associated with heterogeneous slopes or heterogeneous intercepts.

4.4 CONCLUSION

This chapter presented the analytical framework that was applied to establish the relationship between FD and manufacturing sector growth in the SACU countries. In Section 4.2, the SURE model was specified and, based on the previous chapters, the variables included in the model were discussed. The explanatory variables included FD indicators and a set of control variables (inflation, government consumption, trade and investment). The choice of the variables was influenced by the data availability in the countries used in this study. This section also described the source of data that is used. Section 4.3 explained the estimation techniques followed: the contemporaneous correlation test and homogeneity tests. These two tests determine whether the SURE model is the right estimation method for this study.

The following chapter will apply the specified model and techniques presented in this chapter in order to attain the objectives of this study.

CHAPTER FIVE:

EMPIRICAL RESULTS AND DISCUSSION

5.1 INTRODUCTION

This chapter presents the empirical results of the tests. It follows the methodology outlined in the previous chapter in order to address research objectives presented in Section 1.3, make conclusions and also make recommendations which will follow in the next chapter. The chapter is divided into four sections including this introduction. Section 5.2 discusses the SURE results; first, it starts with the preliminary tests carried out to determine whether a single equation estimation or system regression should be employed in this study. They are the Lagrange multiplier (LM) test to test for the existence of contemporaneous correlation among the error terms and F- tests to test for the hypothesis of homogeneity among the cross section of the countries. Then the system results obtained from estimating Zellner SURE are analysed by stating the effects of financial indicators and control variables on manufacturing sector growth. Section 5.3 concludes the chapter.

5.2 SURE RESULTS

It is very important to begin the empirical analysis with the test of contemporaneous correlation among the error terms and testing the hypothesis of homogeneity of the countries as this will confirm whether the chosen estimation method is appropriate for the set of countries used in this study. Least squares estimation was used for both tests and two variances of Equation 4.3 were estimated with alternative FD indicators as the explanatory variable.

5.2.1 Contemporaneous correlation results

The two different sets of least squares residual covariance tables were obtained and used to test for contemporaneous correlation. The following values of λ were obtained:

Eqn1: FIC $\lambda = 15.58$

Eqn2: LL $\lambda = 17.12$

In order to use SURE, the error terms must not be significantly different, meaning they should be contemporaneously correlated. The 1% and 2.5% critical value from χ^2 -distribution with 6 degrees of freedom are 16.812 and 14.449 respectively (Brooks, 2008).

The values of λ above are greater than the critical values and therefore we reject the null hypothesis and conclude that there is contemporaneous correlation between the error terms.

5.2.2 Homogeneity of parameters results

Three models were estimated for each FD indicator, the unrestricted and two restricted models (Equations 4.3, 4.7 and 4.9). The corresponding RSS were obtained and used to test for hypothesis of homogeneity of the countries stated in Chapter 4. Table 5.1 below reports the results obtained from testing overall homogeneity (H_3) and slope homogeneity (H_1) across the cross-section of countries. The F-stat is greater than F (table-value) for both hypotheses and therefore they were rejected. Based on these results, we can conclude that the intercepts and slope coefficients are different across the cross-section of countries. These results imply that it will be appropriate to use the SURE method.

Table 5.1: Tests for regression coefficient homogeneity across countries

Hypothesis	F-Stat	Degrees of Freedom		F _(table-value)	Decision
		Numerator	Denominator		
Eqn1(FIC)					
H ₁	3.215	27	20	2.78	Reject
H ₃	22.153	21	20	2.94	Reject
Eqn2(LL)					
H ₁	2.597	27	20	2.04*	Reject
H ₃	30.016	21	20	2.94	Reject

*5% critical value, the other three are 1% critical values

After establishing that SURE is the appropriate method to be employed, a system of equations was estimated instead of single equations. As explained in the previous chapter, this method gives better results than OLS estimation of individual country equations with less correlated explanatory variables but highly correlated disturbances.

Both models²⁰ performed well: the adjusted R^2 (reported in Table 5.2) is very high implying that the independent variables have a high explanatory power. The average adjusted R^2 for the first model is 0.7990 and 0.7691 for the second model. The following subsections give a

²⁰ These refers to the model that used FIC as a measure of FD and the one that used LL as a measure of FD.

detailed review of the results obtained relating to the relationship between the two indicators of FD and manufacturing growth and the contribution of the control variables in the model.

5.2.3 Effects of FD on manufacturing growth

Table 5.2 gives a summary of the results of the effects of FD on manufacturing sector growth in each country. The coefficients for FIC were negative for Lesotho, RSA and Swaziland and positive for Botswana. Although Botswana has a positive coefficient, it is not significant. On the other hand, only RSA and Swaziland have a highly significant negative relationship. When using liquid liabilities as a measure of FD, Botswana and Swaziland had a negative relationship while Lesotho and RSA had positive coefficients. Regardless of the mixed signs across the countries, all of them were insignificant.

In general, results show that there is a weak relationship between FD and manufacturing sector growth in the SACU countries. Comparing the two models, the first one, which used FIC as proxy for FD, performed better than the second model in terms of adjusted R^2 and significance of FD indicator (which is our focal explanatory variable).

Table 5.2: SURE estimation results: FD and manufacturing growth

Country	FD indicator	Adjusted R^2	Coefficient	Probability
Botswana	FIC	0.713	0.070	0.295
	LL	0.798	-0.120	0.213
Lesotho	FIC	0.728	-0.067	0.467
	LL	0.663	0.101	0.372
RSA	FIC	0.890	-0.269	0.000
	LL	0.800	0.118	0.374
Swaziland	FIC	0.865	-0.482	0.000
	LL	0.816	-0.105	0.418

i. Botswana

The overview of the SACU countries in Chapter Three showed that Botswana has a well-established financial sector compared to other small SACU countries such as Lesotho and Swaziland. The results obtained in this study however indicate that the developed financial sector does not stimulate manufacturing growth as the relationship was found to be insignificant. The manufacturing sector contributes a very small percentage to total GDP; the growth in this sector has been very small regardless of government intervention to stimulate its development. Zizhou (2009) mentions some of the hindrances to the development of this sector in Botswana, including lack of domestic skills and entrepreneurial skills, small size of the domestic market, and lack of or small input base meaning that all raw materials have to be imported and the transport costs are very high because of the landlocked position of the country. All these factors, and many others, make the manufacturing sector in this country a very risky investment for both foreign and domestic investors.

These results are consistent with the findings of Aziakpono (2008) who concluded that there was no evidence of FD positively affecting economic growth in Botswana. Positive results were expected because of the high developed financial sector. The possible explanation for these results is that financial resources are mostly spent on consumption of goods which are imported from South Africa instead of investing in productive projects (Aziakpono, 2008:195).

Another possible factor for our results is the high value of the Botswana currency, the Pula. It has a higher value than the Rand and this gives RSA markets a competitive advantage over domestic markets. The SACU agreement allows free movement of goods across the member countries, therefore locals can spend their funds in RSA where they will get more for their money than they could have obtained locally. This further disadvantages local manufacturing.

ii. Lesotho

The structure of the manufacturing sector in Lesotho is mainly dominated by the clothing and textile industries owned by foreign companies. As a result the financing of the establishment of these industries comes from foreign countries, the capital does not come from the domestic financial sector. It is therefore no surprise to find that the relationship between FD and manufacturing sector growth is insignificant.

The clothing and textile industries are more labour intensive than capital intensive, hence the high level of employment in Lesotho. Although these industries employ over 50 percent of the manufacturing sector, the salaries are very low (Bureau of Statistics Lesotho, 2010:1). The sector has played a great part in the economy by decreasing the unemployment level and increasing exports. However, the low income received by workers in the clothing and textile industries is not injected back to the economy through savings which will increase available funds for investment but is mainly spent on consumption.

Analysis of the financial sector in Lesotho showed that the sector is highly underdeveloped and is characterised by high inefficiency, high cost of credit and low interest on deposits (i.e. high interest rate spread), and limited financial instruments. Because of all these factors, it becomes very expensive for borrowers to get credit in the domestic financial sector and invest in projects. Also, this discourages entrepreneurship in the country.

As in Botswana, a large portion of credit acquired is directed to consumption and not spent on investment, resulting in a negative impact on manufacturing sector growth.

iii. RSA

The manufacturing sector in RSA has diversified over the years from being concentrated in mining activities to being dominated by industries such as agriprocessing; automotive; chemicals; ICT and electronics; metals and textiles; and clothing and footwear. Although the sector has experienced low levels of growth, it still contributes substantially to the economy. On the other hand the RSA financial sector has achieved great development. Following all these factors, we would expect a strong positive relationship between the two sectors, but the results state otherwise: they show that the significant relationship found between FD and manufacturing sector growth in RSA is negative.

This is not consistent with the correlation coefficient results found in Chapter Three, which show that the correlation between FIC and manufacturing sector growth is positive and high (0.661). The results found in Aziakpono (2005a) also show a positive relationship between FD and economic growth. Following from those results, it would be expected that the relationship would have been positive and significant. It is therefore surprising that the results are negative. Further investigation is called for to unravel this negative result.

iv. *Swaziland*

Although as shown in Figure 3.4 in Chapter Three, the manufacturing sector's contribution to GDP is very high in Swaziland, financial development has a negative effect. The negative financial development is consistent with the findings of Aziakpono (2005a) which were about the relationship between FD and economic growth. These results are also in line with the correlation analysis results that gave negative coefficients for both FD indicators.

Swaziland is the only country that gave negative coefficients for both FD indicators and FIC is highly significant, as in the case of RSA. The manufacturing sector is dominated by private sector enterprises (CBS Annual Report, 2009). The sector performed very well during the sanctions in RSA resulting from political instabilities in the 1980s as some industries relocated to Swaziland from RSA. In the 1990s when sanctions were removed, the sector started to experience difficulties as most of the industries moved back to RSA (Kirk and Stern, 2005:173).

Swaziland is suffering from similar problems to Lesotho. These include underdevelopment and inefficiency of the financial system, low income levels, lack of saving culture, high consumption spending, high spending on imports of goods and capital mobility amongst the CMA member countries. Neusser and Kugler (1998:645) state that access to foreign financial markets (high degree of capital mobility) could lead to the negative impact of FD on manufacturing growth if it diverted savings to foreign instead of domestic entrepreneurs. Investigating the relationship between FD and economic growth, De Gregorio and Guidotti (1995) also argue that the negative results could be caused by financial liberalization in a poorly regulated environment and this might be the case in Swaziland and Lesotho, since external liberalization might encourage an outflow of capital. This is confirmed by Aziakpono (2008) who shows that total assets and liabilities of banks are decreasing over time, especially since the mid 1990s, while foreign assets of banks are increasing, suggesting that both banks and individuals are bypassing the domestic economy for their savings or investments.

5.2.4 *Effects of the control variables*

The results of the effects of the control variables on manufacturing sector are presented in Table 5.3 below.

Table 5.3: SURE results: control variables

Country	FD indicator	Inflation	Government	Investment	Trade
Botswana	FIC	0.0147 (0.084)	0.133 (0.402)	0.452 (0.007)	0.573 (0.000)
	LL	0.002 (0.74)	0.051 (0.708)	0.499 (0.000)	0.667 (0.000)
Lesotho	FIC	0.0002 (0.938)	0.746 (0.000)	0.072 (0.437)	0.587 (0.029)
	LL	-0.004 (0.196)	0.817 (0.000)	0.023 (0.786)	0.025 (0.952)
RSA	FIC	0.007 (0.000)	0.067 (0.485)	-0.128 (0.053)	0.108 (0.031)
	LL	0.013 (0.000)	-0.0002 (0.999)	0.181 (0.003)	-0.012 (0.853)
Swaziland	FIC	-0.005 (0.266)	-0.511 (0.000)	-0.450 (0.000)	0.116 (0.426)
	LL	0.0005 (0.918)	-0.820 (0.000)	-0.575 (0.000)	0.627 (0.000)

i. Inflation

Inflation is expected to decrease savings or increase lending rates and therefore decrease investments, which in turn will decrease growth (De Gregorio, 1996:443). The results in this research show opposite relationship, in that, the inflation coefficient is positive and even significant in RSA and Botswana. Given that inflation rates in these countries have been fairly low in recent years, the positive effect may not be surprising. This might suggest that inflation is still within the positive threshold in the SACU countries.

ii. Government

Botswana and Lesotho have positive coefficients, but they are not significant in Botswana. Though the Botswana government has taken part in the development of the sector, it is not directly involved. In the case of Lesotho, the results may be an indication of higher aggregate demand for domestic manufacturing products resulting from high government spending. RSA has mixed results but they are both not significant. In Swaziland the relationship is negative

and significant. In 2000, the state-owned industries were privatised and this raised the foreign interest in the country and as a result most of the industries are privately owned. This means that increased government consumption crowds out private investment. The coefficient signs of government in Swaziland are consistent with those found in Aziakpono (2005a) on the impact of government spending on economic growth.

iii. Investment

The investment coefficient signs were mixed across the countries. In Botswana they are positive and significant, showing that increased investment in the economy spurs manufacturing sector growth. Lesotho has a positive but insignificant coefficient: there is the potential of an impact of investment on the growth of the sector. RSA has mixed results across the two models, while Swaziland has negative coefficients.

iv. Trade openness

The coefficients of trade were generally positive for all the countries. Even though some were insignificant, the findings show that trade has some influence in the growth of the manufacturing sector. This may be an indication that international markets increase the demand for domestic products while supplying the required capital goods and technology for domestic producers (Allen and Ndikumana, 2000:155). Figure 3.3 in Chapter Three showed that for all four countries the manufacturing exports as a percentage of the total merchandise exports are above 50 percent and in Botswana and Lesotho manufacturing exports are higher than manufacturing imports as percentage of total merchandise imports. In RSA and Swaziland manufacturing imports are higher than exports, but the difference is not large. This may however have the potential of crowding out the domestic production and hence why there is a negative sign in the second model for RSA.

5.3 CONCLUSION

The chapter presented the empirical results of the study. The first section presented the results of contemporaneous correlation among the error terms and testing the hypothesis of homogeneity of the countries. The null hypothesis of no contemporaneous correlation was rejected in the first step and the hypothesis of overall homogeneity and slope homogeneity across the cross-section of the countries were also rejected in the second stage. The results of

both these two stages supported the use of the SURE model. Section 5.2 presented the SURE model results, first the effect of FD on manufacturing growth, then the effect of the control variables. The results showed a weak relationship between FD and manufacturing sector growth and in some cases the effect was negative.

CHAPTER SIX:

CONCLUSIONS

6.1 SUMMARY OF FINDINGS

This study investigated the relationship between FD and manufacturing sector growth in the SACU countries. It contributes to the existing literature on FD and growth by looking at sectoral growth and not economic growth. Theoretical literature has proven that the development of the financial sector could have a positive impact on the real sector. The relationship stems from increased savings which are channelled into investments by financial intermediaries. It is vital for a country to have a saving culture as it increases available funds to be invested in productive projects. It is also essential to have sound financial institutions that will be able to allocate funds efficiently.

The empirical literature suggests the existence of a relationship between growth and FD, but the extent, the sign and the direction of the relationship differs across the studies and countries. Different measures of growth and FD have been used and also different methodologies have been applied²¹; this is one of the main reasons causing conflicting results.

Historical trend analysis was used to compare the SACU countries in terms of economic performance, manufacturing sector growth and financial development. The economies of the countries are highly interdependent in terms of financial services, employment and trade. RSA is the leading economy; it has better services, advanced markets and a variety of goods and services. As a result the other countries depend highly on it, more than 50 percent of their imports are from RSA. Analysing the financial sector gives similar results: the RSA financial system is well developed compared to the other SACU countries. The financial sector in the other four countries (BLNS) is dominated by the RSA banks. The free movement of funds in the CMA countries (LNS) might have contributed to the under development of their financial sectors as individuals and companies bank in RSA where there are better returns and services. The manufacturing sector in RSA has grown but has however shown a slow growth compared to the other countries. Lesotho and Swaziland have a manufacturing sector that contributes greatly to their economies. The main reason why this sector has performed so

²¹ See Appendix, Table A.1, which summarised the selected studies, highlighting the methodologies they applied and the measures of FD and growth used in the studies.

well in countries with less developed financial sectors is because it is predominantly owned by foreigners and is not financed through the domestic financial system.

The SURE model was estimated using two FD indicators: credit to private sector provided by commercial banks and the ratio of liquid liabilities of commercial banks to GDP. Manufacturing sector growth was measured by manufacturing value added as percentage of GDP and the control variables were trade openness, inflation, investment and government consumption. The effect of FD on manufacturing sector growth was very weak, a negative and significant relationship was found in RSA and Swaziland when FIC was used. Lesotho had a negative but insignificant relationship while for Botswana it was a positive but insignificant relationship. When LL was used, Botswana and Swaziland had a negative sign and RSA and Lesotho had a positive one but they were all insignificant.

With these results we cannot conclude that the manufacturing sector performs better in countries where the financial sector is well developed and we also cannot conclude whether the relationship between the two sectors in all the SACU countries is positive or negative as the results were mixed.

6.2 POLICY IMPLICATIONS AND RECOMMENDATIONS

The analysis in Chapter Three and estimation results show that there is little or no relationship between the development of the domestic financial sector and manufacturing sector growth in the SACU countries. As a result, implementing policies that improve domestic financial sector will not significantly increase manufacturing sector growth. In order to decrease the volatility in the manufacturing sector growth, it is evident that future policies in the small SACU countries (especially Lesotho and Swaziland) should be more focused on increasing the competitiveness of the domestic markets in order to attract both foreign and domestic investment. This can be achieved through investing in human capital in the country, strengthening the legal system and encouraging entrepreneurship.

The manufacturing sector in the SACU countries has provided increased employment; the sector employs more people than other large sectors such as mining in Botswana. Increased employment is supposed to have a positive impact on the economy as more people have income and they can therefore save. As savings increase, there are more funds available for investments and increased investments spur growth. The incomes in this sector are very low and their impact on growth is mainly through increased consumption and not investments.

The countries²² should improve the salaries in the manufacturing sector by imposing minimum wages and also implement policies that will encourage more savings.

The role of the SACU agreement is to improve the economies of the member states. The main problem with the agreement is that the member countries are not at the same level of development. RSA is highly developed compared to the other countries, with Lesotho and Swaziland at the bottom of the list. These countries are therefore struggling to compete with RSA in other markets and also they are suffering from their citizens crossing the border to get better services. The CMA agreement has exacerbated this problem as people and banks can move their funds to RSA where they get better returns. SACU countries have to find a way of forming policies that will give the small countries a better position so that they can develop.

In conclusion, the countries have to have better macroeconomic policies and improve their business environment in order to attract investments, experience high levels of growth and benefit from the SACU agreement.

6.3 LIMITATIONS OF THE STUDY AND AREAS FOR FURTHER RESEARCH

There are various FD measures and each measure has its own limitations, therefore using more indicators might give better results because the activities of more financial intermediaries in the financial sector could be captured. The study only used two measures because of the availability of data in all the countries. Also, only one measure of manufacturing sector growth was used, manufacturing value added as percentage of GDP. Including another measure in the study, such as manufacturing GDP used by Neusser and Kugler (1998), might help in analysing the consistency of the effect of FD on manufacturing growth and therefore better conclusions could be reached.

RSA has a well developed capital market and its measures are not represented in the estimation process. This may have distorted the results because the FD indicators do not represent the whole financial sector development. As a result, it will be biased to conclude that the development of the financial sector in RSA does not have an impact on the manufacturing sector growth. The growth of the sector could be a result of foreign investment and domestic capital markets.

²² Mainly in Lesotho where the manufacturing sector is dominated by clothing and textile industries which employ mostly unskilled labour and pay low wages.

Most series were available on an annual basis; this gave a very short period of study. The major limitation arising from having a short period of study is that not many variables can be included in the model. Inclusion of many variables will lead to loss of degrees of freedom and it might be impossible to estimate the model. Other variables that could have been included in the model are interest rate spread, foreign direct investment (FDI) and exchange rate. The use of quarterly data could produce better results.

The manufacturing sector is not the only sector that has a high contribution to total GDP, especially in Botswana where the contribution is very low. Investigating the effect of financial development on other high performing sectors in among the SACU countries could be helpful in uncovering the full effects of financial development in these countries.

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APPENDICES

Table A.1: Summary of empirical studies

1. ECONOMIC GROWTH AND FD STUDIES

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Abu-Bader and Abu-Qarn (2008)	Egypt	1960-2001	Trivariate VAR framework. Granger causality tests using the co-integration and vector error-correction (VEC) methodology.	FD indicators: ratio of money stock, M2, to nominal GDP, the ratio of M2 minus currency to GDP, the ratio of bank credit to the private sector to nominal GDP and the ratio of credit issued to non-financial private firms to total domestic credit (excluding credit to banks). Growth measure: Real GDP <i>per capita</i>	Results strongly support the view that FD causes economic growth. Their findings suggest that the financial reforms launched in 1990 led to a rise in private investment which in turn led to the rebound in the economic performance of Egypt in the 1990s.
Allen and Ndikumana (2000)	8 SADAC countries	1972-1996	Ordinary least squares (OLS) (same intercept for all countries) and fixed effect model (implying that each country has its own intercept) obtained with two stage least squares (2SLS) instrumental procedure.	FD indicators: as percent of GDP, credit to the private sector, the volume of credit provided by banks, and liquid liabilities of the financial system (measured by M3), and an index of financial development combining these three indicators. Growth measure: growth of real <i>per capita</i> GDP	Results show a positive and significant relationship between economic growth and the size of the financial system as measured by liquid liabilities of financial institutions; however the results are less conclusive with other financial indicators, credit by banks and credit to the private sector.

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Aziakpono (2005a)	SACU	Quarterly data from 1980:1 to 2000:1	Zellner SURE method	FD indicators: the ratio of private credit to nominal GDP, the ratio of liquid liabilities of commercial banks to nominal GDP. Growth measures: natural log of real GDP and growth in real GDP.	Domestic financial intermediation is relevant in financially integrated markets. However, the evidence also indicates that for the smaller countries of the SACU with less developed financial institutions, to derive the optimal gains from financial intermediation, they would need to take steps to strengthen their weak financial system and resolve the institutional and structural problems in their economies.
Aziakpono (2005b)	Lesotho	1980-2001	VAR, Co-integration and the Error Correction Model	FD indicators: the ratio of credit extended to the private sector by commercial banks as a percentage of GDP, the ratio of liquid liabilities of commercial banks to nominal GDP, the ratio of commercial bank private sector credit as a percent of their liquid liabilities. Growth measures: <i>per capita</i> GDP growth and the log of <i>per capita</i> real GDP.	-The current low and declining level of FI in Lesotho has caused a slowdown in the economic growth process. - Growth plays little or no role in stimulating the development of FI in the economy. Instead the growth of the economy appears, at present, to hinder the development of FI.

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Calderón and Liu (2002)	109 developing and industrial countries	1960-1994	VAR 5 years and 10 years panel data	FD indicators: the ratio of broad money (M2) to GDP, the ratio of credits provided by financial intermediaries to the private sector to GDP. Growth measure: real GDP <i>per capita</i> growth rate,	- Financial development generally leads to economic growth. - The Granger causality from financial development to economic growth and the Granger causality from economic growth to financial development coexist. - Financial deepening contributes more to the causal relationships in the developing countries than in the industrial countries. - The longer the sampling interval, the larger the effect of financial development on economic growth. - Financial deepening boosts economic growth through both a more rapid capital accumulation and productivity growth, with the latter channel being the strongest.
de Gregorio and Guidotti (1995)	98 countries and 12 Latin American countries	1960-1985	Ordinary Least Squares (OLS)	FD indicator: bank credit to the private sector to GDP. Growth measure: GDP <i>per capita</i> growth.	They found that FD is positively correlated with growth in a large cross-country sample, but its impact changes across countries, and is negative in a panel data for Latin America. They argue that the latter finding is the result of financial liberalization in a poor regulatory environment.

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Ghirmay (2006)	USA	1970-2001	VAR and Granger non-causality procedure	FD indicator: financial sector GDP ²³ . Growth measure: Real GDP.	Financial development affects growth by increasing the level of investment and its productivity. On the other hand, no evidence of reverse causality from economic growth to financial development was found or from increased investment to FD, suggesting that FD independently generates positive economic growth.
Gries, Kraft and Meierrieks (2009)	16 Sub-Saharan African countries	1960s-2003/04	Hsiao-Granger method using bivariate and trivariate vector autoregressive (VAR) or vector error correction models (VECMs)	FD indicators: commercial bank assets to commercial bank plus central bank assets, liquid liabilities to GDP and private credit by deposit money banks to GDP. Growth variable: real GDP <i>per capita</i> .	Only limited support is found for the popular hypothesis of finance-led growth. In general, the evidence indicates that financial deepening and trade openness have a little influence on economic development. In particular, the investigated countries have failed to benefit from financial deepening.
Jalil and Ma (2008)	China & Pakistan	1960-2005	Bound testing approach to co-integration within the framework of Autoregressive Distributed Lag (ARDL)	FD indicators: deposit liability ratio (LL) and credit to private sector (FIC). Growth measure: real GDP <i>per capita</i> .	Pakistan: both LL and FIC have significant impact on economic growth. China: FIC has insignificant impact on economic growth while LL has significant impact.
Jeanneney, Hua and Liang (2005)	29 Chinese provinces	1993-2001	Panel dataset applying the Generalized Method of Moment system estimators	FD indicators: private credit, bank competition, and public credit. Growth measure: the growth rates of total factor productivity (TFP) and its two components, i.e., the growth rate of technical efficiency and that of technical progress.	FD significantly contributes to China's total factor productivity (TFP).

²³ Measurement of value added provided by the financial system (Ghirmay, 2006:30).

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Khan and Qayyum (2006)	Pakistan	1961-2005	Bound testing approach to co-integration within the framework of Autoregressive Distributed Lag (ARDL).	FD indicators: total bank deposit liabilities relative to GDP, ratio of private sector credit to GDP, amount of money cleared through clearing house relative to GDP and ratio of stock market capitalization to GDP. Growth measure: real GDP	Empirical results reveal the presence of a positive long-run relationship between real GDP, trade liberalization and financial development.
Levine, Loayza and Beck (2000)	74 and 71	1960-1995	Generalized method-of-moments (GMM) 5 yearly dynamic panel estimators and a cross-sectional instrumental-variable estimator	FD indicators: liquid liabilities divided by GDP, ratio of commercial bank assets divided by commercial bank plus central bank assets and private credit divided by GDP. Growth measure: the growth rate of the real per capita gross domestic product (GDP) growth.	Exogenous components of financial intermediary development are positively associated with economic growth. Also, the data show that cross-country differences in legal and accounting systems help account for differences in financial development.
Luintel and Khan (1999)	10 sample countries	1951-1995	Multivariate vector autoregression (VAR) framework	FD indicators: ratio of total deposit liabilities of deposit banks to one period lagged nominal GDP. Growth measure: real <i>per capita</i> output.	In the long run, financial depth is positively and significantly affected by the levels of <i>per capita</i> real income and the real interest rate. Found bi-directional causality between financial development and economic growth in all the sample countries analysed.
Mohapi and Motelle (2006)	Lesotho	1980-2003	Granger causality test and the VECM based causality test	FD measures: the ratio of private sector credit to domestic credit, the ratio of private sector credit to GDP, the ratio of domestic credit to GDP, the ratio of bank deposit liabilities to GDP, the ratio of broad money to gross GDP. Growth measure: Rate of change of GDP.	No co-integration.

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Nasri and Mouawiya (2005)	Middle East	1969-2000	Panel co-integration along with time series methodologies such as the Johansen's co-integration, Granger causality, and the variance decompositions	FD indicator: the ratio of private sector credit to base money. Growth measure: Real GDP.	In the long run financial development and economic growth may be related to some level. In the short run, the panel causality tests point to real economic growth as the force that drives changes in financial development. Individual countries' causality tests fail to give a clear evidence of the direction of causations.
Padachi, Seetanah and Durbarry (2007)	44 African countries	1979-2002	Generalised method of moments (GMM)	FD indicators: ratio of liquid liabilities to GDP and credit by financial intermediaries to private sector divided by GDP. Growth measure: real GDP <i>per capita</i> .	Financial development has a positive and significant effect on the level of economic growth but its contribution is very small compared to the other explanatory variables.
Pradhan (2009)	India	1993-2008	Multivariate VAR model	FD indicators: market capitalization, broad money supply, and bank credit. Growth measure: Index of Industrial production.	The co-integration test confirms the presence of long run equilibrium relationship between financial development and economic growth. The Granger causality test suggests that there is presence of bidirectional causality between money supply and economic growth, bank credit and economic growth, money supply and foreign trade, market capitalization and foreign trade; an unidirectional causality from market capitalization to economic growth, foreign trade to economic growth, money supply to market capitalization, bank credit to market capitalization and money supply to bank credit; and no causality between bank credit to foreign trade.

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Rioja and Valev (2003)	74	1961-1995	GMM dynamic panel techniques	FD measures: Private Credit, Commercial vs. Central Bank, and Liquid Liabilities. Growth measures: rate of growth of real <i>per capita</i> GDP and productivity growth.	Finance has a strong positive influence on productivity growth primarily in more developed economies. In less developed economies, the effect of finance on output growth occurs primarily through capital accumulation.
Shyn, Yong-Sang and Ohet (2008)	Korea	1981-2001	Fixed Effect (EF) model and Weighted least square model (WLS)	FD measure: domestic credit plus market value of total stocks divided by domestic GDP. Growth measure: Growth in real value added in each industry.	As financial markets develop, finances flow to industries where the growth opportunities are highest and to industries that predominate at each stage of economic development.
Vazakidis and Adamopoulos (2009)	Greece	1978-2007	Johansen co-integration tests and Granger Causality tests based on Vector Error Correction Model (VECM)	FD indicators: the general stock market index and the domestic bank credits to private sector. Growth measures: Real GDP and the industrial production index.	Economic growth has a positive effect on FD (stock market development and credit market development) through industrial production growth in Greece.

2. STUDIES THAT USE SECTORAL GROWTH

Arizala, Cavallo and Galindo (2009)	77	1963-2003	Ordinary Least Squares (OLS)	Growth measure: the growth rate of real FD indicator: Ratio of private credit to GDP was used as proxy for FD. Growth measure: TFP growth.	TFP growth can accelerate up to 0.6% per year, depending on the external finance requirement of industries, following a one standard deviation increase in financial development.
De Guevara and Maudos (2009)	Spain	1997-2003	Ordinary Least Squares (OLS)	FD measures: private credit/GDP ratio. Growth measure: the firm's average real sales growth rate.	Firms in industries with a greater dependence on external finance grow faster in more financially developed provinces.

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Eichengreen, Gullapalli and Panizza (2009)	49	1980-2004	Ordinary Least Squares (OLS). Sensitivity checks and estimated the baseline equation using two decades (1980-89 and 1990-1999) and a half decade (2000-2004).	FD measure: private credit to GDP. Growth measure: value added of industry.	Found evidence that capital account openness has positive effects on the growth of financially-dependent industries, but those effects are eliminated by crises. Also found that the positive effects of capital account openness are limited to countries with well-developed financial systems, good accounting standards, strong creditor rights, and rule of law.
Galindo and Micco (2004)	20 industries in 33 countries	1970-1990	Cross-industry-country regressions	FD indicator: ratio of credit to the private sector to GDP. Growth measure: share of industry j in country i of total value added in manufacturing at the beginning of the period.	Empirical evidence suggests that state-owned banks do not promote the growth rates of manufacturing industries that rely on external sources of funding for their operation and/or that, due to reduced access to collateral, face tighter financial constraints. On the contrary, the development of a private banking industry appears to have a significant effect over such types of industries.

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Neusser and Kugler (1998)	13 OECD countries	1970-1991	VAR, Granger causality tests	FD indicator: financial sector GDP ²⁴ Growth measures: Manufacturing GDP and manufacturing total factor productivity	Found mixed results across the countries. When using manufacturing GDP and financial GDP, the null hypothesis of no co-integration was not rejected for half of the countries. But when manufacturing TFP was used, the null hypothesis was rejected more often, meaning there is more evidence of the long-run relationship. Also found that the causal link between financial development and economic growth is weak, especially for the smaller countries, and this may be because of the different degrees of capital mobility.
Von Furstenberg (2004)	Poland	1990-2001	Cross sectional regressions and correlations	FD measures: all expressed in percent of GDP; Net Life Premiums, Net Non-Life Premiums, Net Total Premiums, Life Insurance Investment, Non-Life Insurance Investment, Total Insurance Investment, M2: Money + Quasi-money, domestic credit excluding government. Growth measure: TFP growth.	Companies' dependence on external finance had no explanatory power for the structure of industry growth in Poland.

²⁴ Value added (the sum of payments to all factors of production) for financial intermediaries (Neusser and Kugler, 1996:639).

Study	Country cover	Years covered	Estimation method(s)	Variables	Summary of findings
Wang (2000)	Taiwan	1961-1996	Seemingly Unrelated Regression Estimation (SURE) method and Generalized Least Squares (GLS) method	FD indicator: liquid liabilities to GDP. Growth measure: value added in each sector.	Results indicate that inter-sectoral externality of the financial-supply-leading version is greater than that of the real-demand-following version. The results also indicate that the variations in externality series of the financial sector of the supply-leading version can be explained mostly by the financial variables, such as the financial depth, the share of formal finance, and the interest difference. The variations in externality series of the industrial sector of the demand-following version can be explained by the real economic variables, which largely determine the industrial production.

A5.1: RESULTS OF CONTEMPORANEOUS CORRELATION

Table A.2: Residual covariances obtained using LS regression of unrestricted model with FIC as measure for FD

	_BO	_LE	_SA	_SW
_BO	0.008159	0.001217	0.000635	0.002449
_LE	0.001217	0.011704	-0.00119	-2.20E-03
_SA	0.000635	-0.00119	6.93E-04	1.00E-03
_SW	0.002449	-2.20E-03	1.00E-03	0.010039

Calculations – LM test:

$$r_{BL}^2 = \frac{(0.001217)^2}{(0.008159)(0.011704)} = 0.01551$$

$$r_{BSA}^2 = \frac{(0.000635)^2}{(0.008159)(0.000693)} = 0.071314$$

$$r_{BSW}^2 = \frac{(-0.002449)^2}{(0.008159)(0.010039)} = 0.073223$$

$$r_{SAL}^2 = \frac{(-0.00119)^2}{(0.000693)(0.011704)} = 0.173129$$

$$r_{SWL}^2 = \frac{(-0.00220)^2}{(0.010039)(0.011704)} = 0.04123$$

$$r_{SWSA}^2 = \frac{(0.00100)^2}{(0.010039)(0.000693)} = 0.144892$$

$$\lambda = 30(0.519298) = 15.57895$$

Table A.3: Residual covariances obtained using LS regression of unrestricted model with LL as measure for FD

	_BO	_LE	_SA	_SW
_BO	0.005844	0.001401	0.00123	1.73E-04
_LE	0.001401	0.014754	-9.01E-04	-5.19E-03
_SA	0.00123	-9.01E-04	1.28E-03	1.72E-03
_SW	1.73E-04	-5.19E-03	1.72E-03	0.013698

$$r_{BL}^2 = \frac{(0.001401)^2}{(0.005844)(0.014754)} = 0.022764$$

$$r_{BSA}^2 = \frac{(0.00123)^2}{(0.005844)(0.00128)} = 0.203044$$

$$r_{BSW}^2 = \frac{(0.000173)^2}{(0.005844)(0.013698)} = 0.000374$$

$$r_{SAL}^2 = \frac{(-0.000901)^2}{(0.00128)(0.014754)} = 0.043155$$

$$r_{SWL}^2 = \frac{(-0.00519)^2}{(0.013698)(0.014754)} = 0.133024$$

$$r_{SWSA}^2 = \frac{(0.00172)^2}{(0.013698)(0.00128)} = 0.168407$$

$$\lambda = 30(0.570768) = 17.12305$$

A5.2: RESULTS OF HOMOGENEITY OF PARAMETERS

A. Least squares regression results using FIC as measure for FD

a) Unrestricted model

Dependent Variable: LMAN?
Method: Pooled Least Squares
Date: 08/31/10 Time: 00:03
Sample (adjusted): 1979 2008
Included observations: 30 after adjustments
Cross-sections included: 4
Total pool (balanced) observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
_BO--C	-3.300300	0.937422	-3.520611	0.0007
_LE--C	-3.383423	1.142271	-2.962013	0.0039
_SA--C	3.950476	2.336358	1.690869	0.0941
_SW--C	6.792900	0.773793	8.778701	0.0000
_BO--LFIC_BO(-3)	0.056000	0.076876	0.728446	0.4681
_LE--LFIC_LE(-3)	0.009402	0.093067	0.101021	0.9197
_SA--LFIC_SA(-3)	-0.310635	0.226022	-1.374356	0.1725
_SW--LFIC_SW(-3)	-0.445192	0.098151	-4.535766	0.0000
_BO--INFL_BO(-2)	0.017166	0.009764	1.758076	0.0819
_LE--INFL_LE(-2)	-0.000554	0.003279	-0.168939	0.8662
_SA--INFL_SA(-2)	0.005877	0.007586	0.774726	0.4404
_SW--INFL_SW(-2)	-0.001032	0.004423	-0.233363	0.8160
_BO--LGV_T_BO(-3)	0.200433	0.180315	1.111572	0.2691
_LE--LGV_T_LE(-3)	0.618208	0.123524	5.004774	0.0000
_SA--LGV_T_SA(-3)	0.095202	0.426090	0.223431	0.8237
_SW--LGV_T_SW(-3)	-0.537804	0.149411	-3.599486	0.0005
_BO--LINVEST_BO(-2)	0.315130	0.190794	1.651679	0.1019
_LE--LINVEST_LE(-2)	0.040390	0.090826	0.444697	0.6575
_SA--LINVEST_SA(-2)	-0.168463	0.288209	-0.584517	0.5602
_SW--LINVEST_SW(-2)	-0.465963	0.078527	-5.933814	0.0000
_BO--LTRADE_BO(-2)	0.637084	0.149941	4.248901	0.0000
_LE--LTRADE_LE(-2)	0.798632	0.272131	2.934737	0.0042
_SA--LTRADE_SA(-2)	0.164695	0.208601	0.789520	0.4318
_SW--LTRADE_SW(-2)	0.191572	0.150456	1.273280	0.2060
R-squared	0.985336	Mean dependent var	2.703241	
Adjusted R-squared	0.981823	S.D. dependent var	0.725252	
S.E. of regression	0.097780	Akaike info criterion	-1.635328	
Sum squared resid	0.917858	Schwarz criterion	-1.077829	
Log likelihood	122.1197	Hannan-Quinn criter.	-1.408925	
F-statistic	280.4643	Durbin-Watson stat	1.459585	
Prob(F-statistic)	0.000000			

b) Restricted model – slope coefficients are the same

Dependent Variable: LMAN?
Method: Pooled Least Squares
Date: 08/31/10 Time: 00:05
Sample (adjusted): 1979 2008
Included observations: 30 after adjustments
Cross-sections included: 4
Total pool (balanced) observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFIC?(-3)	-0.140555	0.067730	-2.075229	0.0403
INFL?(-2)	-0.004678	0.004091	-1.143661	0.2552
LGVT?(-3)	0.105711	0.125530	0.842118	0.4015
LINVEST?(-2)	-0.099190	0.080837	-1.227028	0.2224
LTRADE?(-2)	0.516648	0.152114	3.396443	0.0009
_BO--C	-0.373781	0.738817	-0.505919	0.6139
_LE--C	0.572215	0.779799	0.733799	0.4646
_SA--C	1.677420	0.690809	2.428196	0.0168
_SW--C	1.312644	0.799986	1.640834	0.1037
R-squared	0.924473	Mean dependent var		2.703241
Adjusted R-squared	0.919029	S.D. dependent var		0.725252
S.E. of regression	0.206373	Akaike info criterion		-0.246225
Sum squared resid	4.727468	Schwarz criterion		-0.037163
Log likelihood	23.77350	Hannan-Quinn criter.		-0.161324
F-statistic	169.8336	Durbin-Watson stat		0.282433
Prob(F-statistic)	0.000000			

c) Restricted model – overall homogeneity (both slope and intercepts are the same)

Dependent Variable: LMAN?
Method: Pooled Least Squares
Date: 08/31/10 Time: 00:07
Sample (adjusted): 1979 2008
Included observations: 30 after adjustments
Cross-sections included: 4
Total pool (balanced) observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.422201	1.101762	-3.106117	0.0024
LFIC?(-3)	0.846530	0.076422	11.07709	0.0000
INFL?(-2)	0.002092	0.008385	0.249550	0.8034
LGVT?(-3)	-1.083955	0.229691	-4.719188	0.0000
LINVEST?(-2)	-0.259603	0.125936	-2.061383	0.0415
LTRADE?(-2)	1.636987	0.141723	11.55064	0.0000
R-squared	0.659106	Mean dependent var		2.703241
Adjusted R-squared	0.644154	S.D. dependent var		0.725252
S.E. of regression	0.432633	Akaike info criterion		1.210854
Sum squared resid	21.33755	Schwarz criterion		1.350228
Log likelihood	-66.65123	Hannan-Quinn criter.		1.267454
F-statistic	44.08293	Durbin-Watson stat		0.256232
Prob(F-statistic)	0.000000			

F-TEST CALCULATIONS USING RSS FROM THE RESULTS ABOVE

Critical value: F (27,20) = 2.78 at 1%

$$F_1 = \frac{(S_2 - S_1)/[(N - 1)K]}{S_1/[NT - N(K + 1)]}$$

$$F_1 = \frac{(4.727468 - 0.917858)/[(4 - 1)9]}{0.917858/[4(30) - 4(24 + 1)]}$$

$$F_1 = \frac{0.141097}{0.0438929}$$

$$= \underline{\underline{3.21457}}$$

Critical value: F(21,20)= 2.94 at 1%

$$F_3 = \frac{(S_3 - S_1)/[(N - 1)(K + 1)]}{S_1/[NT - N(K + 1)]}$$

$$F_3 = \frac{(21.33755 - 0.917858)/[(4 - 1)(6 + 1)]}{0.917858/[4(30) - 4(24 + 1)]}$$

$$F_3 = \frac{0.9723663}{0.0438929}$$

$$= \underline{\underline{22.1532}}$$

B. Least squares regression results using LL as measure for FD

a) Unrestricted model

Dependent Variable: LMAN?

Method: Pooled Least Squares

Date: 09/08/10 Time: 01:23

Sample (adjusted): 1979 2008

Included observations: 30 after adjustments

Cross-sections included: 4

Total pool (balanced) observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
_BO--C	-2.918923	1.094485	-2.666937	0.0090
_LE--C	-0.713008	1.861068	-0.383118	0.7025
_SA--C	2.221776	2.302641	0.964882	0.3370
_SW--C	4.360008	0.911568	4.782975	0.0000
_BO--LLL_BO(-3)	-0.091238	0.149955	-0.608437	0.5443
_LE--LLL_LE(-3)	0.028843	0.104172	0.276875	0.7825
_SA--LLL_SA(-3)	0.163653	0.442573	0.369778	0.7124
_SW--LLL_SW(-3)	-0.039518	0.128613	-0.307262	0.7593
_BO--LGV_T_BO(-3)	0.036644	0.208137	0.176058	0.8606
_LE--LGV_T_LE(-3)	0.730752	0.131691	5.548991	0.0000
_SA--LGV_T_SA(-3)	-0.045943	0.416530	-0.110299	0.9124
_SW--LGV_T_SW(-3)	-0.760527	0.166619	-4.564456	0.0000
_BO--LTRADE_BO	0.695447	0.146645	4.742390	0.0000
_LE--LTRADE_LE	0.167515	0.400282	0.418492	0.6765
_SA--LTRADE_SA	-0.069219	0.216565	-0.319622	0.7499
_SW--LTRADE_SW	0.649042	0.176753	3.672035	0.0004
_BO--INFL_BO(-3)	0.001512	0.009742	0.155242	0.8770
_LE--INFL_LE(-3)	-0.002966	0.003051	-0.971941	0.3335
_SA--INFL_SA(-3)	0.011958	0.007744	1.544134	0.1258
_SW--INFL_SW(-3)	0.002084	0.004737	0.439961	0.6610
_BO--LINVEST_BO(-2)	0.463494	0.154619	2.997659	0.0035
_LE--LINVEST_LE(-2)	0.054289	0.078211	0.694127	0.4893
_SA--LINVEST_SA(-2)	0.153336	0.210625	0.728005	0.4684
_SW--LINVEST_SW(-2)	-0.605369	0.086680	-6.983936	0.0000
R-squared	0.982951	Mean dependent var	2.703241	
Adjusted R-squared	0.978867	S.D. dependent var	0.725252	
S.E. of regression	0.105432	Akaike info criterion	-1.484653	
Sum squared resid	1.067118	Schwarz criterion	-0.927155	
Log likelihood	113.0792	Hannan-Quinn criter.	-1.258250	
F-statistic	240.6512	Durbin-Watson stat	1.263392	
Prob(F-statistic)	0.000000			

b) Restricted model – slope coefficients are the same

Dependent Variable: LMAN?
Method: Pooled Least Squares
Date: 09/08/10 Time: 01:32
Sample (adjusted): 1979 2008
Included observations: 30 after adjustments
Cross-sections included: 4
Total pool (balanced) observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LLL?(-3)	-0.406698	0.120239	-3.382412	0.0010
LGVT?(-3)	-0.037233	0.120419	-0.309193	0.7578
LTRADE?	0.378727	0.147830	2.561920	0.0118
INFL?(-3)	-0.001089	0.004228	-0.257512	0.7973
LINVEST?(-2)	0.016914	0.082407	0.205243	0.8378
_BO--C	1.263285	0.796048	1.586946	0.1154
_LE--C	2.306548	0.851523	2.708731	0.0078
_SA--C	3.219784	0.763205	4.218769	0.0001
_SW--C	2.931465	0.843727	3.474423	0.0007
R-squared	0.923188	Mean dependent var	2.703241	
Adjusted R-squared	0.917652	S.D. dependent var	0.725252	
S.E. of regression	0.208121	Akaike info criterion	-0.229354	
Sum squared resid	4.807902	Schwarz criterion	-0.020292	
Log likelihood	22.76123	Hannan-Quinn criter.	-0.144453	
F-statistic	166.7602	Durbin-Watson stat	0.286265	
Prob(F-statistic)	0.000000			

c) Restricted model – overall homogeneity (both slope and intercepts are the same)

Dependent Variable: LMAN?
Method: Pooled Least Squares
Date: 09/08/10 Time: 01:31
Sample (adjusted): 1979 2008
Included observations: 30 after adjustments
Cross-sections included: 4
Total pool (balanced) observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.153739	1.581271	-0.729628	0.4671
LLL?(-3)	1.171894	0.215491	5.438248	0.0000
LGVT?(-3)	-0.984185	0.300860	-3.271242	0.0014
LTRADE?	1.143155	0.168942	6.766535	0.0000
INFL?(-3)	0.006196	0.010656	0.581505	0.5620
LINVEST?(-2)	-0.805449	0.181586	-4.435641	0.0000
R-squared	0.445629	Mean dependent var	2.703241	
Adjusted R-squared	0.421315	S.D. dependent var	0.725252	
S.E. of regression	0.551709	Akaike info criterion	1.697115	
Sum squared resid	34.69966	Schwarz criterion	1.836490	
Log likelihood	-95.82691	Hannan-Quinn criter.	1.753716	
F-statistic	18.32772	Durbin-Watson stat	0.150628	
Prob(F-statistic)	0.000000			

F-TESTS CALCULATIONS USING RSS FROM THE RESULTS ABOVE

Critical value: F(27,20)= 2.04 at 5%

$$F_1 = \frac{(S_2 - S_1)/[(N - 1)K]}{S_1/[NT - N(K + 1)]}$$

$$F_1 = \frac{(4.807908 - 1.067118)/[(4 - 1)9]}{1.067118/[4(30) - 4(24 + 1)]}$$

$$F_1 = \frac{0.13854756}{0.0533559}$$

$$= \underline{\underline{2.597}}$$

Critical value: F(21,20)= 2.94 at 1%

$$F_3 = \frac{(S_3 - S_1)/[(N - 1)(K + 1)]}{S_1/[NT - N(K + 1)]}$$

$$F_3 = \frac{(34.69966 - 1.067118)/[(4 - 1)(6 + 1)]}{1.067118/[4(30) - 4(24 + 1)]}$$

$$F_3 = \frac{1.6015496}{0.0533559}$$

$$= \underline{\underline{30.016}}$$

A5.3: RESULTS OF SYSTEM ESTIMATION

a) Using FIC as measure for FD

System: UNTITLED

Estimation Method: Seemingly Unrelated Regression

Date: 08/31/10 Time: 16:31

Sample: 1979 2008

Included observations: 30

Total system (balanced) observations 120

Linear estimation after one-step weighting matrix

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-3.245499	0.826350	-3.927512	0.0002
C(5)	0.070368	0.066806	1.053313	0.2948
C(9)	0.014711	0.008413	1.748739	0.0835
C(13)	0.132746	0.157845	0.840993	0.4024
C(17)	0.451566	0.163567	2.760746	0.0069
C(21)	0.573015	0.131665	4.352055	0.0000
C(2)	-2.661820	1.115030	-2.387217	0.0189
C(6)	-0.067058	0.091787	-0.730588	0.4668
C(10)	0.000252	0.003228	0.078018	0.9380
C(14)	0.745816	0.122092	6.108648	0.0000
C(18)	0.071883	0.092094	0.780537	0.4370
C(22)	0.586536	0.264117	2.220747	0.0287
C(3)	3.944237	0.530262	7.438276	0.0000
C(7)	-0.269490	0.051277	-5.255534	0.0000
C(11)	0.006508	0.001767	3.682684	0.0004
C(15)	0.067475	0.096190	0.701482	0.4847
C(19)	-0.127998	0.065314	-1.959729	0.0529
C(23)	0.107574	0.049086	2.191523	0.0308
C(4)	7.195857	0.743993	9.671936	0.0000
C(8)	-0.481951	0.092907	-5.187468	0.0000
C(12)	-0.004653	0.004157	-1.119317	0.2658
C(16)	-0.511123	0.140003	-3.650813	0.0004
C(20)	-0.450253	0.074084	-6.077593	0.0000
C(24)	0.116109	0.145081	0.800307	0.4255
Determinant residual covariance		2.95E-10		

Equation: LMAN_BO = C(1) + C(5)*LFIC_BO(-3) + C(9)*INFL_BO(-2) + C(13)*LGVT_BO(-3) + C(17)*LINVEST_BO(-2) + C(21)*LTRADE_BO(-2)

Observations: 30

R-squared	0.762643	Mean dependent var	1.615391
Adjusted R-squared	0.713194	S.D. dependent var	0.191170
S.E. of regression	0.102380	Sum squared resid	0.251558
Durbin-Watson stat	1.261743		

Equation: LMAN_LE = C(2) + C(6)*LFIC_LE(-3) + C(10)*INFL_LE(-2) + C(14)*LGVT_LE(-3) + C(18)*LINVEST_LE(-2) + C(22)*LTRADE_LE(-2)

Observations: 30

R-squared	0.774738	Mean dependent var	2.680237
Adjusted R-squared	0.727808	S.D. dependent var	0.236482
S.E. of regression	0.123377	Sum squared resid	0.365326
Durbin-Watson stat	1.415980		

Equation: LMAN_SA = C(3) + C(7)*LFIC_SA(-3) + C(11)*INFL_SA(-2) + C(15)*LGVT_SA(-3) + C(19)*LINVEST_SA(-2) + C(23)*LTRADE_SA(-2)

Observations: 30

R-squared	0.909165	Mean dependent var	3.040299
Adjusted R-squared	0.890241	S.D. dependent var	0.090703
S.E. of regression	0.030050	Sum squared resid	0.021672
Durbin-Watson stat	1.512541		

Equation: LMAN_SW = C(4) + C(8)*LFIC_SW(-3) + C(12)*INFL_SW(-2) + C(16)*LGVT_SW(-3) + C(20)*LINVEST_SW(-2) + C(24)*LTRADE_SW(-2)

Observations: 30

R-squared	0.887955	Mean dependent var	3.477038
Adjusted R-squared	0.864612	S.D. dependent var	0.309796
S.E. of regression	0.113990	Sum squared resid	0.311847
Durbin-Watson stat	1.413350		

b) Using LL as measure for FD

System: SYS01

Estimation Method: Seemingly Unrelated Regression

Date: 09/08/10 Time: 01:35

Sample: 1979 2008

Included observations: 30

Total system (balanced) observations 120

Linear estimation after one-step weighting matrix

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-2.861525	0.712382	-4.016839	0.0001
C(5)	-0.119914	0.095576	-1.254638	0.2127
C(9)	0.050819	0.135109	0.376137	0.7076
C(13)	0.666775	0.100919	6.607043	0.0000
C(17)	0.002063	0.006186	0.333428	0.7395
C(21)	0.498970	0.103824	4.805919	0.0000
C(2)	-0.401746	1.971913	-0.203734	0.8390
C(6)	0.101104	0.112785	0.896430	0.3723
C(10)	0.817061	0.140301	5.823611	0.0000
C(14)	0.025460	0.423258	0.060151	0.9522
C(18)	-0.004182	0.003209	-1.303490	0.1955
C(22)	0.022721	0.083467	0.272213	0.7860
C(3)	1.950336	0.654693	2.979007	0.0037
C(7)	0.117790	0.131821	0.893562	0.3738
C(11)	-0.000150	0.117109	-0.001282	0.9990
C(15)	-0.011510	0.061809	-0.186222	0.8527
C(19)	0.012973	0.002131	6.088527	0.0000
C(23)	0.181000	0.059981	3.017631	0.0033
C(4)	4.779249	0.929065	5.144150	0.0000
C(8)	-0.104833	0.128881	-0.813409	0.4180
C(12)	-0.820113	0.163116	-5.027780	0.0000
C(16)	0.627444	0.180137	3.483139	0.0007
C(20)	0.000474	0.004617	0.102699	0.9184
C(24)	-0.574947	0.085940	-6.690108	0.0000
Determinant residual covariance		6.39E-10		

Equation: LMAN_BO = C(1) + C(5)*LLL_BO(-3) + C(9)*LGVT_BO(-3) + C(13)*LTRADE_BO + C(17)*INFL_BO(-3) + C(21)*LINVEST_BO(-2)

Observations: 30

R-squared	0.832722	Mean dependent var	1.615391
Adjusted R-squared	0.797872	S.D. dependent var	0.191170
S.E. of regression	0.085947	Sum squared resid	0.177287
Durbin-Watson stat	1.613157		

$$\text{Equation: LMAN_LE} = C(2) + C(6)*LL_LE(-3) + C(10)*LGVT_LE(-3) + C(14)*LTRADE_LE + C(18)*INFL_LE(-3) + C(22)*LINVEST_LE(-2)$$

Observations: 30

R-squared	0.721211	Mean dependent var	2.680237
Adjusted R-squared	0.663130	S.D. dependent var	0.236482
S.E. of regression	0.137255	Sum squared resid	0.452135
Durbin-Watson stat	1.179091		

$$\text{Equation: LMAN_SA} = C(3) + C(7)*LL_SA(-3) + C(11)*LGVT_SA(-3) + C(15)*LTRADE_SA + C(19)*INFL_SA(-3) + C(23)*LINVEST_SA(-2)$$

Observations: 30

R-squared	0.834128	Mean dependent var	3.040299
Adjusted R-squared	0.799571	S.D. dependent var	0.090703
S.E. of regression	0.040607	Sum squared resid	0.039574
Durbin-Watson stat	1.236465		

$$\text{Equation: LMAN_SW} = C(4) + C(8)*LL_SW(-3) + C(12)*LGVT_SW(-3) + C(16)*LTRADE_SW + C(20)*INFL_SW(-3) + C(24)*LINVEST_SW(-2)$$

Observations: 30

R-squared	0.847653	Mean dependent var	3.477038
Adjusted R-squared	0.815914	S.D. dependent var	0.309796
S.E. of regression	0.132919	Sum squared resid	0.424016
Durbin-Watson stat	1.223776		