

Dissecting the transmission of financial shocks to household income distribution in South Africa

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Dissertation submitted in *partial* fulfilment of the requirements for the degree *Magister Commercii* in Risk Management at the Potchefstroom Campus of the North-West University

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November 2015

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Abstract

The onset of the 2008-09 global financial crisis induced a coeval shrinkage to relatively all fields of production in several countries (Baxter, 2009:106). While the contraction of sectors of production was a common effect of the financial crisis among the affected countries, the degree of the impact and the channels of transmission of the financial shock to households and individuals differ among the affected countries (Gumata, Ncube & Ndou, 2012:5). Most people affected by the financial crisis in the developed countries (such as those in the Eurozone and the US), are exposed to the peril of poverty and segregation. On the other hand, the 2008-09 financial crisis has worsened income redistribution for a number of countries in the developing world (Otker-Robe & Podpiera, 2013:4). South Africa has not been immune to the consequences of the 2008-09 global financial crisis emanating from developed countries' financial sectors and the resulting slowdown in real economic activity (Essers, 2013:2). As a result, South Africa entered a recession late in 2008 and its financial growth has not reached pre-crisis levels ever since. Furthermore, growth has been handicapped by the renewed global slowdown, due to the unfolding Eurozone crisis and a disappointing economical recovery in the US (Essers, 2013:2).

One can expect such an adverse economic trajectory to have real consequences for South African households and individuals. In analysing the consequences of financial shocks, it was evident in the previous financial crises (such as the 1930 Great Depression, 1997 Asian financial crisis), that a distinct style of income distribution is generated during the crisis (Azis & Mansury, 2003:112). One of the common patterns of income distribution in a time of crisis stems from the fact that currency deflation as well as elevated interest rates favour the high-income households (Azis & Mansury, 2003:112). However, this assumption is not always true, since these high-income households might be at a disadvantage if they were investing in sectors which rely more on imports. These patterns of income distribution tend to vary among economies, therefore, understanding how these mechanisms manifested themselves in a local economy, is critical for policy formulation in order to counter the effects of financial shocks and manage risks effectively.

The aim of this study is to identify the transitional channels or networks through which a financial shock influences household income distribution in South Africa. In order to do this, the study used social accounting matrices (SAM), multiplier analysis, and the structural path analysis (SPA). The results for South Africa indicated that low-income mining households were more severely affected during the crisis owing to their substantial dependence on low-skilled jobs in the mining industry. In effect, the households' income declined as a result of lost or reduced salaries and wages from this industry. It was confirmed that the mining industry is the main channel (among others) disseminating the effects of the shock from a credit crisis to a decline in income of the low- and middle-income households in South Africa. Conversely, in the case of high-income households, capital was prevalent, channelling the impact of the financial shock. This entails that the South African high-income households' income was reduced through investment returns and the availability of credit.

Key words: dissecting, financial shock, households, income distribution, social accounting matrix, transmission

Opsomming

Die aanvang van die 2008-09 finansiële krisis het gelei tot 'n gelyktydige inkrimping van feitlik alle sektore van produksie in verskeie lande (Baxter, 2009:106). Alhoewel, die afname in die sektore van produksie 'n algemene gevolg van die finansiële krisis onder die betrokke lande was, word daar oor die algemeen aanvaar dat die graad van die impak van die finansiële skok asook die kanale van oordrag aan huishoudings en individue in verskillende lande uniek is aan daardie land (Gumata, Ncube & Ndou, 2012). In die ontwikkelde lande (soos dié in Euro-sone en die Verenigde State van Amerika), word die meeste mense blootgestel aan die risiko van dreigende armoede of segregasie (Otker-Robe & Podpiera, 2013:4). Gegewe die feit dat Suid-Afrika deel vorm van die wêreld-ekonomie, was dit vanselfsprekend dat die land nie die gevolge van die 2008-09 wêreldwye finansiële en ekonomiese krisis kon ontsnap nie (Essers, 2013:2). Die resessie het die land laat in 2008 binnegekom en die ekonomiese groei in die land het nie sedertdien pre-krisis vlakke bereik nie. Daarby is groei negatief geaffekteer deur die hernieude wêreldwye verlangsamings van die ekonomie weens die ontvoering van die Euro-sonekrisis en 'n teleurstellende ekonomiese herstel in die Verenigde State van Amerika (Essers, 2013:2).

'n Mens kan verwag dat so 'n ongunstige ekonomiese tendens werklike gevolge vir Suid-Afrikaanse huishoudings en individue sal hê. In die ontleding van die gevolge van finansiële skokke, het dit geblyk uit die gevolge van vorige finansiële skokke (byvoorbeeld die 1930 Groot Depressie en die 1997 Asiatiese finansiële krisis), dat 'n bepaalde patroon van die verspreiding van inkomste tydens die krisis (Azis & Mansury, 2003:112) gegenerer word. Een van die algemene patrone van die verspreiding van inkomste tydens 'n krisis volg uit die feit dat die geldeenheid depresiasie en hoë rentekoerse voordelig is vir die mense uit hoë-inkomste huishoudings (Azis & Mansury, 2003:112). Hierdie aanname is egter nie altyd waar nie, aangesien hierdie hoë-inkomste huishoudings benadeel kan word as hulle belê in sektore wat hoogs invoer-afhanklik is. Hierdie patrone van die verspreiding van inkomste is uniek aan elke ekonomie, dit is dus van kritieke belang vir die formulering van beleide om te verstaan hoe hierdie meganismes in 'n plaaslike ekonomie manifesteer, ten einde die gevolge van die finansiële skokke teen te werk en die risiko's doeltreffend te bestuur.

Die doel van hierdie studie is om die oorgangskanale of netwerke waarmee 'n finansiële skok huishoudelike inkomsteverspreiding in Suid-Afrika beïnvloed te identifiseer. Ten einde dit te doen, het die studie gebruik gemaak van sosiale boekhoudingsmatrikse (SAM), vermenigvuldigeranalises, en die strukturele pad-analise (SPA). Vir Suid-Afrika het die resultate getoon dat lae-inkomste huishoudings in die mynbousektor die meeste geaffekteer is tydens die krisis. Die Suid-Afrikaanse lae-inkomste huishoudings was meer geaffekteer deur die finansiële skok as gevolg van hul beduidende afhanklikheid van lae-geskoolde werk in die mynbousektor. Aangesien die mynbedryf een van die grootste werkgewers in Suid-Afrika is, is daar baie huishoudings se inkomste wat geaffekteer word deur verminderde salarisse en lone in hierdie sektor. Verder is die mynbousektor ook een van die belangrikste kanale wat die gevolge van die skok van 'n kredietkrisis versprei om 'n vermindering van die inkomstes in lae- en middel-inkomste huishoudings in Suid-Afrika teweeg te bring.

In hoë-inkomste huishoudings, daarenteen, het kapitaal 'n belangrike rol gespeel in die kanalisering van die impak van die finansiële skok. Dit het behels dat die Suid-Afrikaanse hoë-inkomste huishoudings se inkomste verminder is deur beleggingsopbrengste en die beskikbaarheid van krediet.

Sleutelwoorde: dissekering, finansiële skok, huishoudings, verspreiding van inkomste, sosiale rekeninge matriks, transmissie

Acknowledgements

First and above all I praise God Almighty for providing me this opportunity and granting me the capacity to proceed successfully.

My appreciation is extended to the North-West University for the academic and financial support in relation to this research. I decree my sincere thanksgiving to my supervisor Prof Riaan Rossouw for his inestimable input, leadership and inspiration. I would also like to appreciate Dr. Chris van Heerden for his advice and guidance.

My indebtedness is also eminently protracted to my husband, Nobington, who provided the necessary support, which was essential for this dissertation to be written.

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Acronyms

AIG	American International Group
BSBS	Basel Committee on Banking Supervision
CCAPM	Consumption capital asset pricing model
CGE	Computable General Equilibrium
CPI	Consumer price index
DBSA	Development Bank of Southern Africa
DSGE	Dynamic stochastic general equilibrium
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross domestic product
GEAR	Growth, Employment and Redistribution program
GFC	Global financial crisis
ILO	International Labour Office
IMF	International Monetary Fund
IO	Input-output model
JSE	Johannesburg Securities Exchange
MOE	Medium of exchange
NAM	National accounting matrix
ODA	Official development assistance
ODI	Overseas Development Institute
OECD	Organisation of Economic Cooperation and Development
PTM	Price theory of money
SAM	Social Accounting Matrices
SARB	South Africa Reserve Bank
SNA	System of National Accounts
SPA	Structural path analysis
Stats SA	Statistics South Africa
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
US	United States of America

Chapter 1: Introduction

1.1 Financial shocks and the global economy

There has been a multitude of studies exploring and analysing the macro-level impacts of the 2008-09 global financial crisis (GFC) on developing countries as well as emerging markets recently. These studies focus on reduced private capital flows, shrinking trade and lower international remittances (IMF, 2009, 2010; ODI, 2010; World Bank, 2009). From these numerous studies, it has been shown that financial markets over the globe have become progressively interdependent over the years (Hausler, 2002:1). As a result of this interdependence, financial globalisation has on one hand benefited national economies, investors and savers (Hausler, 2002:1). On the other hand, this financial integration has also brought about increased financial turbulence as well as new risks and challenges (Boshoff, 2006:61). Financial integration can fuel events such as a financial crisis originating in a particular economy, to spill-over to the rest of the world (Boshoff, 2006:61). Given the fact that South Africa is also interconnected to the international economy, the country did not escape the tremors emanating from the financial sectors of developed countries and the resulting slowdown in real economic activity (Essers, 2013:2). As a result of the 2008-09 financial crisis, South Africa entered a recession late in 2008, and since then South Africa's economic growth has not reached pre-crisis levels (Mabugu, van der Berg, Chitiga, Daceluwe, Maisonnave, Robichaud, Shepherd & von Fintel, 2010:4). In addition, the sluggish economic growth of South Africa has been intensified by the renewed global slowdown, due to the unfolding European crisis and a slow economic recovery in the United States (Essers, 2013:2). In effect, this slowdown in economic growth as a result of the financial crises can have real consequences for South African households and individuals.

Recent work has been done that provide a useful overview of the various potential micro-level impacts, external shocks on developing countries' households and individuals. Examples of these studies include Harper, Jones, Pereznieta, and McKay (2011); Heltberg, Hossain, and Reva (2012); Lundberg and Wuermli (2012); Fallon and Lucas (2002); McKenzie (2003); Azis and Mansury (2003) and Thomas and Frankenberg (2007). In these studies, they analysed the impact that the external shocks associated with a global economic crisis and policy responses may have on developing country households and individuals. Their results indicated that the impact of these external shocks on households and individuals can be either direct or indirect. This also suggests that the channels of transmission of external shocks are either direct or indirect. Some channels of transmission can be directly linked to the aforementioned macro-level shocks, such as a decline in remittances from family members working in financially troubled (developed) countries or a reduction in the export price of cash crops that provide for the household's livelihood. Other crisis effects are more indirect, operating through the meso-level economic and socio-political structures. For example, a lower availability of credit, reduced government spending on social

services, and increases in unemployment and under-employment, because of companies closing down or disinvesting (Heltberg *et al.*, 2012:3).

From the previous discussion it can be argued that the financial crisis had real consequences on households and individual's disposable income. In agreement to this argument, Mabugu *et al.* (2010:4) stated that the GFC has led to the decline of the disposable income of households and individuals around the world, especially for the poor. This impact of the financial crisis on household income can be severe in South Africa considering the country's history of income inequality. The income inequality of South Africa is among the highest in the world. In accordance with this, South Africa's Gini coefficient (the tool that measures income inequality) was 0.7 in 2008 (Leibbrandt, Woolard, Finn & Argent, 2010:15; SARB, 2013:3). Furthermore, approximately 25 million people in South Africa survive on more or less US\$2 per day or less than R524 per month (SARB, 2013:3). Since these statistics were gathered during the financial crisis, it can be argued that financial crises have not been without consequences for the South African household income distribution (Ngandu *et al.*, 2010:71; Essers, 2013:4). It is these household income transition channels that this study will focus on.

In order to accomplish this aim, this dissertation will attempt to analyse and examine the transposal of a financial shock on the disposable income of households in South Africa. This will be accomplished with specific focus on the direct as well as the indirect effects of the shock on household income distribution and the mechanisms that produce such effects. Since the financial shocks in this dissertation are referring to the GFC and the Eurozone financial crisis, the following section (Section 1.2.1) provides more insight on these financial crises and the impact on the South African economy. The remainder of this chapter briefly outlines the contributions of this dissertation and reviews some of the most relevant literature. The chapter is divided into the following sections: problem statement and motivation (Section 1.3), research question (Section 1.4), Objectives (Section 1.5), hypothesis (Section 1.6), methodology (Section 1.7) and study outline (Section 1.8).

1.2 Background

1.2.1 Financial crises

Due to the GFC and the on-going global recession, individuals and households around the world are confronted with a decline in disposable income stemming from fewer employment opportunities and lesser remittances revenue (Myie & Robinson, 2013:13). In the case of South Africa, some of the impacts were felt in investor and consumer confidence as well as price decline in export commodities. Furthermore, the country went into recession which impacted employment and caused rising food prices (Mabugu *et al.*, 2010:5; Ngandu *et al.*, 2010:70). For the purpose of comprehending the impact of the financial shock particularly from the South African perspective, this section of the study provides insights

into the GFC and the Eurozone crisis and the impact that it had on the real sector in South Africa. Understanding these financial crises and how they affected the real sector, will help to identify the channels of transmission through which the financial shock impacted the household income in South Africa later in this study (Otker-Robe & Podpiera, 2013:4). The following sections will discuss the GFC (Section 1.2.1.1) and the Eurozone crisis (Section 1.2.1.2).

1.2.1.1 The global financial crisis

The depreciating housing market in the United States (US) as well as the substantial increase in defaults on subprime mortgages are the main factors that contributed to the GFC (Ehler, 2009:1). Consequently, the anticipated risk of counterparty default along with a consistent lack of transparency accelerated. On account of this high perceived risk, banks serving the global economy developed strict lending conditions. Duly, narrowing the lending criteria led to expensive credit, hence slowing down the world economic activity (Akkas, 2009:28). The restricted lending criteria also constrained the aggregate demand and consequently this resulted in credit losses together with an increasing sluggish economy (Baxter, 2009:105). As a result, the effects started to spill over to the world economy. Some of the superior financial institutions defaulted, threatening the market certainty even more (Akkas, 2009:27). For the purpose of understanding how this default in financial institutions manifested, this section will discuss how the financial crisis started in the US and the way in which it spread to the world economy.

It is widely argued that the GFC started in July 2007 with a credit crunch arising from poor incentives in the US mortgage industry (Allen & Carletti, 2009:3; Chitiga, 2010:5). Borrowing and lending regulations in the US mortgage industry were compromised prior to the GFC. Traditionally, banks used to scrutinise borrowers before lending them money. Money would be lent only to those approved. This was important, since any losses made had to be paid by the banks. This form of lending encouraged the banks to first evaluate the capability of the borrowers prior to the disbursement of funds (Baxter, 2009:105).

However, over time this system changed and the incentives were altered. Opposing tradition, a number of brokers and banks began to establish home loans and trade them to be securitised¹, rather than holding them. This particular way of lending was called the “originate and distribute model” (Allen & Carletti, 2009:4). For the sake of accumulating more profits, the brokers and the banks had to sell as much mortgages as possible. The originators were paid according to the number of mortgages authorised. The brokers and banks were not worried about the default risk of the borrowers, rather their concern was to just sell the mortgages off. The leading sellers involved in this system of lending included Lehman Brothers, Bear Sterns, Goldman Sachs, Morgan Stanley and Merrill Lynch, (Chitiga, 2010:5; Baxter, 2009:106).

¹ Securitisation is a financial mechanism intended to convert a collection of assets into saleable securities. These saleable securities are supported by the cash flow stream associated with the underlying assets. Asset securitisation transforms private debt into public debt (Jobst, 2006:733).

In addition to the securitisation system, those entities which undertook securitisations, such as investment banks, would pool the whole set of mortgages together (Chitiga, 2010:5). The assets in this pool will be assorted into distinct tranches by the securitising banks where after they will sell them to investors. These tranches have different risk profiles. Senior tranches, for instance, are relatively secure as they hold the initial precedence on the collateral in the case of default (Allen & Carletti, 2009:4). On the other hand, the junior tranche in most cases holds a lower credit rating when compared to the senior tranche. This way of investing using discrete tranches was not only risky, but had implications for the investors. Since this process was practiced across the country, the risk became too big without diversification and in a way this had an impact on individuals and households. Baxter (2009:106) stated that the US subprime mortgage market had a significant impact on households and co-operate wealth. Wealth reduction had a negative impact on the demand side of many of the world's largest economies and the impact spilled over to the developing countries. Therefore it is important to investigate how investors and households in South Africa were also affected by this scenario in this study.

After some time, the securitisation system ultimately became ineffective, giving rise to the subprime mortgage crisis (Baxter, 2009:105). As the interest rates were constantly rising, the mortgage repayments also accelerated and the property values depreciated. Consequently, mortgage loan holders were incapable to fulfil their financial obligations (Chitiga, 2010: 5). As it became difficult to repay the mortgages, there was sharp increase in foreclosures and more homes were dumped into the market. As a result, lenders experienced much loss without any means to regain these losses. Moreover, poor repayment of the loans led to liquidity shortages and eventually all of these aspects led to a financial crisis (Allen & Carletti, 2009:4).

This depreciation of the mortgage industry did not only have an impact on the US economy, but it also affected the global economy (Chitiga, 2010: 6). As the impact started to unfold, confidence in the financial market fell and most of the financial securities became very complicated (Allen & Carletti, 2009:5). Subsequently, some of the major financial organisations failed, increasing the uncertainty in the financial markets. Given this loss of confidence in the financial system, banks became strict with lending and this in turn gave rise to a credit crunch (Akkas, 2009:27). As the banks were tight on lending, this fuelled the crisis and liquidity shortages increased (Chitiga, 2010:5). At the beginning there was relief on liquidity shortages to the financial institutions, however, as the liquidity needs became continual, policy makers had to alter for other means of relief. Regardless of all these efforts to provide for the liquidity needs in the financial system, the crisis was insistent, resulting in the collapse of a number of financial organisations such as the Lehman brothers (Adler & Tovar, 2012:3). Consequently, the financial crisis then spilled over to other countries, especially to the developed countries that were more narrowly

connected to the US financial sector. The price decrease in assets, for example, seriously impacted the European banks that owned the US toxic assets (Hosono, Takizawa & Tsuru, 2013:1).

However, the spill-over effects went beyond the asset price depreciation or liquidity shortages in the financial system. In one way or another, the impact of this crisis spread to other countries (such as in Asia and Europe) despite the fact that their financial systems were less connected to the US financial system. Japan's Gross Domestic Product (GDP), for example, fell unexpectedly in 2011 because of the predominant decline in exports (Hosono *et al.*, 2013:1). The effects of the financial crises are still prevalent in Japan, since the country's economy recently surprisingly fell into recession. The country's GDP fell at an annualised rate of 1.6 per cent from July to September 2014 (Ujikane & Fjioka, 2014:4). Since Japan is the third largest economy, its economic position has much influence on the world economy. In other words, the impact of this unfolding recession can also affect other economies that are economically related to Japan.

In brief, the 2008-09 financial crisis had implications not only in Japan's economy, but in most economies around the world and various arguments have been made concerning the causes of this financial crisis. A number of researchers indicated poor policy application, relaxed monetary policies, financial modification, inadequate regulation and the Chinese surpluses as some of the factors that are conferred to the global financial crisis (Ikhome, 2008:2; Allen & Carletti 2009:6). Other researchers are of the perspective that mortgage traders misguided the borrowers to such an extent that they had to borrow beyond their capability. Researchers also described these lending practices of subprime lenders as greedy. However, as mentioned before, the US housing bubble was the most influential factor that set off the GFC (Baxter, 2009:105).

The credit crunch due to the GFC meant that there was a limited availability of commercial loans from banks, not only to the advanced economies but also to developing economies. In the case of South Africa, the spill-over effects on their banking system were relatively few when compared to the impact in some other countries such as the UK, Europe and the US. Some of the factors that leveraged South Africa include the strong regulatory system and its residual exchange controls on residents. Nevertheless, as the supply of credit contracted, local banks were under pressure, particularly on their earnings during the crisis (SARB, 2009:106; Padayachee, 2010:10). In the same context, the uncertainty in the financial markets led to lower credit risk ratios by the year 2008 (Padayachee, 2010:9). As a result, the growth in credit extension slowed and growth in credit towards private sector declined substantially in 2009. As a result, the local banks' earnings were under pressure and Absa confirmed this as clients defaulted on future contracts (Padayachee, 2010:9). Similar pressures on credit extensions were also experienced by Standard and Nedbank (Padayachee, 2010:10).

Furthermore, a lack of commercial credit generally leads to firm retrenchments or closures and the private sector moving towards more part-time and flexible work arrangements (Steyler & Powell, 2010:4). In agreement with this statement, the GFC was mainly transferred through trade, financial flows, decline in consumer demand and a decrease in private investment (Steyler & Powell, 2010:4). The GFC reduced income in most of the advanced economies across the globe and international trade was reduced (Begg Gurney, Newton, Fisher & Matysek, 2010:3). This has been a primary factor in the transmission of GFC to the developing countries, including South Africa. Given the fact that South Africa is a middle-income country that is more dependent on international funds and trade earnings, declines in financial inflows can be expected to influence the South African household's income through employment and investments (OECD, 2010:22). In Bangladesh, Mexico and Philippines, for instance, the impact of the financial crisis on the middle-income was attributed to significant shocks to employment and labour earning in the manufacturing sector (Habib, Narayan, Olivieri & Sanchez-Paramo, 2010:2). The reason for this is the fact that the manufacturing sector employs a large number of middle-income households and this is also true in South Africa (OECD, 2010:26).

As the effects of the GFC spread around the world, South Africa went into recession after 17 years and its GDP growth rate fell (Styler & Powell, 2010:2). Manufacturing activity declined and the demand for mining products also fell (SARB, 2009:12). A sharp rise in lending rates as well as the risky perception concerning the international financial markets could have contributed much to the decline in economic activity (Styler & Powell, 2010:2). Loss of employment together with a contraction of businesses, specifically in the manufacturing and mining industries, were also proof of the spill-over effects of the world recession on the real economic activity in South Africa. The decline in the world demand for commodities is also evident, for example, in the motor industry of South Africa, a decrease in export demand contributed to a reduction in production levels (Baxter, 2009:106). This adverse influence of the GFC on the local economy is expected to continue with the on-going Eurozone crisis (Baxter, 2009:105). The following section (Section 1.2.1.2) will provide an overview of the Eurozone financial crisis.

1.2.1.2 The Eurozone crisis

Both private and the government debt were rising among the Eurozone countries, to such an extent that it was difficult to repay (Watt, 2008:3). As a result of overall defaults, rating agencies downgraded the credit ratings of countries such as Italy, Portugal and Ireland (Noeth & Sengupta, 2012:468). This in turn caused debt to be more expensive, culminating in a vicious cycle of growing debt. The Eurozone financial crisis was a result of a combination of factors. The causes of the Eurozone crisis will be discussed below.

Between 2002 and 2008 European countries were lending to one another in an easy credit environment that encouraged high risk lending and borrowing practices. This was done by lowering interest rates with the aim being helping countries to stimulate economic growth. As a result, countries were borrowing large sums of money, which they could not afford, assuming that the countries will not default (Taylor,

2011:12). Most of the borrowed money, however, was not invested in infrastructure, job creation and overall growth in accordance with the original purpose. To some extent, socialist fiscal policies and mismanagement of funds were the main reasons for not investing the funds as predetermined. Spain, for example, has a more socialist fiscal policy and they once accumulated debt of up to 283% of annual economic output in 2007, with no or little investment in future growth (Watt, 2008:6, Noeth & Sengupta, 2012:458).

In addition, apart from the easy credit conditions among the Eurozone countries, there were international trade imbalances during the GFC. Countries such as China had a huge trade surplus and in contrast, European countries had large trade deficits. As argued by some reviewers, the emerging economies' extravagant surpluses could have contributed to the relaxed financial environment in the economies with current account deficits (Watt, 2008:6). For the same reason, these relaxed financial circumstances imposed strain on the global interest rates (Watt, 2008:7). This promoted a credit boom as well as high risk-taking among the developed countries, especially in the US and some European countries. The crisis was also fuelled to some extent, as mentioned earlier, by some of the trade deficits in the US and Europe, that was a result of socialist fiscal policy. Greece, for example, had a trade deficit because the government had increased its commitment to public workers in the form of generous wages and pension benefits (Story, Landon & Nelson, 2010:1). This caused Greece to be uncompetitive in the export market when compared to Germany, who had more debt, but kept its wages competitive and thus its export affordable (Elliot 2010:1). Since then, Greece continued to be in a debt crisis and currently the European Central Bank indicated that it would not expand the emergency loan program that has been propping up Greek banks recently (Alderman, 2015:1). In the case where one country defaults or exits the group, it can result in uncertainty within the region as well as across the world.

Apart from the international trade imbalances, the approach that banks and countries used when lending money to troubled countries also fuelled the crisis. The correct procedures of lending funds were not followed. A loan, for instance, was not evaluated to determine if it is profitable or risky. This system encouraged countries (for example Portugal, Italy, Greece and Spain) to borrow beyond their capability, therefore they could not repay their loans and they subsequently defaulted (Rees, 2009:98). As more countries in the Eurozone were defaulting, borrowing costs increased. These defaults resulted in a lower GDP and higher unemployment. In some cases, countries like Portugal and Greece had to raise taxes to make up for the deficits. As taxes were increasing, private lenders defaulted, leaving less money available for future investment. The financial contagion among the European countries affected the rest of the region and the global economy either directly or indirectly (The Economist, 2011:1).

Taking the case of South Africa, the country has been affected by the Eurozone crisis. However, the country was cushioned from severe impact of the GFC by policy regulations, for example the exchange

controls, interest rate policy and the National Credit Act. The higher regulation of the financial system of South Africa differentiates the country from developed countries' like Europe and North America financial markets (Ikhome, 2008:2). This matter, however, failed to wholly insulate the country from the tremors of the financial crisis. South Africa is also susceptible to a credit crunch due to its debt-driven, consumption-led growth (Seeraj, 2008:13). Therefore, the interconnection between South Africa's financial markets and those of the developed countries of the North as well as the emerging economies, is compared to other African countries to a large extent. South African' biggest banks (like Barclays Bank holdings in ABSA), for instance, have foreign investors as their dominant shareholders (Seeraj, 2008:14). Similarly, the export earnings of South Africa are expected to be affected by the current European crisis since the EU is South Africa's main trading partner (Gumata, Ncube & Ndou, 2012:5). In line with this expectation, preceding the financial crisis in 2009, there was a 35% decline in exports from South African to the European Union. This serves as a precursor that a crisis in the European countries may not leave South Africa unaffected. A decrease in export earnings may imply a decrease in economic activity to the export dependent industries and this will eventually lower households' income of South Africa through investments and employment. Studies however indicate that the influence of the current Eurozone crisis on the South African economy is minimal, views that this study will provide more information on (Nelson, Belkin, Mix & Weiss, 2012:2).

From the above, it can be deduced that both the GFC and the current Eurozone crisis have influences on the world economy. This effect also spilled over to world households and individuals. A high increase in income inequality as well as a high acceleration in the debt-income ratios were two of the noticeable effects of the aforementioned two financial crises, particularly among lower- and middle-income households (Kumhof, Ranciere & Winant, 2013:4). Similarly, Myrie and Robinson (2013:2) acknowledged an increase in food insecurity as a result of the global financial shock and the economic slowdown. This food insecurity emanated from a decline in income of households and individuals due to limited job opportunities and decreasing earnings (Baxter, 2009:105; ODI, 2009:2; ILO, 2010:8).

Like other countries, the South African economy is struggling with a sluggish economic growth, originating from the spill-over effects of the GFC, European crisis and the proximate global economic slowdown. The rising unemployment and poverty rates in the country have strained the resources of the nation and pressured the government to review their policies (SARB, 2009:12). As for the business corporations, the impact of the financial crises is felt directly through expensive credit and indirectly through the reduction in consumption spending. For most of the businesses, production costs remain high and exports earnings are shrinking due to a decline in world demand for commodities. Therefore, there is an increased risk of more retrenchments in a number of business sectors as well as pressure to increase wages. From this explanation, it is evident that this financial shock has influences on household income distribution (Story *et al.*, 2010:1; Begg *et al.*, 2010:3). Thus, identifying the transmission networks

through which such shocks ultimately affect households can be useful in order to counter the severe consequences of such financial shocks on household income distribution.

1.3 Problem statement and motivation

As the impact of the 2008-09 financial crisis started to spread, most of the affected countries experienced contractions in their production sectors. This entails that the financial shock spilled over from the financial sector to the real sector. The theory of propagation mechanisms from the financial to the real sector in business cycles has been explored in numerous studies (for example Bernanke, Gertler & Gilchrist, 1996; Bernanke & Gertler, 1995; Azis, 2000). However, empirical works that aim to identify and measure a shock impact within a general equilibrium framework are rare (Azis & Mansury, 2003:112) therefore this study attempts to fill this gap.

The above mentioned empirical works on the impact of a financial shock, argue that a particular pattern of income distribution is usually generated during the crisis. Furthermore, there is always an assumption that the high-income households are the ones that benefit from currency depreciation and high interest rates during a crisis. However, this is not always true, since these people might also lose money or jobs if they were employed in sectors that are highly import-dependent. Therefore, understanding how financial shocks effects manifested themselves from the financial to the real sector is critical to policy formulation.

In analysing the economy-wide impact of the financial shock, previous studies, such as Thorbecke (1998; 2000), Azis (1998; 2000), Robinson (1991) and Bernanke, Gertler and Gilchrist (1999) have attempted to adopt a general equilibrium model. These studies have also used the Social Accounting Matrix (SAM) multipliers and Structural Path Analysis (SPA). However, the limitation of previous SAM multiplier and SPA studies was the arbitrary manner in which the shock was introduced to the modelled economic system. In studies, such as Thorbecke (1998; 2000), Azis (1998; 2000), Robinson (1991) and Bernanke, Gertler and Gilchrist (1999), the standard practice was to induce an artificial fall in the output of the sectors that are known as *ex-post* to contract during the crisis. Such an *ad hoc* method of introducing a shock into the system does not capture the actual mechanics of a crisis that is triggered by movements in financial variables (i.e. foreign capital) rather than in production (Azis & Mansury, 2003:112). The problem is that sectoral output can decline because of numerous types of shocks, of which a financial turmoil is only one of them. Simply reducing the sectoral output artificially, thus fails to recognise the origin of the crisis and neglects the linkage between the financial sector and the rest of the economy.

Another consequence of an *ad hoc* introduction of the shock is that it prohibits one from gauging the magnitude of the contraction if the crisis had been the only shock that occurred, *ceteris paribus* (Azis & Mansury, 2003:113). The decline in production, in particular, is predetermined exogenously in these studies and is based on actual data as if the decline is all due to the financial crisis. Conversely, the impact

of the crisis on production should be determined endogenously. Aforementioned tacit assumption may lead to bias conclusions when estimating the impact of the shock. The sources of the bias assumptions are the exclusion of other shocks that had nothing to do with the financial crisis that might have contributed to the decline in production. The unemployment problem in South Africa during the financial crisis, for example, may not only occur as a result of the shock but also as a result of other factors. In the same way, Esser (2013:28) suggests that it is not only the external environment, but also individual choices that play an important role in the labour market in South Africa.

Using a more sophisticated financial Computable General Equilibrium (CGE) model would be desirable. However, the required data are often lacking, and capturing the intricate mechanisms of variables in such a model is far from easy. In this dissertation, an alternative method is proposed to transcend the aforementioned limitation of the standard Social Accounting Matrix (SAM) based approach, without having to construct a CGE model. The researchers augment the standard SAM by incorporating a fairly detailed financial sector based on the flow-of-funds data (as published in the 2009 South African Reserve Bank Quarterly Bulletin), thus allowing financial variables to be the original source of the shock (a standard SAM condenses financial transactions into a single savings or investments account). While the concept of the flow-of-funds matrix (the way money move between economic agents) is not new, the contribution of this dissertation is in the *explicit* use of such matrix in the SAM system.

1.4 Research question

The research question is: *Through which transition networks or channels does a financial shock influence household income distribution using the case of South Africa?*

1.5 Objectives

The primary objective of this dissertation is to determine the transition from a financial crisis induced shock to the income distribution of South African households. The primary objective can be disaggregated into a number of detailed goals or objectives, which entail the following:

- Analyse the transmission of a financial shock from the financial sector to the real sector and in doing so, identify the principal paths or networks of transmission to households;
- Provide policymakers with a deeper understanding of the effect of a financial shock within the current economic structure; and
- Make relevant policy proposals regarding the implementation of ways to counter the economy-wide impacts of a financial shock.

1.6 Hypothesis

The hypothesis underlying this dissertation is that a general equilibrium approach, based on a financial sector-augmented SAM, can be used to overcome some of the major limitations of the standard SAM-based approach. By integrating the financial and real sector, the extended SAM framework can capture clear inter-linkages among variables, resolving some arbitrary hypotheses. Thus, the movement of financial variables often compensate for the effect of real side variables.

1.7 Methodology

In order to achieve the objectives as set out in Section 1.5, a literature review, data, empirical analysis, and modelling of a financial shock are required. The literature review will be discussed in Chapter 2 and 3. This review will present an overview of the relevant financial and economic crises (as the origin of a financial shock) and their impact on the South African economy (with elaboration on the possible paths of networks of influence between the financial and real sector of an economy). Furthermore, an overview of the salient knowledge in general equilibrium theories and how they have influenced the development of quantitative assessment tools will be provided. The latter will firstly focus on the transmission mechanism of a financial shock from the financial sector to the real sector, secondly on how a financial shock influences an economy, and finally various models, relationships and findings used in previous studies will be examined. This literature review will assist in linking the theory of general equilibrium to the problem in order to understand how the South African economy is dependent on other global economies (Chapter 2). Since, financial shocks impact many countries in different ways, Chapter 3 will discuss literature on the transmission channels of a financial shock. This is important when analysing and comparing the findings of this study later in Chapter 5.

After the literature review, the data and methods are discussed (Chapter 4). The data is used to conduct the empirical analysis. The empirical study will focus on the Social Accounting Matrix (SAM)² data and Structural Path Analysis (SPA)³ in order to analyse the transmission that the GFC and the Eurozone financial crisis induced shock had on the South African economy. The SAM data (based on 2006 prices) will be obtained from the Development Bank of Southern Africa (DBSA, 2009).

SAM-based and SPA models are among the most popularly used models for measuring the economy-wide impacts of a financial shock (Jafri & Bulandi, 2006; Azis & Mansury, 2003). If the SAM is used

² Social Accounting Matrices are numerical arrays representing the circular flow of income in an economy. Each cell in the SAM reflects payments from one account to the other. Their assumptions are critical to this framework. They contain fixed prices and constant average expenditures propensities. Some of the accounts have to be set endogenous and the rest as exogenous. The choice for the accounts depends on the nature of the analysis (Roberts, 2005:394).

³ The SAM multiplier framework can be used to quantify the effect of an increase in the exogenous component of an endogenous account into another endogenous account. However, this framework is unable to show how this effect conducted through the economic system. The SPA identifies the principal paths of transmission of this effect (Azis & Mansury 2003:113).

appropriately, it proposes some important and useful features about the socioeconomic character of and the association between the structure of production and the distribution of income in an economy (Round, 2003:14). The standard inverse matrix calculated from a SAM is a useful tool for estimating the impact of an exogenous shock on income of endogenous accounts. It captures the direct and indirect effects of the shock. However, the multiplier analysis does not reveal the network of paths through which an injection is transmitted (Azis & Mansury, 2003:113; Defourney & Thorbecke, 1984:2). In order to identify the principal paths of transmission, the SPA method is used. From this discussion, a SAM- based model can thus be seen as tool for analysing the transmission of a financial shock to household income distribution of South Africa.

1.8 Study outline

Chapter 1 will present the introduction and provide an overview of the impact of recent and current financial crises (i.e. the global and European financial crises) on the South Africa economy, as well as a problem statement, motivation and description of the research method(s) used.

An overview of the 2008-09 GFC, the on-going European financial crisis and the spill-over effect of these events on the South African economy will be presented in Chapter 2. Furthermore, the chapter will provide a theoretical perspective on the studies conducted with regard to economy-wide impacts of financial shocks. This will assist in obtaining an understanding of the financial shock referred to in the study (that is, GFC and Eurozone crisis). This chapter will also identify possible channels of transmission of a financial shock that will later be used to analyse and compare the findings of the study.

Chapter 3 will provide a brief overview of the economic theories of general equilibrium and its application to the financial sector in an economy. Global events, such as financial crises, have an impact on many countries through various channels and networks. The aim is, therefore, to link the theory of general equilibrium with the problem at hand in order to better understand the networks through which the South Africa economy depends on the rest of the world's economy. By examining the production and consumption sides of the economy, the household income distribution pattern that is influenced by the financial shock, is explained. The information on these factors ensures that changes in production activities are well reflected by changes in household income levels.

An overview of the data and methods used (i.e. the SAM, multiplier analysis, and structural path analysis) for economy-wide impact assessment will be provided in Chapter 4. The chapter will also describe the construction of the flow-of-funds matrix, which is used to expand the financial sector in the SAM.

Chapter 5 will present, compare and discuss the results and findings from the methods applied. The chapter will further summarise the impact that a financial shock has on the South African economy. The

results showed that, the mining low-income households were most affected during the crises. The low-income households were more affected by the financial shock due to their heavy reliance on low-skilled jobs in the mining sector. Since the mining industry is one of the major employers in South Africa, many households were affected by the financial shock through reduced salaries and wages in this sector. The mining sector also proved to be instrumental in transmitting the shock from the credit crunch to the fall in household income to both the low and middle income groups. However, in the case of high-income households, capital played a major role in transmitting the impact of the financial shock.

Finally, Chapter 6 will present a summary of the dissertation's key findings. The chapter will also provide some relevant policy recommendations and avenues for further research. This findings in this study can be used for policy formulation concerning stimulating economic growth and creating employment during times of financial crisis. Considering that the findings of this study expose the networks through which the households' income in South Africa is influenced by a financial shock, these findings will assist the government policy makers to counter the effects of the crisis as well as to identify strategies to boost the income of households. These strategies include direct transfers from the government to low-income households. In addition, government expenditures can stimulate production in those sectors that provide the principal source of employment for low- and middle-income households. Moreover, the South African policy makers can consider investigating significant barriers that limit the mining and manufacturing companies in order to unblock the issues that affect the ability of the sectors to respond positively to a financial crisis.

1.9 Conclusion

This chapter presented the introduction to the study and provided an overview of the impact of recent and current financial crises (i.e. the global and European financial crises) on the South Africa economy. This chapter also included a problem statement, motivation for the study and a description of the research method(s) used.

Chapter 2 provides a literature review on recent financial crises and their influence on the South African economy.

Chapter 2: Recent financial crises and their impact on South Africa

2.1 Introduction

The 2008-09 GFC and the Eurozone crisis have motivated a multitude of studies that examined the causes, dynamics and impacts of these crises on the world economy (Lewis, Joseph & Roach, 2009; Helleiner, 2011; Taylor, 2011; Kayli & Kotze, 2012). The aim of this chapter is to summarise the events that led to each crisis and their impact on the global economy. Furthermore, this will provide a background to the analysis following in the next chapters.

In order to achieve this aim, this chapter provides a definition of a financial shock (Section 2.2), traces the origins of the GFC as it unfolded in the US and spread to the rest of the world (Section 2.3). Apart from this, this chapter explains the on-going European financial crisis and the way in which this crisis is spreading among the European countries (Section 2.4). The impact (Section 2.5) and transmission channels (Section 2.6) of these crises to the developing and emerging economies are also included in this chapter. This will provide the necessary background information to explore the spill-over of the financial crises to the South African economy (Section 2.7) and this can contribute to identify the possible transmission channels of the financial crises to the South African economy (Section 2.8).

2.2 Definition of a financial shock

A shock is usually defined as an unexpected event with a large effect on the economy or the markets (Fornari & Stracca, 2013:9). In finance, a financial shock is an expected change of financial conditions in the financial sector (Hirakata, Sudo & Ueda, 2009:23). According to the perception of Hirakata *et al.* (2009), a positive financial shock is a transfer of wealth from the real economy to the financial industry. In their findings, investors' decisions are greatly influenced by this circulation of assets between the real and the financial sector. Similarly, Hall (2010) indicated that a positive financial shock is also beneficial to financial intermediation in that it is associated with a decrease in taxes, which in turn reduces the operating costs and promotes efficiency. Accordingly, this type of shock is favourable for the financial intermediaries to generate more profits and thereby to increase the availability of credit (Hall, 2010:3). The definition of Nolan and Thoenissen (2009) that is similar to this definition describe financial frictions shocks as shocks that have a great influence on the effectiveness of debt contracts that exist between the lenders and the borrowers. In their findings, this type of a shock will largely determine the simplicity or complexity of debt contract conditions (Nolan & Thoenissen, 2009:596). In addition, Gilchrist, Ortiz and Zakrajsek (2009) interpret a financial shock as an extra shock to the foreign finance premium. They argue that due to financial market imperfections, lenders demand a premium to provide the necessary external funds. During an economic downturn, premiums charged on the various forms of external finance

increase and as a result production and spending may decrease (Gilchrist *et al.*, 2009:2). Simply said, a financial shock is more similar to a supply shock in the sense that it has an impact on the firm's marginal costs (Meh & Moran, 2010; Gerali, Neri, Sessa & Signoretti, 2010). However, other studies have associated a credit supply shock with the aggregate demand shock (Curdia & Woodford, 2010; Fornari & Stracca, 2013:8).

Given the above discussion, one definition of a financial shock can be derived. A financial shock is an unexpected event in the financial sector, which can be either positive or negative. Historically, there are different types of financial shocks. However, in this study, the financial shock referred to originated as a result of the 2008-09 GFC and the current European crisis. In this research, it should be noted that a financial shock originates from the financial variables in the SAM framework. For the purpose of determining the effect of a financial shock on a specific market, it is crucial to correctly identify the financial shock. The next section will elucidate these two financial shocks.

2.3 Overview of the 2008-09 GFC

The 2008-09 GFC was stimulated by a downfall of the subprime mortgage market in the US. There are also several critical driving factors that reinforced the crunch in the world financial markets. These include the presence of an intensively innovative and deregulated global financial system, uprising asset prices and readily available credit (Lewis *et al.*, 2009:1). While some people have ascribed the primary cause of the GFC to the deficiency of a suitable and efficient regulatory system in developed countries, others have cited the ethical fails of high powered bankers and business persons in the US to be the primary cause of the GFC (Lewis *et al.*, 2009:2).

Starting with the US housing 'bubble', the financial crisis unfolded itself in several stages (Helleiner, 2011:67). As the housing boom continued, many people started to be substantially involved in the subprime mortgages increases. At the same time, poor incentives in the US industry also promoted many less creditworthy borrowers. This resulted in many defaults, which weakened the assurance of financial organisations and financial products that were exposed to these mortgages. By mid-2007, several hedge funds started to collapse and there were serious concerns in the financial markets concerning the vulnerability of a number of financial organisations in the US as well as in Europe (Lewis *et al.*, 2009:3).

The crisis deepened in March 2008 regardless of all the official attempts to stabilise the markets with hefty quantities of liquidity. It is during this time that one of the major US investment banks, Bear Stearns, had to be relieved by the US authorities. Following this, by September 2008, three events led to a total deterioration of market confidence. Firstly, by the beginning of September, the US government put the two giant government-sponsored mortgage lending agencies, Fannie Mae and Freddie Mac ("Fannie and Freddie"), under a form of public "conservatorship" due to the excessive losses they were

encountering (Helleiner, 2011:68). Secondly, by mid-September, the US investment bank, Lehman Brothers, was strained into default and thirdly, the world's biggest insurance company, American International Group (AIG), was relieved and nationalised by the US government (Roubin & Mihm, 2010:34).

At this specific time, the intensity of the financial crisis started to spread further than the North Atlantic region. As the situation got tougher, the US and European banks withdrew their international loans and this triggered severe financial complications as well as debt crises in the countries that were highly-dependent on external funding. International trade credits also contracted, which severely affected the exports and imports of a number of economies. There was financial contagion, especially in countries whose financial systems were already susceptible due to home-grown housing 'bubbles', financial excesses, and large current account deficits. Britain, Germany, Ireland, Spain, the Baltic countries, Dubai, Singapore, Australia, and New Zealand were amongst the affected countries, with Iceland being affected most severely (Helleiner, 2011:69). The impact of the financial crisis was also transmitted to other countries in the world through different networks and linkages functioning through the real economy, such as declining exports, commodity prices, and remittance payments. The weakening global growth emanating from the GFC financial crisis fuelled the sovereign-debt crisis in Europe (European Commission, 2013:8). The Eurozone financial crisis is still persistent in some of the European countries like Greece, and Europe's politicians, regulators, and market players are adopting several strategies to counter the dire consequences of the current financial crisis in the region (Alderman, 2015:1). The next section will discuss the on-going financial crisis in Europe.

2.4 The on-going European financial crisis

During the 2002-2007 (pre-crisis) period, countries in the Eurozone could borrow funds at low interest rates aiming to stimulate growth in a time of a global economic slowdown. This 'cheap' debt, supported a very risky way of borrowing and lending to such an extent that countries were lending large sums of money to each other in an assumption that the countries were "too big to fail" (Taylor, 2011:12). If the interest rates had remained low, perhaps the debt crisis could have been avoided, however, the interest rates rose sharply. Eventually, the Eurozone acquired more debt than it could afford (Nelson *et al.*, 2012:6).

The Eurozone debt crisis began late in 2009, when the new Greek government unveiled that the former governments did not present the budget information correctly. Unexpectedly, deficit levels led to a deterioration in investor confidence and this caused bond spreads to increase to unendurable levels (Nelson *et al.*, 2012:6). Sudden anxiety arose when it was revealed that the fiscal positions and debt levels of several Eurozone countries were out of control (Taylor, 2011:13). In May 2010, Greece received a financial relief package (loans) from other Eurozone governments and the International Monetary Fund

(IMF) in order to avoid defaulting on its debt. Investors became increasingly anxious about public finances in Ireland and Portugal (European Commission, 2013:8). As their bond spreads increased, the two countries also asked European IMF financial assistance packages that were finalised in December 2010 (Ireland) and May 2011 (Portugal).

Following these events, unprecedented policy measures have been pursued by the European leaders and institutions to counter the crisis and stem contagion, particularly in Italy and Spain, the third and fourth largest economies in the Eurozone respectively (Taylor, 2011:13). Unfortunately these policy measures were unable to increase market confidence for any sustained period of time and the crisis has cycled through periods of relative calm followed by severe market pressure. In Eurozone countries for instance Greece, Spain, Portugal that are, under the most market pressure, the crisis has caused protests and a backlash against severity measures (Nelson *et al.*, 2012:7). The economically stronger economies (such as Germany, Britain, France) that were the source of financial relief to the troubled countries, were not in favour of the idea of the so called “bailing out” and were also blaming other countries that failed to execute the “responsible” policy strategies. Helleiner (2011:69) points out that controversy between major authorities regarding the effectiveness of strategies to counter the effects of the financial crisis, is one of the main factors that intensifies fears in markets and this has eventually turned into a political crisis as well.

Through this poor implementation of reforms, the motion of recovery has been sluggish as European countries struggle to eliminate the consequences of the crisis (European Commission, 2015:3). Furthermore the economic growth remained weighed down by the global weak growth trends and output has yet to reach the pre-crisis levels. While private consumption has been the main drive of growth in the recent recovery, investment and exports have done little to support this growth. Despite the expected increase in domestic investment and consumption by 2014, the EU recovery has lacked momentum. The reasons behind this weak momentum include a structural weakness that has not been fully addressed by structural reforms (European Commission, 2015:9). As for 2015, the decrease in oil price is expected to drive economic growth among the Eurozone countries. This sharp decline in oil prices since mid-2014 has been important in forecasting the EU financial crisis. In other words, it is expected that lower oil prices will support domestic demand, while the Euro’s depreciation promotes exports. However, this expectation can have adverse effects in that lower inflation tends to raise real interest rates, thus impacting on growth (European Commission, 2015:10).

Given the above, the understanding of the spill over effects of both the global and European financial crises is crucial for identifying the transmission channels. The next section will discuss the spill-over effects of these two financial crises on developing and emerging economies.

2.5 Impact of financial crisis on developing countries and emerging economies

The developing countries⁴ have become increasingly interconnected in international trade and finance over the past few decades. As a consequence of the crisis, remarkable shrinkage of the global financial flows detains their development progress (UNCTAD, 2009:5). By virtue of global integration, the effects of the financial crisis promptly spread to most developing economies in form of constraints in trade finance and a decline in demand affecting bilateral trade flows. In the initial stages, the financial crisis in the developed economies did not influence the developing and transitional countries, as the crisis did not originate within their financial systems. There was a perception that the real economy in the developing countries may remain unaffected and that growth in developing countries would help to boost the world economy. However, the drastic drop in the developed countries' demand contributed to a sharp decrease in export prices as well as export quantities from the developing countries. As a result, this initial relentless shrinkage of output and employment in the export sectors of developing and emerging countries has spread to other industries in these countries, causing economy-wide declines in output and employment (Kavli & Kotze, 2014:209).

Developing countries, in particular, are severely affected by a decrease in commodity prices, demand for exports and capital inflows. The consequences are severe for those developing countries that are highly dependent on exports, particularly those with a small national economy, since the contraction in global demand will probably curtail their exports and raise unemployment (UNCTAD, 2009:5). Before the start of the financial crisis, most of the developing countries, such as those in sub-Saharan Africa, had been growing steadily, motivated by higher commodity prices after a prolonged period of stagnation caused, in part, by terms-of-trade losses. With this recent slump in demand emanating from the crisis, a negative effect on this development had been experienced among the developing countries. Nevertheless, developing countries like Nigeria that export oil have benefited slightly from volatile energy prices during the crisis (Bakrania & Lucas, 2009:7). However, in some circumstances these oil exporters have experienced a serious decline in tax revenues; an income that these economies greatly rely on (Bakrania & Lucas, 2009:8).

In addition, there is evidence from available literature that the financial crisis is having unfavourable effects on global investment (UNCTAD 2009; Calvo, Fabrizio & Pablo, 2012). Inflexible credit terms along with decreasing aggregate profits have lessened the potentiality of companies to fund their international projects (UNCTAD, 2009:25). The world economic slowdown as well as an elevated increase of risks have once more deteriorated investors' confidence and this has influenced foreign direct investment (FDI). Many overseas financial institutions are pulling back their investments in the developing countries' stock exchanges and repatriate the proceeds (UNCTAD, 2009:27). On the one side,

⁴ Countries with General National Income (GNI) less than US\$ 12,736. Most of developing countries are in Africa, Asia and Latin America (World Bank, 2015:1).

this withdrawal results in a sharp decline in stock prices and large devaluations in their currencies. On the other side, as the stock prices drop, it additionally affect investment in the developing economies. However, the impact of currency depreciation depends much on the portion of imported inputs in production or on the consumption basket of employees (Calvo *et al.*, 2012:25).

2.6 Crisis transmission channels to the developing and emerging economies

As mentioned above (Section 2.5), the effects of the financial crisis were transmitted to the developing and emerging economies through trade and financial flows (Te Velde, 2008; ODI, 2010; Toporowski, 2009). These propagation networks or paths were noticed in industries composed of productions and supply chains in particular (UNCTAD, 2009:5). To understand how these channels work and to utilise this knowledge for achieving the aim of this study, this section will discuss the financial flows (Section 2.6.1) and trade (Section 2.6.2) as the main transmission channels of the financial shock to the developing and emerging economies.

2.6.1 Transmission through financial flows

The failure of the stock exchanges in the major financial institutions like Lehman Brothers, Bear Stearns and Northern Rock in May 2008 was also rapidly spreading to the stock exchanges in the great influential transitional economies (Gurtner, 2010: 190). The stock exchanges in Brazil, India, China, Russia as well as South Africa are among those that were affected soon after the collapse of these big financial centres. Similarly, the Morgan Stanley Capital International Emerging Market Index, which indicates the stock markets in the threshold countries, dropped by 23% within the same period. The financial systems of these economies had developed and were connected to other countries' financial systems a long time ago. If the financial regulations of the country are reluctant, that country is more vulnerable to risk (Gurtner, 2010: 190). In addition, countries like those that rely much on oil in the Middle East as well as Singapore were severely impacted by the crisis through financial flows. This resulted from the fact that these countries' Sovereign Wealth Funds had been invested in volatile assets, which greatly depreciated. In the same way, stock market losses also had a severe impact on economies such as Chile, whose pension funds comprise of shares from the developed countries (Toporowski, 2009:2).

It is has been argued that some stock markets within the developing countries' stock were also affected by spill-over effects of the financial crisis (ODI, 2010:2). In the beginning, portfolio investment flows received the most of the tremors emanating from the financial crisis; reversing from inflows in 2006 to outflows in 2008. These outflows had an adverse impact on the developing and emerging economies as foreign investors relocated their funds to the countries that they perceived to be a lower risk (World Bank, 2009:24). In 2008, portfolio investment and Foreign Direct Investment (FDI) faced a sharp decline, while some countries (such as Zambia, Kenya and Nigeria) encountered significant net outflows.

Due to the effects of the financial crisis, obtaining finances from abroad became complex. The availability of foreign funds was limited by an escalating risk premium that developing countries faced as a consequence of the crisis. Abroad funding to Nigeria and South African companies, for instance, has been scarce during the crisis (IMF, 2009:8). From January to September 2008, Brazil faced a capital drain of USD 13 billion, Argentina USD 20 billion, and Mexico and Venezuela USD 19 billion each (Calvo, 2013:3). In some cases where funds had been obtained at low rates, e.g. in Japan or Switzerland; the credit business was terminated and invested in high-interest countries. The drying up of foreign funding has been a stumbling block for development, thereby it channelled the impact of the crisis to other industries of the economy (UNCTAD, 2009:5).

Furthermore, the GFC led to decline in remittances, which has been an important source of revenue to the developing world, especially in Africa. Remittances from migrants to developing countries, in particular, have been increasing constantly prior to the crisis and as a result of the financial crisis these remittances declined (World Bank, 2009:24). The severe impact of the crisis through remittances was most severely felt in the countries that have a considerable percentage of remittances in their capital flows; e.g. the Central American States and India (Burki & Mordasini, 2009; Awad 2009; World Bank, 2009). The contraction in remittances was mainly connected to the suspension of foreign labour employment as well as the repatriation of foreign workers.

The impact of the financial crisis can be fuelled by a reduction in foreign aid; this aid is crucial to most developing countries (OECD, 2009:14). As is evident from the past financial shocks, the donating countries often lower their aid. If the donating countries face significant budget deficits and accelerating public debt, they will lower their precedence to fund the developmental aid in most cases (World Bank, 2009:23). This will position those economies that depend more on official development assistance (ODA) for their capital flows at a disadvantage. As a result of the financial crisis, there has been a peril to reduce or stop ODA (OECD, 2009:15). According to the OECD, bilateral foreign assistance from donors like France, Italy and Ireland have reduced, due to the crisis and this effect may continue with the on-going financial crisis.

2.6.2 Transmission through trade

On the onset of the global economic slowdown, the emerging and developing countries faced a sharp decline in the demand of their goods and services to the developed countries. This decline on global demand has contributed to slow growth in the developing as well as the emerging countries: mainly in China and India. In turn, the contraction in growth in India and China also provoked a decrease in their demand for resources as well as energy, particularly from Africa (Gurtner, 2010: 192). Consequently, export prices and volumes from the developing countries decreased, leading to a collapse in export

income (UNCTAD, 2009:6). This impact was severe that the poorest developing countries like Tanzania, Zambia, Afghanistan, Haiti and Uganda experienced export declines in the first half of 2009 (Awad, 2009:4). In the case of developing countries, those who are more dependent on exports were more impacted by the financial crises. An economy in which a single sector is more responsible for the wellbeing of the whole country, like Ukraine and the Slovak Republic with steel production and automotive industry respectively, was vulnerable to a clumping risk (Calvo, 2013:3).

Given the discussion above, South Africa was also affected by the financial crisis in the same way that other developing countries were affected. It becomes essential for South African policy makers to comprehend these spill-over effects that penetrate the domestic economy. The next section provides an overview on the effects of the financial crises on the South African economy.

2.7 The spill-over effects of the financial crises on the South African economy

Assessing the impact that economic decisions taken by developed countries may have had on small unclosed economies, became an urgent issue among the policy makers (Ncube, Ndou & Gumata, 2012:5). Various studies emphasise the spill-over effects of the 2008-09 financial crisis, Eurozone sovereign debt crisis as well as the unconventional policy response in the small open economies (Heltberg *et al.*, 2012; Ncube *et al.*, 2012; Essers, 2013). Theoretically, models show that policy response in large economies spill over to small open economies through various channels. Ncube *et al.*, (2012) focus on approaches which indicate the interconnections between national and external variables. For example, a powerful interaction between the exchange rate, foreign interest rate, output and monetary stimulus is indicated in the portfolio balance model (Ncube *et al.*, 2012:5). In a big economy, the monetary stimulus of expenditure that changes effects on exchange rates, tends to raise domestic income through the improvement in the trade balance. However, in the case of the small open economy, the same scenario leads to fall in income, since currency appreciation and lower transactions demands for money reduce interest rates (UNCTAD, 2009:7).

Numerous studies, such as Diebold and Yilmaz (2009; 2012), Yilmaz (2010), Antonakakis and Badinger (2012) acknowledge and examine the spill-overs that influence the financial and non-financial sectors of the economy. In these studies, very little is said about the developing and emerging countries such as South Africa, more attention was paid to the Group of Seven (G-7) economies⁵. Notable exceptions to these studies apply the spill-over methodology to equity prices in South Africa (Duncan & Kabundi, 2013) and emerging-market exchange rate returns and volatility (Kavli & Kotze, 2014). Nevertheless, the studies by Duncan and Kabundi (2013), Botha (2004), Kabundi (2009), Du Plessis (2006) Boshoff (2010), Kabundi and Loots (2007), and Botha (2010) analyse the relationship between the South African business

⁵ These are major industrial countries: Canada, France, Germany, Italy, Japan, the United Kingdom and the US (IMF, 2015: 3)

cycle and other economies around the globe. In Kabundi (2009), there is an indication that a co-movement exists between the US and South African output. Equally, Botha (2010) acknowledged a high synchronisation, particularly during the times of crisis. Furthermore, Boshoff (2010) noted a strong increasing correlation between South Africa and some of the developed economies⁶, especially in the more recent period from 1980 to 2010.

In agreement to this co-movement evidence, Duncan and Kabundi (2013) noticed an increasing assimilation in trade between the US and South Africa. This and other initiatives were reinforced by the African Growth and Opportunity Act of 2000 (Duncan & Kabundi, 2013:566). This increase in trade is evident, since the amount of US trade contributes a noticeable percentage in the calculation of the South African trade weighted exchange rate. The evidence of this trade relationship can be seen in the financial flows. The US conventional and non-conventional monetary stimulus in recent years encouraged significant capital flows to South Africa's equity and bond markets, thereby affecting the asset prices, exchange rates and interest rates. These financial ties have also increased the impact of bouts of risk tolerance and aversion, and magnified their impact on asset prices and bond yields (Calvo *et al.*, 2012:25).

Owing to this trade relationship, there has been evidence in support of the ability of the US to influence emerging market economies (IMF, 2009; ODI, 2010). It has been widely shown that the US monetary policy shock affects short-term interest rates and exchange rates in emerging markets (Kabundi, 2009; Ikhome, 2008; ODI, 2010). An exception to this finding is the article by Mackowiak (2007) who argued that the US monetary policy shocks were less influential to emerging economies when compared to other exogenous shocks. In addition, Canova (2005) noted that the interest rate channel is a powerful reinforcement of US monetary shocks, while the trade channel played an insignificant role. In similar literature focussing on South Africa, Kabundi and Loots (2010) analysed the transition networks of a positive demand and supply shocks from Germany to South Africa. They found that there is a positive relationship in these two markets. This means changes in the demand and supply in Germany will have an impact on South African exports, either positive or negative.

Regardless of the above evidence, Bakrania and Luca (2009) among others are of the opinion that Africa would be spared from the severe impact of the financial crisis since the continent has relatively weak linkages to the global economy. However, this was not the case. Africa was also affected by the financial crisis through the contraction in financial flows that resulted from the global recession and this effect was worsened because the continent's growth rely much on exporting commodities (Duncan & Kabundi, 2013:568). For South Africa in particular, the effects of the financial shock did not spare the country (Essers, 2013:3). Historically, South Africa, unlike other countries in the continent, has been involved in the global markets and its economy is relatively open to other developed economies. In consistence with

⁶ These are the US, UK, Europe and Australia (Boshoff, 2010: 1)

the given status, Ncube *et al.*, (2012) show that the US monetary stimulus shock leads to low inflation, rand-dollar depreciation, revaluation in stock prices, depressed bond yields, decline in monetary aggregates and real interest rates in South Africa. These findings imply that the SA economy is highly reactive to exogenous shocks and these shocks can neutralise the effectiveness, to some extent, of policies established to administer domestic macroeconomic issues (Ncube *et al.*, 2012:5).

In order to understand the spill-over effects on the local economy, the next section (Section 2.7.1) discuss the impact of the financial crisis as the events unfold in South Africa.

2.7.1 The entry point of the financial crisis impact in South Africa

Given South Africa's integration in the global economy, many observers were of opinion that the country would not escape the effects of the global recession (Ruch, 2013:2). This expectation became reality when South Africa entered recession late in 2008 and its growth rate was unable to recover since then (Essers, 2013:1). The manufacturing and mining sectors experienced severe declines as commodity prices and external demand collapsed (SARB, 2013:8).

In response, the South African authority took a different stand to the spreading crisis at the start of this crisis. By the end of 2008, Trevor Manuel (Finance Minister of that time), reacted to world recession with the perspective that South Africa will sail through the consequences of the crisis (Mabugu *et al.*, 2010:18). Despite the remarkable signs that were visible in the real economy in early 2009, Trevor Manuel still continued to communicate that the South African economy was not affected by the world economic slowdown. One of the reasons for such a positive viewpoint arose from the previous experience in the late 1990s when there was an Asian financial and currency crisis through which South Africa fared very well (Baxter, 2009:112). The government attributed that earlier success to the solidarity of its home-spun structural adjustment program, the Growth, Employment and Redistribution program (GEAR) that saw key macroeconomic balances fall within IMF norms quickly after the democratic elections of 1994. Since then the country experienced sustained, though far from spectacular, rates of economic growth from 1999 to 2007. Inflation fell comfortably within the inflation targeting range of 3-6 per cent between late 2003 and 2006, testing and later breaching the upper limit only from mid-2007. The budget deficit and current account deficits were both under control (Ruch, 2013: 3).

However, since 2008 things like the major macroeconomic balances and the weakness as well as susceptibility in the real sector that was noticeable for some time started to take a different direction. By the end of 2008, the GDP growth rate of the country fell to 1.8 per cent (SARB, 2009:12). By early and mid-2009 the GDP growth rate further dropped by 6.4 and 3.2 per cent respectively. This indicated that the country was already in a technical recession at the end of the first quarter of 2009. The manufacturing output declined by 6.8 per cent compared to the previous quarter. During the same period, mining

production also declined by 12.8 per cent (Baxter, 2009:115). Related contractions were also apparent in retail as well as trade sales in which motor vehicles sales both domestic and export fell sharply. About 484 000 workers lost their jobs in the third quarter of 2009 with most of these workers coming from the manufacturing sector (about 150 000). The total unemployment was more than calculated, taking into account workers who have ceased from searching for work (Essers, 2013:30).

In addition, South Africa's inflation broke through the outer limit of the target range of 3-6 per cent, while the Consumer Price Index (CPI) was at 9.9 per cent by 2008 (SARB, 2009:13). The current account deficit as a percentage of GDP increased from a very moderate and governable 1.1 per cent in 2003 to a disappointing 5.8 per cent in 2008, an alarming increase of 7 per cent in the first quarter of 2009, and a further 3 per cent drop in the second quarter of 2009 (Stytler & Powell, 2010: 2). In the beginning this deficit was manageable due to the availability of external finance. However, towards the end of 2008, the anxiety in the world markets exerted pressure on the capability of capital inflows to finance this deficit. The Reserve Bank, following a lengthy period of successive Repo (bank) rate hikes from April 2005, began cutting its key Repo rate from the latter date, to its current low of 7 per cent at the end of December 2009 (SARB, 2009:13).

Furthermore, the Johannesburg Securities Exchange (JSE) all-share index dropped from 32 542 Rands in May 2008 to 18 066 Rands in November 2008 (Duncan & Kabundi, 2013:569). During this time, the volatility and uncertainty in the stock market was worrying as the new listings remained subdued throughout 2009 (Ncube *et al.*, 2012:5). By 2009, depressed global conditions and a lower liquidity on global financial markets also impacted on the rand-denominated bonds in the European and Japanese bonds markets (Calvo *et al.*, 2012:25). Following this, the secondary domestic bond market experienced a sharp decrease in profits. As a result, bond prices were weakened leading to a much reduced level of participation by non-residents in the domestic market. At the same time, the local property market had also weakened since late 2008, but without the devastating consequences the low-income home owners felt in the US and to some extent in the UK. Following this noticeable downward trend in late 2008, house price deflation continued in 2009 despite the serial lowering of the repo and mortgage rates. Consequently, activity in new home construction declined, as the demand decreased, and also as a result of depressed conditions in the labour market and a decline in household income expectations. Additional to this background, it should be noted that the impact of the financial crisis can be more intense than recorded, since there are millions of South Africans who exist outside these formal markets; people that live in informal settlements and slums (Calvo *et al.*, 2012:26).

Apart from the above noticeable effects of the financial crisis, Ruch, (2013) finds the net directional spill-overs for the US, South Africa, China, the Eurozone and Japan. He argues that South Africa recently received most of the spill-overs, especially since the onset of 2008-09 financial crisis (Ruch, 2013:13).

During the financial crisis, as the annual growth rate of South Africa slowed from 3.4 per cent in 2007 to 16.2 per cent in 2009; over the same period the spill-overs to South Africa increased from 30 per cent to 67 per cent. The decomposition of spill-overs to South Africa during the financial crisis, from the US, China, Japan and Eurozone were rising despite the fact that the financial crisis originated in the US (Kavli & Kotze, 2014:209).

Since 2011 there was also an increase in the net spill-overs to South Africa due to the fact that the global financial crisis constrained the real economic activity. The growth per annum in South African industrial production slowed from 5.8 per cent to 3.5 per cent year on year from April 2011 to April 2012. This was mainly caused by the economic slowdown in the Eurozone as well as in the US; this slowdown impacted growth in China and South Africa (Duncan & Kabundi, 2013:569). In 2012 growth dipped to 2.5 per cent due to amongst others mining strikes and a decline in exports (IMF, 2013:6). Furthermore the SARB reduced the repo rate by 50 base points (bps), regardless of the fact that inflation was above the target range. As a result of slow income growth, private consumption fell. In addition, rand depreciation and volatility have been high since the beginning of 2012. At the same time, commodity prices, especially that of gold and platinum underwent substantial declines. These same trends continued in early 2013 when the GDP growth fell to 0.9 per cent; the lowest since 2009 (IMF, 2013:6). Growth in South Africa is still disappointing and the potential growth is likely to be constrained by electricity load-shedding. As the financial crisis in the Eurozone continues, the spill-overs to South Africa remain elevated and continue to affect the growth prospects of the country adversely (IMF, 2013:7).

In order to understand how the above spill-over effects manifested themselves, the next section discusses the transmission channels to the South African economy.

2.8 Transmission channels to the South African economy

In the initial stages of the spill-over effects of the crisis in South Africa (as discussed in Section 2.7.1), the GDP growth rate declined, showing that the country was in recession. Against this background, it can be argued that these spill-over effects were mainly transmitted through trade finance, since South Africa's GDP is severely punctuated much by trade (Ncube *et al.*, 2012:6). This corresponds well with the previously (Section 2.6) identified transmission channels of trade and capital linkages as some of the main channels that were transmitting the financial shocks to the developing economies. This section will discuss the transition of the financial shock to the South African economy through trade (Section 2.8.1) and capital linkages (Section 2.8.2). This knowledge is crucial in the identification of the transmission channels from the financial shock to the household income distribution in South Africa later in this study.

2.8.1 Transmission to South African economy through capital linkages

South Africa, as the largest economy in the sub-Saharan Africa, with a well-developed and globally integrated financial sector, receives most of the portfolio inflows. The country is also the largest borrower from European banks in sub-Saharan Africa. As a result of this relationship, South Africa experienced a large reduction in portfolio inflows late in 2011 due to the crisis and this impacted stock market performance and the currency (as discussed in Section 2.7). Since European banks provide a significant share of South African banks' syndicated loan funding, a reduction of lending from Europe affects the funds of the country (Nelson *et al.*, 2012:2). It is common in many developing countries that increased limitations on financial inflows, limit the funds for businesses to expand or to start new businesses. This leads to lower production, high unemployment and even retrenchments as was the case with South Africa during the crisis. In realising the aim of this study, it is important to establish whether the spill-over effects of the financial crisis to households' income in South Africa are transmitted through financial linkages.

2.8.2 Transmission through trade linkages

As a consequence of the GFC, the developed countries' demand for exports from developing and emerging countries fell. This has adverse consequences for South Africa, since the country greatly relies on trade for its GDP growth (as discussed in Section 2.8.1). The strong motivation behind sustaining the trading channel is the fact that South Africa has been a main trade partner for the US and Europe. Direct real linkages such as trade in goods and services between different countries, in particular, provide an easy platform for a shock in one country to be transmitted to others (UNCTAD, 2009:8). In addition, South Africa was also affected by the effect of the financial crisis through trade linkages from other developing countries such as China and India (Duncan & Kabundi, 2013:570).

2.9 Summary

This chapter has focused on the definition of a financial shock, which in this study refers to the 2008-09 GFC and the on-going Eurozone debt crisis. The origin of these crises can be linked to the US housing 'bubble', which fuelled the debt crisis in the Eurozone area. These financial crises' effects have spilled over to world economies, including the developing and emerging economies. This chapter explained financial linkages and trade linkages as some of the main transmission channels of the financial crisis to the developing and emerging economies. One of the common spill-over effects of the crisis among the developing and emerging countries was a decline in exports. In South Africa, the recession was triggered by a decrease in economic growth, manufacturing activity and the demand for the mining products. In the realising how these spill-over effects manifested themselves, this chapter also explored capital linkages and trade linkages as some of the possible main transmission channels of the financial shock to the South

African economy. From the literature study in this chapter, there appears a need to understand the latter in order to identify the transmission channels of the crisis to the local economy.

In risk management, identifying and measuring risk is the initial step. Chapter 3 will present economic theories of general equilibrium as well as the various concepts available for measuring the impact of a financial shock within the general equilibrium framework.

Chapter 3 General equilibrium and the financial sector

3.1 Introduction

McDonald and Kirsten (1999:537) have a convincing opinion with regards to the importance of SAM-based models for measuring the impact of financial shocks on household income distribution. According to Azis and Mansury (2003:113), the models that use a SAM database, have increased substantially over time. In most cases, CGE models, multiplier models as well as partial equilibrium models use a SAM database to simulate the effect of a shock on the income of households. However, most of the researchers opt for computable general equilibrium (CGE) models rather than the other aforementioned models (Dixon, Parmenter, Powell & Wilcoxon, 1992:70). The motivation behind rather using CGE models is that their frameworks allow a simultaneous dissection of the consumption and the production sides of an economy. When using a model to analyse the spill-over effects associated with change in policy following an exogenous shock, CGE models are usually adopted (Bellu, 2011:1).

In recent literature on CGE modelling, Dixon and Jorgenson (2012) acknowledges that CGE modelling can be explained in a credible manner to people without CGE backgrounds. This is possible in that their results analysis is based on elementary microeconomics (e.g demand and supply curves). In addition, the CGE results are often best explained in a macro - to- micro, non-circular sequence (Dixon & Jorgenson, 2012:94). This crucial feature makes CGE models to be very influential in policy formulation. Accordingly, the CGE model seems appropriate to accomplish the aim of this dissertation (i.e. to determine the transition of a financial or economic crisis induced shock into the income distribution of South African households). For the same reason, understanding the relationship between general equilibrium and the financial sector is important for this study. Therefore, the present chapter examines the economic theories of general equilibrium.

To begin with, the theory of general equilibrium developed into the preferred theory in microeconomics since the 1950s; it was used before the coming of the game theory as well as information economics in the 1970s (Lengwiler, 2004:20). Nonetheless, the relevance of the general equilibrium theory to macroeconomic fluctuations combined with the asset pricing theory has renewed its utilisation (Kydland & Zarazaga, 1997; Agenor, McDermott & Prasad, 2000; Lewis, 2006). In theory, the world has become more connected through trade, financial markets and globalisation (Lengwiler, 2004:21). Therefore this chapter will review the theories of general equilibrium so that the contested relationship between the general equilibrium and the financial sector is exposed.

For the purpose of grasping the relationship between general equilibrium and the financial sector, this chapter initially introduces the main theories of general equilibrium and its historical evolution up to the

present time (Section 3.2). Apart from this, Section 3.2 will brief the criticism of general equilibrium theory and highlight how the methods proposed for this analysis transcend these limitations. This section will also discuss the relevance of general equilibrium theory within the market economy. Section 3.3 focuses on the relationship between general equilibrium theory and money. It provides an explanation of how money is dependent on general equilibrium theory. This context is necessary, since the financial shock in this analysis originated from the financial sector (Allen & Carletti, 2009:4). The dependency of the monetary theory on general equilibrium theory can imply the influence of money in the real economy. Section 3.4 looks at previous studies on the way in which financial shocks influence the economy through general equilibrium theory. Section 3.5 illustrates the channels of financial shock from a macro point of view. The conclusion follows in Section 3.6, highlighting the transition linkages intervening the financial and real markets. Since financial shocks impact many countries through various channels and networks, it is important to understand how the channels operate. Therefore, this chapter will link the theory of general equilibrium with the problem at hand in order to better understand the networks through which the South African households' income can be influenced by the financial crises.

3.2 The theory of general equilibrium

General equilibrium theory strives to describe how the entire economic market operates. This is done by analysing the choices of market participants and for identifying a point of aggregate or common cohesion (Mitra-Kahn, 2005:4). However, it is important to note that the theory of general equilibrium has developed over the years. The theories of Adam Smith, Marshall, Walras, Pareto as well as Arrow and Debreu are evidence that the theory of general equilibrium has evolved throughout economic thinking (Dixon *et al.*, 1992:70). This section will start by discussing the evolution of general equilibrium theory (Section 3.2.1) then the Neo-Walrasian general equilibrium (Section 3.2.2). Furthermore, the problems of general equilibrium theory (Section 3.2.3) as well as the relationship between general equilibrium and the market economy (Section 3.2.4) will be explained.

3.2.1 The evolution of general equilibrium theory

General equilibrium theory has developed gradually from the time of Adam Smith to its present state (Arrow, 1974:253). During this evolution period, economic analysis became remarkable, specifically with regard to the buying and selling of commodities. It was discovered that the amount of goods and services buyers wanted to buy and the amount of goods and services sellers offered varied due to different intentions. In this context, Marshall (1890) and Walras (1889) identified a mechanism of market clearing in order to reach equilibrium in an economy. They both agreed that though equilibrium is unfixed, the market forces prevail to ensure perfect competition. The only difference between Walras and Marshall is that Walras (1889) examines the net excess demand, while Marshall investigates the paradox in relation to the prices of supply and demand (Clower 1996:36). Despite this difference, their conclusions are similar

(Mitra-Kahn, 2005:5; Costa, 1998:3). Walras and Marshall both acknowledged that exchange is administered by traders, and transaction prices work as a tip that helps producers to determine the supply levels. In other words, the conclusion they reached in 1890 suggested that equilibrium is achieved through price adjustments and quantity adjustments in the exchange and production market respectively. Furthermore, the two authors agreed that only traders influence the prices (Mitra-Kahn, 2005:4). In the 1890s they also discovered that the underlying currents in the economy may encourage an economic setting of prices and may determine the output. Despite the fact that Walras is ambiguous pertaining the matter of price determination, both authors conclude that price determination is addressed within the market economy (Mitra-Kahn, 2005:5).

Following the work of Walras and Marshall in the 1890s, Pareto wrote his manual of political economy in 1906. This manual explains a view on the future of the general equilibrium model (Pareto, 1906:106). The Paretian School improved general equilibrium thought through the 'tastes and obstacles' approach. This approach focused on agent optimisation for price takers who operate in an economy with many markets. In this approach, tools of efficiency as well as differentiability are the core principles (Fonseca & Ussher, 2004:2). The concept of complementary slackness initiated by the Paretian School proved to be a peculiar equilibrium for the static analysis of Walras equilibrium. This equilibrium is achieved by employing the principle of weakly revealed preference and this advances the basic equilibria in the pioneer Walras theory.

There was some Marginalist revival in the 1930s, which made the Paretian School very popular. Hicks (1939), among others, is the one who steered the revival in the publication of the Cowles Commission. With the precept of science in measurement, the Cowles Commission was established in the Vienna Colloquium in 1939. It was the intention that the Cowles Commission connect economics and mathematics (Fonseca & Ussher, 2004:1). As a result of this publication, the Vienna Colloquium was disbanded by the beginning of the Second World War and its legacy then advanced more through the penetration of economists from Europe who utilised Walras' equilibrium theory. The incorporation of the Paretian School and Cowles Commission brought about the Neo-Walrasian School, which is nowadays referred to as the primitive of general equilibrium theory.

3.2.2 The Neo-Walrasian general equilibrium

The Neo-Walrasian school of thought explains almost all the principles of the present-day economic analysis as well as the modelling of general equilibrium (Fonseca & Ussher, 2004:2). The Neo-Walrasian School redefined the study of equilibrium by bringing together the 'tastes and obstacles', individual economic optimising approach of Pareto, but using the weak axiom of preference from the Vienna Colloquium (rather than that of Pareto's differentiability), and confining in convex preferences. The assumptions governing the stable equilibrium in the Neo-Walrasian School are similar to those of a

perfectly competitive market in which firms set no output outside equilibrium. However, the use of a Walrasian auctioneer is necessary to resolve the co-ordination puzzle, which prevails since there is no room for price conciliation (Fonseca & Ussher, 2004:3). This means that exchange equilibrium is attained by the seller (auctioneer), not through the market. In its basic design, this is a representative for producers and consumers. Since this is an exchange model, it assumes that income do not exist, and is accordingly inferred within inclined resources. Goods are dispersed by time, place and 'state of nature', but only as observations for future, as all markets for future and present exchange and supply must clear at the beginning of the world, as it is assumed that trade do not happen outside equilibrium.

Implying approximate prices to attain equilibrium, the goal of the model is to accomplish the economical distribution of goods in the economy and this is called utility maximisation. As a result, excess demand curves and aggregate demand must be persisting in order to resolve a Brouwer fixed point equilibrium (Mitra-Kahn, 2005:8). This matter, as well as the problem of imperfect competition, is dealt with by assuming perfect competition and a Cobb Douglas demand function. Consumer preferences are assumed to be stable and monotonic so as to secure a weak Pareto efficient result and all agents are price takers. From the discussion above, it is clear that general equilibrium has its own problems as will be discussed in Section 3.2.3 below.

3.2.3 Problems of general equilibrium theory

General equilibrium model received a lot of criticism (Mitra-Kahn, 2005:9). An element that is criticised is the fact that the way time is treated within the model is complicated. The model demands that suppliers along with traders should always be aware of all potential results or outcomes. They must also effectively observe the markets for probable risks and uncertainties. In addition, utility is an additive and is discounted over time. Practically, these two items may however be inappropriate or unrealistic. Furthermore, when the time period is extended to infinity, the initial theory of welfare will be unsuccessful except for the condition that the Neumann-Morgenstern Axioms (completeness, transitivity, substitutability, decomposability, monotonicity and continuity) dominates. In addition, general equilibrium theory is criticised concerning the assumption that there is no perfect competition; hence the influence of other industrial structures is acknowledged (Mitra-Kahn, 2005:10). As a result, the core of the theory has been addressing this criticism, arguing that a reasonable distribution will occur within the basis, as the number of agents increase and when groups form allies. Therefore, competitive equilibrium is the result of assuming that one allocation cannot be improved by any coalition created. This relies upon the following assumptions: it is uncostly to form coalitions, there is perfect information regarding group coalitions and there is convexity.

Another criticism of general equilibrium theory is that the model fails to solve the matters surrounding the production externalities (Mitra-Kahn, 2005:9). Despite the introduction of Pigovian taxes (where a

price is attributed to a particular externality and rectification is remunerated), the problem of externalities still prevail. Furthermore, the internalisation of the externality expense, fails to recognise the complexity of consumption and public good externalities (Fonseca & Ussher, 2004:4). In addition to the criticism, the matter of imperfect information was not convincingly resolved by just assuming zero profits. Recently, a critics on general equilibrium modelling suggest that sometimes the results are obvious and did not require a large-scale model (Dixon & Jorgenson, 2012: 94). Despite the shortcomings, general equilibrium theory is still useful for analysing the market economy (Mitra-Kahn, 2005:9). Therefore, the next section (Section 3.2.4) will discuss the application of general equilibrium theory in the market.

3.2.4 General equilibrium theory and the market economy

General equilibrium theory intends to explain the convergence of the entire economy to approach equilibrium and it discovers the means by which this happen (Mitra-Kahn, 2005:10). Yet, the present-day general equilibrium theory cannot practically explain this mechanism. From its inception, the modern general equilibrium theory excluded the role of money in the economy and it constrains itself to perfectly competitive markets only (Mitra-Kahn, 2005:10). Furthermore, the theory of competitive equilibrium really presents a valuable standard from which it is evident that market forces work to maximise utility and output in an economy, however, the model again fails to explain the concept of money as well as price determination. This entails that the recent model may not be able to portray all the aspects concerning price determination. Walras and Marshal actually criticised this perspective in their decentralised price negotiations. For both output and price, there is now a centralized price setter (the Walrasian Auctioneer), that pursuits to balance input and output without the traditional market forces' involvement (Mitra-Kahn, 2005:11). Since this study is going to use the general equilibrium model in the analysis, it becomes essential to explain the application of general equilibrium to the financial sector in an economy. Section 3.3 will discuss the application of general equilibrium theory in the financial sector.

3.3 General equilibrium and the financial sector

There is a strange relationship between general equilibrium theory and the monetary theory, since the market value of paper currency cannot be justified on individualistic preferences or production functions (Calvo, 2013:2). General equilibrium theory can advance with the exclusion of money. On the other hand, the monetary theory will not prevail separately from the real economy. The classical expression 'veil of money' is the secondary role traditionally attributed to money. This is to say that money is only there to determine nominal prices. Calvo (2013) convincingly argued that general equilibrium models must be expanded in a nominal approach in order to consolidate the vital function of the payments system (Calvo, 2013:20). As a result of this veil of money theory, some theorists prefer to work with models which exclude money (Calvo, 2013:1). This position of the theorists is in contradiction to the macroeconomic debate among policy makers today. In this debate, liquidity is a quality indicating that money is present

and it includes other elements or factors. A number of market participants associate the housing bubble with a liquidity mirage and the intense crisis succeeding the Lehman 2008 event with a liquidity crunch (Calvo, 2013:2). Furthermore, the liquidity crisis is often associated with unhealthy financial systems and unemployment. The conventional general equilibrium model as well as the monetary model fail to clarify all the mentioned aspects.

One of the reasons for this failure is the fact that the conventional monetary theory does not consider crises that stem from the financial sector. This indicates another strength of general equilibrium approach, where, in its real structure, the concept credit is substituted by inter-temporal and state-contingent prices, and market turmoil is not displayed. In other words, conventional theory has accepted the reality that money is not neutral, but the theory probably has accepted the perspective of the ‘veil of finance’ ignorantly (Calvo *et al.*, 2012:4). It may not be surprising that the Fed and several global important central banks have not considered a probable deficient credit market in their monetary policy strategy. They could have for instance included inflation targeting in their policies. Therefore they found themselves lacking ideas and instruments when affected by the current crisis.

As discussed above, the monetary theory is an exceptional realm. Money has been excluded in general equilibrium theory due to the fact that the market value of paper currency cannot be substantiated on individualistic (Robinson Crusoe-type) preferences or production functions. Based on this point of view, the output value of paper currency greatly outpaces its intrinsic value. This means that the equilibrium value of cash was not a medium of exchange (MOE). Frank Hahn (1965), for instance, reveals that regardless of the fact that money falls into a utility function, it is still impossible to reject the actuality of barter equilibrium although certain technical assumptions have been made (Calvo, 2012:5). Provided that the output price of cash is equal to zero, it is then not possible to determine the demand for cash, hence the demand may be set equal to the supply. This is in line with the Walras Law that assumes the existence of equilibrium relative prices of the barter economy that clear all real markets when the output price of cash is equal to zero. This confirms the presence of a barter equilibrium even if there is an MOE. It is evident that there is a distinction between cash and normal goods in that when the output price of a normal good is zero, there is usually a positive excess demand.

In general monetary models, Hahn’s problem is avoided by plainly excluding barter equilibrium. Contrarily, micro-economists have surveyed a number of clarifications, including legal tender and the requirement that taxes must be paid by means of local cash. These illustrations reinforce the rejection of barter equilibrium, yet they are earnestly inadequate. This is a point that becomes apparent in a global framework where the circulation of different currencies happens simultaneously. Furthermore, questions such as those pertaining the sustainability of the euro and the possibility that the US dollar will be replaced by gold will not be fully answered with the existing micro foundations.

Calvo (2012:5) is of the opinion that when the output value of cash is positive, sticky and staggered prices help to sustain an equilibrium in which cash has a positive output value advancing the process. Staggered prices, in particular, may rule out the situations in which the cash prices of regular goods posted at a certain time will be limitless. This implies that cash price in terms of goods whose prices are posted at a time are equal to zero. This holds true, as the relative price with respect to all regular goods whose prices are predetermined at time, will also be unlimited. This means that the demand for goods whose unbounded prices are set at time, will be zero, which is unlikely to be an optimal price setting strategy. These value-of-cash foundations are called the Price Theory of Money (PTM) (Calvo, 2012:4). The PTM suggests that the euro will not disappear unless Europeans stop quoting their prices in euros, and that despite the large depreciation of the US dollar with respect to gold, the US dollar will keep circulating as long as prices and wages in the US are quoted in US dollars.

From the above discussion it is clear that the theories like veil of money and finance can leave critical aspects out of sight. Therefore, comprehending the relationship between general equilibrium and the financial economy is important and this will latter help in identifying channels through which the financial shock affected the South African economy. The next section (Section 3.3.1) will continue to explore this relationship from the Neo-classical perspective.

3.3.1 Neo-classical economics and the financial sector

Neo-classical theory is basically equilibrium theory in that it is built on a Walrasian foundation (Bortis, 2010:3). It is a collection of absolute principles or conceptions for formulating acceptable economic theories. Its essential assumptions define the shared understanding of the neo-classical economists. Those fundamental assumptions include an expectation that prices are expected to reflect all the necessary information that is used for decision making. When considering the homogeneity of financial assets, financial markets expressed as most perfect (Bortis, 2010:4). In this regard, Walras (1954) deliberates the stock exchange to be the model market in which the auctioneer can determine the equilibrium between supply and demand without difficulty. Unlike the conventional monetary theory, the neoclassical theory considers money or finance as absolutely essential, though not principally essential. Furthermore, the interconnection between money, financial sector and the markets in the real economy is absolutely unclear when the theory is related to events happening around the globe. In other words, money is particularly inconsiderable in the neo-classical theory in the sense that banks direct their savings to the most profitable investment projects (Bortis, 2010:4). Thus, the financial markets easily appear to give information on what is going on within the real markets. Consider a rise in the prices of already existing capital goods; on the one hand this shows higher profit rates, while on the other hand this also suggests excess demand. In this scenario, share prices as well as new capital goods investment accelerate in view of

the increasing supply in order to get closer to equilibrium. As portrayed by Say's Law, this point of view entails that savings administer investment. According to this perspective, it is not possible to overproduce or to create compulsory unemployment. Furthermore these theorists comprehend that financial crises, do not exist, and if they come into existence, the neo-classical theorists will seriously struggle to explain them, or they will completely fail to analyse them (Bortis, 2010:5).

In addition to the above explanation, the latest version of Say's Law reveals that the rate of interest influences savings and investment into equilibrium (Bortis, 2010:5). This implies that savings, regardless of its value, is most likely to be invested. Given this perspective, the financial sector comprises a highly efficient market to channel savings into the most profitable investment projects. As a result, share prices determined at the stock exchange show growth potentials to enterprises and at the same time share prices provide the enterprises with the financial means to realise this growth (Bortis, 2010:6). In this manner, savings manage investment and the coherence of individuals is in accord with the coherence of the system. For that reason, the utility and profit maximising behaviour of all individuals results in a general equilibrium that is also a social optimum. Similarly, prices summarise all the relevant information and lead the economic actors from disequilibrium to equilibrium. Hence, in the case of rational expectations, economies are always in equilibrium and prices indicate equilibrium positions, around which estimated and realised prices and earnings are normally distributed. Conforming to this theory, prices changes would reflect shifts in equilibrium positions and such shifts are supposed to be caused by external factors, which, if considerable in size, become external shocks.

In another perspective, equilibrium implies that markets are cleared by price adjustment through arbitrage at each moment in time (Scholtens & Van Wensveen 2003:9). In the neo-classical model of a perfect market or the Arrow-Debreu world, for example, equilibrium should be achieved under the following criteria. Firstly, there must be no individual market participant that can dominate prices. Secondly, in equivalent situations, the terms and conditions for lending and borrowing should be the same for all participants. Thirdly, there must be no discriminatory taxes. Fourthly, there should be an absence of scale and scope economies. Furthermore, all financial titles are homogeneous, divisible and tradable and there are no information costs, no transaction costs and no insolvency costs. Finally, all market parties have *ex ante* and *ex post* estimates and full information on all factors and events relevant for the (future) value of the traded financial instruments (Scholtens & Van Wensveen, 2003:10).

In general equilibrium theory, however, the financial sector basically deviates savings to investors whose activities are certainly led by market equilibrium prices (Scholtens & Van Wensveen, 2003:11). Consequently, in the long run, investment cannot exceed savings because with full employment, savings govern investment. As a matter of fact, savings release the resources needed to produce investment goods at the full employment level. In other words, the rate of interest equalises savings and investment at full

employment imposing, thus the application of Say's Law in a neoclassical exchange economy (Bibi, Cockburn, Fofana & Tiberti, 2010:8). In this viewpoint, theorists also consider bank credits in a neoclassical view, as a disturbing element. If investment surmounts savings, the crisis cannot be avoided, since the resources issued by saving will not be enough to realise all the investment projects ventured.

In brief, general equilibrium theory in the financial market pinpoints the exposition of prices of financial assets and this is also referred to as the asset pricing theory. The asset pricing theory was one of the contributions of Stiglitz (1970) that had the purpose of connecting finance more closely with economic theory (Scholtens & Van Wensveen, 2003:12). He explained the demand for financial assets with a utility maximisation obstacle whose final aim is the optimal choice of consumption. This created a platform for the tree model of Lucas (1978) as well as the consumption capital asset pricing model (CCAPM) of Breeden (1979) (Scholtens & Van Wensveen, 2003:12). The CCAPM model is a general equilibrium model that is uncomplicated and it focusses on an approach that has been valuable to most financial economists (Scholtens & Van Wensveen, 2003:13). This model provides a better structure to the behaviour of individuals with regard to risk taking, hence permitting more explicit forecasts about equilibrium asset prices. In a way, this behaviour of people based on financial asset prices is explained better in the neo-classical theory (Scholtens & Van Wensveen, 2003:9).

Therefore, understanding the neoclassical theory is important, since the methodology used in this study is primarily based on the neoclassical theory of general equilibrium formulated by the aforementioned Walras (1877) and Arrow and Debreu (1954) (Bibi *et al.*, 2010:8). However, neoclassical theory fails to adequately reveal the functioning of the real sector and the role of the financial sector within a monetary production economy (Bibi *et al.*, 2010:9). As a result the neo-classical theory fails to explain financial crises. In order to explore the channels linking financial frictions in general and the financial crisis in particular, to long run productivity growth, previous studies have to be analysed, which leads to the next section.

3.4 Previous studies on general equilibrium and financial shocks

Over the last two decades, economists started to introduce credit frictions into models that permit borrowing and lending in equilibrium (Hafstead & Smith, 2012:2). With regard to this, the studies by Bernanke and Gertler (1989), Azis (1998, 2000) and Thorbecke (1998) are some of the pioneers who adopted the general equilibrium framework to measure the impact of a financial shock. Thereafter, some studies were done and indicated that credit frictions may deepen the macroeconomic fluctuations emanating from specific shocks. Examples of these studies include, Kiyotaki and Moore (1997), Carlstrom and Fuerst (1997) and Bernanke and Gertler (1999). For more examples and an improved understanding, this section will provide literature reviews of some of the studies on such an analysis, starting with earlier studies and moving to recent studies.

Azis and Mansury (2003) did a study analysing how the financial shock influenced household income distribution in Indonesia. They used the general equilibrium model for this analysis. They found that the high-income groups are the ones that benefit from increasing interest rates as well as weak exchange rates and high interest rates in times of a financial crisis. Nevertheless, their findings show that the same high-income people might be on the disadvantage if they are investing in sectors that rely largely on imports for production (Azis & Mansury, 2003:125). In addition, Braun and Gillman (2006), distinguished a vital economy in which the banking sector offer two services, namely, inter-temporal credit and exchange credit. They used the general equilibrium theory for this analysis and their findings show that if an economy moves from manageable inflation to deflation, households may demand less of the exchange services provided by the banking sector. Duly, the decline in demand for exchange services lowers the profits as well as employment of the banking sector. This fall in demand in turn reduces bank employment and profitability in the banking sector provided there is an increase in returns and even small fixed costs associated with lending (Braun & Gillman, 2006:24).

Furthermore, many studies following the 2008 GFC strived to link financial factors including, but not limited to, financial intermediation to macroeconomic fluctuations and the optimal response of monetary policy to financial shocks. These studies include among others, Gertler and Kiyotaki (2009), Cúrdia and Woodford (2010), Del Negro, Eggertson, Ferrero and Kiyotaki (2010), and Dib (2010). In Gertler and Kiyotaki (2009) they used the framework of general equilibrium to study how disruptions in financial intermediation can fuel a crisis in the real activity and various credit market interventions by the central bank and the current. The treasury might work to mitigate the crisis. The following discussion deals with some of these studies.

To begin with, Curdia and Woodford (2010) used the simple Dynamic Stochastic General Equilibrium (DSGE) model with credit frictions to analyse the economic disturbances that originate from the financial sector. They found that a spread adjustment can improve based on the standard Taylor rule, however, it is not probable that the optimum size is as big as the expected one. Once more, the particular type of adjustment is undesirable despite the source of the variation in credit spreads (Curdia & Woodford, 2010:35). In addition, Jermann and Quadrini (2009) examined the influence of the financial shocks on the movement of variables between the real and the financial sectors in a general equilibrium framework. This study suggests that financial frictions and shocks that have an effect on the capability of a firm to obtain funds, are important for macroeconomic fluctuations. When this model was used to interpret the recent economic crisis, it showed that the crisis was a tightening of firms' financing conditions that has caused a sharp decline in GDP and labour from the middle of 2008 (Jermann & Quadrini, 2009:22). In the same way Del Negro *et al.* (2010) analysed the effect on the non-standard monetary policy by using the theory

of credit friction proposed by Kiyotaki and Moore (2008). They found that the effect of the non-standard monetary policy can be large at zero nominal interest rates (Del Negro *et al.*, 2010:30).

In a similar study, Dib (2010) proposed a micro-founded framework that includes the active banking sector into a DSGE model with a financial accelerator. This was to evaluate the role of the banking sector in the transmission and propagation of real effects of aggregate shocks. They discovered that since it is pricey to raise capital to meet regulatory capital requirements, the banking sector weakens the real effects of financial shocks, lowers macroeconomic volatilities, and assists in sustaining the economy (Dib 2010:30). Moreover, Zhang (2010) did a study on how the banking sector may elaborate and multiply business cycles. He used a dynamic stochastic general equilibrium built on the model by Bernanke, Gertler and Gilchrist (1999). This study found that unanticipated aggregate shocks will stimulate the loan default rate past the expected rate and this will impact both the firm and the bank's balance sheets via the financial contract (Zhang, 2010:16.)

Furthermore, Hafstead and Smith (2012) adopted a general equilibrium model to examine the financial shocks, bank intermediation and monetary policy. They based their work on the standard Bernanke, Gertler and Gilchrist (1999) financial accelerator model, by incorporating a monopolistically competitive banking sector with interbank lending. They found that banks play the most important role through the cost of intermediation via loan production. This study also suggests that the demand and supply side of shocks originating from the financial sector have large macroeconomic effects (Hafstead & Smith, 2012:36). Similarly, Takamura (2013) used general equilibrium theory to explore the aggregate business cycle patterns. The framework was developed for households, banks and firms. The findings show that capital injection is not that efficient against aggregate productivity shocks, because easing banks' lending will only drive firms' demand for loans if the aggregate productivity drops. On the other hand, a capital injection can resist the unfavourable effects of financial shocks on the supply of loans (Takamura, 2013:25). Last but not least, Khan and Thomas (2013) developed a DSGE model to explore the cyclical significance of credit market delinquencies. The authors discovered that the credit shock they used in the model does not deliver the unusual recovery of investment and employment during 2009. Therefore, the suggestion proposed by Ohanian (2010) was recommended for future research (Khan & Thomas, 2013:45).

Following this literature review on financial shocks, the next section will discuss the channels of financial shocks from a macro point of view. This is important since the main objective of this study is to identify the transmission channels of a financial shock to the South African economy.

3.5 Channels of financial shocks from a macro point of view

The traditional bank lending channel emphasises the fundamental role of commercial banks as suppliers of credit for borrowers without access to the capital market (Millard & Nicolae, 2013:3). Providing this, reserve requirements were an irrevocable restriction on several banks and commercial banks if they did not have any other source of funding except for deposits. On the other hand, borrowers did not have any other source of credit except deposits. However, in the present age, non-bank financial intermediation has become a crucial source of credit (Millard & Nicolae, 2013:4). For this reason, deposits are no longer the main source of funding for the financial sector and even for commercial banks. Equally, this is likely to mean that the traditional bank lending channel is much less important these days. The credit channel is even broader, since it allows the balance sheet of borrowers to constrain the amount that they can borrow (Bernanke & Gertler, 1995:27). Based on this, Kiyotaki and Moore (1997) and Bernanke *et al.* (1999) built models incorporating the broader credit channel and they found that reduction in credit can temporarily affect supply. The latter is relevant here in that it emphasises credit as a broader transmission channel of the shock. To further explore other main channels through which financial shocks affect economies, the next section discusses the transmission channels of financial shocks as documented in the existing literature.

3.5.1 Working capital

Recent studies identify working capital as one of the channels of financial shocks (Fernandez-Corugedo, McMahon, Millard & Rache, 2011:4). Fernandez-Corugedo *et al.* (2011) are among the authors who documented this channel. They argued that credit meant for a working capital function can be portrayed as an extra input in the production function (Millard & Nicolae, 2013:4; Fernandez-Corugedo *et al.* 2011:5). This means that when working capital is costly, firms may cut their production levels and increase the price of products to compensate for their production costs. A credit crunch due to a financial crisis, in particular, may have dire effects on the firms' working capital position. Through the working capital channel, obstacles in the supply of credit have wide and persistent effects on the real sector of the economy (Millard & Nicolae, 2013:5). A reduction in trade credit reinforced the financial intermediation shock to the supply of credit. This study will therefore use this knowledge to identify the channels through which the financial shock impacted household income distribution in South Africa.

3.5.2 Intangibles

Credit frictions may also have a negative influence on the cost of intangible inputs, as well as on the determined productivity. Dal Borgo, Goodridge, Haskel and Pesole (2011) documented intangible investment for the UK and determined how it contributed to economic growth (Corrado, Hulten & Sichel, 2009:2). They found that investment in intangibles exceeded investment in tangibles since 2008.

Within intangible investment, 11% is for R&D, 15% for software, 17% for design, and 22% for training and organisational capital. For the period 2000-2008 they found that intangible capital deepening accounted for 23% of productivity growth, as opposed to 12% for computer hardware and 40% for TFP. Once intangibles are incorporated in the growth accounting model, the estimated TFP growth is reduced by 15% (Dal Borgo *et al.*, 2011:31).

3.5.3 The firm entry and exit

Credit frictions may also badly influence supply through their effect on the entry and exit of firms into the market. Disney, Haskel and Heden (2003), explore this entry and exit and its relationship to productivity. This study measures and examines the implications of internal and external restructuring on productivity growth (Disney *et al.*, 2003:693). Their findings show that on the establishment of labour productivity growth the external restructuring measures 50% whilst establishment TFP growth measures 80-90%. This happens as a result of their finding based on evidence from the ARD data set from the Census of Production 1980-1992, that found that entrants are more productive than 'leavers' (Disney *et al.*, 2003:694).

Apart from the above channels, the literature contains several studies on the transmission channels from the real to the financial sector. Section 3.6 will discuss these transmission channels.

3.6 Real and financial transmission channels

Previous literature acknowledged that there are two paths through which the transition networks linking the real sector and the financial sector function (Bernanke, 1995; Bernanke & Gertler, 1989; Carlstrom & Fuerst, 1997; Kiyotaki & Moore, 1997). The financial positions of individuals and companies, specifically, are influenced by the circumstances within the real sector. From another angle, the financial positions of individuals and firms also have an impact on the real economy (BCBS, 2011:13). Some of the basic principles of the macroeconomic theory come from this transition channel theory. In specific terms, if the macroeconomic conditions are weaker, the revenues and profits of businesses as well as the income of households are reduced (Jacobson, Linde & Roszbach, 2005:308). This influence does not exclude banks. As a result, the net worth of both households and businesses will be reduced. Another implication of reduced revenues and profits for both businesses and households is that the borrowers' default rate is increased, which will eventually affect the bank losses and bank balance sheet.

In a similar way, the above mentioned studies have identified three channels that are responsible for transmitting financial shocks from the financial economy to the real sector and the other way around (BCBS, 2011:14). These channels are the borrower's balance sheet, the bank balance sheet and the

liquidity channel. The aforementioned channels have a greater influence on the lenders and borrowers' financial position. In most cases the balance sheet channels are attributed to the financial accelerator (Bernanke, 1995:27). From the perspective of the first two channels (i.e the bank balance sheet channel and the borrower balance sheet channel) the impact of the financial position to both the bank and the borrower is intensified (BCBS, 2011:6). A weakness in contract execution, lack of information, capital regulatory requirements and agency costs are some of the capital-market frictions that may allow these balance sheet channels to arise (Bernanke, 1995:28). The third channel focuses on the liquidity position of the borrower balance sheet and the bank balance sheet. This channel indicates that adjusting balance sheet variables may result in a lot of pressure in or outside the time of a crisis (BCBS, 2011:6). These rigidities then in turn affect real economic variables. Studies have shown that interest in the liquidity channel has increased recently due to the latest financial shock and the main focus was associated with the banking sector (Brunnermeier & Pedersen, 2009; BCBS, 2011; Diamond & Rajan, 2009). Based on this, the latter is relevant for this study, as it emphasise the link between the three mentioned channels and the current financial crisis.

The next sections will discuss the borrower balance sheet channel (Section 3.6.1), bank balance sheet channel (Section 3.6.2) and the liquidity channel (Section 3.6.3).

3.6.1 The borrower balance sheet channel

There are three angles through which the borrower balance sheet channel that pertain to the firms as well as the households emerge. Firstly, it originates from the lenders' failure to evaluate financial competence along with the risks associated with the borrowers. Secondly, it emanates from the lenders' failure to positively manage their investments. Thirdly, it emerges when the lenders fail to completely administer their repayment of debt (BCBS, 2011:7). Given these scenarios, the lenders will require collateral for borrowing, while the borrowers' access to credit will be greatly influenced by the borrowers' equity position. Additionally, there are two fundamental comprehensive groups in the borrower balance sheet models. Firstly, there is a group described by Carlstrom and Fuerst (1997) as well as the group of the Bernanke and Gertler (1989) study. In this particular class of models, borrowers are confronted with an external finance premium which is a significant portion between the expense of funds obtained abroad and locally (BCBS, 2011:7). This external finance premium has a converse relationship with the creditworthiness of the borrower. Since the lenders have constrained power to limit the risk appetite of borrowers, borrowers may take larger risks and consequently, the external finance premium increases. However, by including the borrower's net worth in the funding of a proposal it may approximately balance the risk-taking motives of borrowers and lenders. This entails that if this proposal or business venture is unsuccessful, both the lenders and the borrowers will encounter relatively proportionate losses. In such a way, when the creditworthiness of the borrower is higher, the lenders will have to ask for a lesser premium. Accordingly, all shocks (for instance a financial shock) which have a substantial influence

on equity will make the credit expensive, hence this will also impact aggregate demand and expenditure. Shocks that are associated to the real economy as well as aggregate demand particularly have an impact on net worth (BCBS, 2011:8). Following this, it is then the purpose of the external finance premium to disburse shocks to the real economy and to reinforce business-cycle fluctuations. For this reason, the borrower balance channel has been attributed to the financial accelerator (Bernanke, 1995:27). Moreover, shocks to the financial sector (e.g asset price volatility) have an impact on the borrower's net worth. In this type of shocks the external financial premium also propagates financial shocks to the real economy.

Secondly, the other group of the borrower balance sheet models is described by Kiyotaki and Moore (1997). For this group of models, assets have a two-fold purpose in the economy, thus serving as collateral for loans as well as utilised in the production of goods and services (Kiyotaki & Moore, 1997:211). The need for collateral increases in the way that lenders will be able to reinforce the repayment process when the loans are secured. The correlation between asset prices and credit limits arise as a result of the poor execution of credit contracts. The demand for a tough collateral may arise as a result of any financial shock that contributes to a decrease in asset prices. This will contract expenditure and production thereby putting more pressure on the asset prices. It is evident that despite the fact that lower production and spending arising from a shock strain the asset price in the real sector, this scenario can also facilitate the transmission of shocks to the real economy (BCBS, 2011:7).

Similarly, in the financial accelerator model of Holmström and Tirole (1997), the borrower's collateral is important for both intermediated credit offered by banks and non-intermediated credit offered by investors. Regardless the fact that the non-intermediated credit request a higher quality collateral, it is less expensive for borrowers considering that no monitoring is needed (BCBS, 2011:8). In other words, insufficient collateral will not allow borrowers to get non-intermediated credit from investors, but rather from the banks. The borrowers now have to pay more since there is a need for the monitoring of this type of lending. Furthermore, banks also are unable to entirely monitor due to their restrained capital. This entails that credit will only be available to borrowers with great collaterals. Negative shocks that affect the borrower's collateral lead to expensive credit or the inability to access credit. A lower availability of credit does not only constrain spending, but it also contributes to a decline in aggregate demand (Holmström & Tirole, 1997:663).

3.6.2 The bank balance sheet channel

This channel can be split into two channels namely, the bank capital channel and the traditional bank lending channel. The two channels acknowledge the effect of negative shocks on the balance sheet of financial organisations. This results in a lower availability of credit and a slowdown in real economic activity (BCBS, 2011:8). Yet for such intensified impact to occur, borrowers must greatly rely on banks to supply funds. This reliance entails that if there are serious obstacles surrounding the supply of funds by

banks, these borrowers will not easily get loans from other sources. As a result, these borrowers have to reduce their expenditures. Furthermore, for such a severe effect to occur, banks should be unable to completely cushion their supply of funds in reaction to those particular shocks.

Particularly, in the traditional bank-lending channel structure, the shocks associated with monetary policy have an impact that goes further than the usual influence on the interest rates, because these shocks affect the availability as well as the cost of credit. As a result of this impact of the adverse monetary shock, the banks face diminishing balance sheets from both sides. From a liability point of view, a restricting monetary policy produces a regular effect, namely a decline in demand as well as supply of money (BCBS, 2011:8). On the other hand (i.e asset viewpoint), a restricting monetary policy implies alterations to the asset layout which in turn contributes to a great decrease in credit supply, also referred to as the lending channel (BCBS, 2011:8). However, the significance of the bank lending channel has been questioned due to the fact that the latest innovations in the financial markets remarkably led to the rise of private securitisation. Nwogugu (2007) for instance, examines the interconnections between securitisation and capital reserve requirements. In his findings, securitisations weaken the central banks' capability to restrict the extension of credit by commercial banks (Nwogugu, 2007:1031).

Apart from the above, the models of Stein (1998), Van den Heuvel (2002), Borio and Drehmann (2009) are some of the models that consider the bank capital channel by examining the influence of a banks' capital position on the supply of funds. Similar to the aforementioned models, capital is the main source of bank lending, therefore it becomes important that borrowers should be monitored in order to counter wrong motives of borrowers in investment decisions. Due to a capital crisis banks choose to provide less credit to borrowers. Like in the case concerning an adverse shock to borrowers' net worth, a shock has a greater impact on borrowers with bad capital positions and this leads to a decrease in credit availability and less spending (BCBS, 2011:9).

An additional study that examines the influence of bank capital on lending is the one by Stein (1998) and the findings in this study can also be closely linked to the borrower balance sheet channel discussed in Section 2.6.1. The net worth of the organisation, specifically, will greatly influence the cost as well as the availability of non-deposit funds. Similar to the borrower balance sheet channel, this creditworthiness is bound to the capital position of the bank. For the same reason, banks which have a powerful stimulus to endorse and monitor loans are regarded to be better capitalised. As a result, banks with a good capital position have a better access to less expensive non-deposits funds (BCBS, 2011:10). This entails that an external finance premium, which has a converse relationship with the bank capital, exists for the uninsured funds of the bank. Providing the fact that the expense of the external finance premium also has an influence on the cost and availability of funds, decline in bank capital will raise the cost of finance to banks as well as borrowers, and this in turn leads to a slowdown in economic activity. Furthermore, Van

den Heuvel (2002) argued about the influence of bank capital on lending from the perspective that the banks' capital requirements constrain the bank assets and the ability of banks to extend funds. Basically, the bank capital channel can only function if the two scenarios are met. The first condition is that banks must not hold extra capital that they can use to counter the effects of shocks on the bank's capital position. The second condition assumes that there is an imperfect capital market in that it is pricey for a bank to accumulate capital (Van den Heuvel, 2002:259).

It can be concluded that all shocks in the economy that have a negative influence on bank capital will lower the availability of credit from banks (Van den Heuvel, 2002:260). From another angle, a lower availability of credit also lowers borrowers' spending. These shocks that affect aggregate demand and real estate markets might result in loan defaults and decline in bank capital. Moreover, banks' capital can also be influenced by fluctuations in interest rates as well fluctuations to the slope of the yield curve (BCBS, 2011:9). Providing this, Van den Heuvel (2002) recognises the buffering consequence that aforementioned capital requirements have on the bank capital channel. In this model, shocks to interest rates have a severe impact on the lending of banks that are poorly capitalised compared to those banks which have a greater capital position. In his findings, the capital position of the bank capital may influence lending even when the capital regulation requirements are still met. This entails that shocks (e.g loan default) that affects the profits of the bank may have a constant effect on banks' lending. Equally, shocks (e.g asset price volatility) to the financial economy may have severe consequences for the capital position of the bank. In other words, bank capital is also instrumental in propagating the effects of a financial shock to the real economy (Van den Heuvel, 2002:259).

Furthermore, the capital regulations stated in Basel II may additionally worsen the influence of bank capital on lending (Jacques, 2008:79). Literature contains several studies that examine the consequences of the updated regulatory framework for capital adequacy on the financial sector (BCBS, 2011:10). Previous studies have noted that a deteriorating economic environment leads to a decline in banks' capital levels emanating from high risk assets and loan defaults (Lowe 2002; Borio & Drehmann 2009; Altman & Saunders 2001 and Goodhart, Hofmann & Segoviano, 2004). The reason is that during economic slowdowns, credit risk, as measured by the borrower's probability of default, loss-given-default and exposure to default, normally rise. As a result capital requirements also increase and they are more closely limited to risk under the Basel II framework than under a flat-rate capital requirements framework, such as Basel I (BCBS, 2011:10). Accordingly, banks are exposed to high capital requirements and it is also not easy for banks to raise their capital levels in order to realise profits. For that reason, their ability to accumulate reserves diminishes. As the banks encounter problems to accumulate new equity, they will most probably get rid of most of their high risk assets. Consequently, the extension of credit to individuals and businesses is limited through which the economic activity is contracted even further. However, when the economy is booming banks with a greater capital position encounter lower capital

requirements. This will allow the banks to increase the supply of funds hence reinforcing the economy to grow even further. Currently, the available literature is mostly empirical or simulation-based, although Jacques (2008) presents a theoretical model that produces pro-cyclical capital outcomes. In his findings, banks which have capital shortages react to the shock by restricting loans that have a large amount of risk. Furthermore, when comparing Basel II and Basel I, loans that are more risky are much less found in the Basel II framework (Jacques, 2008:79).

3.6.3 The liquidity channel

Following the latest financial shock (GFC), it has been pointed out that liquidity is essential for the availability of credit as well as for enhancing economic production. In some situations, liquidity positions have very little effect on the capability of the propagating channels between the financial and the real sectors. However, in other circumstances, liquidity considerations will generate other extra conveyance channels between the financial and the real economy (BCBS, 2011:10). This particular scenario of transmission networks was acknowledged way back although the focus on these channels received great emphasis during the 2008-09 financial crisis. Liquidity shocks in particular, are mainly transmitted to the banks' lending, the economic activity through elevated leverage ratios and a huge discrepancy in maturity in the balance sheets of the bank. What usually happens is that banks sell assets in the event of a liquidity crisis. Consequently, there will be an oversupply of assets in the markets, which in turn depreciates the price of assets. Sequentially, a decline in asset prices stimulates an additional increase in asset sales in order to meet the marginal demand (Brunnermeier & Pedersen, 2009:77). As a result, asset prices continue to decrease and the health of the balance sheet is affected. Similarly, Diamond and Rajan (2005) identified the interrelations between the emphasised effects of the liquidity crunch and insolvency, highlighting in what way liquidity inadequacy can arise. In their findings, liquidity shortages can be so severe that depositors can unexpectedly demand payments and banks will have no option but to close profitable loans beforehand. Duly, banks may encounter significant losses that will constrain the future lending as well as reinforcing bank defaults (Diamond & Rajan, 2005:606).

In the light of the latest financial shock, Brunnermeier and Pedersen (2009) identified two kinds of liquidity, namely funding liquidity and market liquidity. The funding liquidity is the capability of an organisation to supply the required funds raised from various options (Brunnermeier & Pedersen, 2009:78). In other words, it refers to the liability side of a bank's balance sheet. On the other hand, market liquidity refers to the asset side of a bank's balance sheets and explains the ease with which an asset can be sold. Inadequate liquidity for funding can be expected when market and funding liquidity shortages exist. Given the anticipation that troubled banks may sell assets in the future, strong banks may also limit their lending in order to benefit from future investment prospects. This scheme seems to have been practical during the 2008-09 global financial crisis (Diamond & Rajan, 2005:606).

In addition, Brunnermeier and Pedersen (2009) established an academic model that connects the market liquidity of the security and the funding liquidity of traders. In this model, banks' hedge funds as well as market makers are some of the traders that supply the market liquidity. Through buying and selling assets, these dealers operate as brokers. In effect the funding of traders is affected by market liquidity due to funding difficulties in trading and in turn the funding of dealers affects market liquidity (Brunnermeier & Pedersen, 2009:79). This model explains liquidity risk as the risk that the required funding is limited and it arises on the condition that a trader should always have the capability to fund securities. The primary funding restriction is the restriction that total capital utilisation must be less than the available net capital plus available debt funding (BCBS, 2011:11). Given this, capital abundance enables market liquidity to reach the maximum position and traders are careless about marginal changes in capital and margins. On the other hand, when funding liquidity is scarce, market liquidity is lower and traders will be less interested in obtaining positions that require much capital, because they ask for high margins. Furthermore, if market illiquidity is expected in the future, the risk of financing trades as well as margins can increase. For the same reason, Brunnermeier and Pedersen noted multiple competitive equilibriums in the case where a decline in market liquidity results in either bigger margin requisites or losses on traders' present positions (BCBS, 2011:11). In the liquid equilibrium, markets are liquid, producing better margin requisites for traders, which subsequently assist traders to make markets liquid. However, in the illiquid equilibrium, markets are illiquid and this leads to higher margin requisites or traders losses, hence limiting the ability of traders to provide and restricting market liquidity. Given this type of equilibrium, market liquidity is easily affected by shocks as a result of liquidity spirals (Brunnermeier & Pedersen, 2009:80).

Similar articles by Wagner (2006, 2008) investigate the significance of insufficient market liquidity during crisis times. Lack of market liquidity implies that asset sale prices will be lowered even further in order to meet liquidity demands. This in turn can lead to defaults of other financial institutions. Furthermore, lower market liquidity will contribute to a rise in the cost of failure for individual firms. This will also increase the number of banks that defaults. As a result, the earnings of the bank as well as the negative externalities will be largely determined by the portfolio composition of other banks' (Wagner, 2008:3). For this reason, banks which are more interrelated must produce higher liquidity and capital requisites (BCBS, 2011:12). In similar articles (Adrian & Shin 2010; Kiyotaki & Moore 2008) on the conditions of incomplete markets and asymmetric information, the inter-linkages between funding and market liquidity may help to transmit shocks. The reason behind this perspective is that with these inter-linkages, the inexistence of an entire set of contingent securities together with information asymmetries about the solvency of the banks may trigger anxiety of counterparty credit risk (Allen & Gale, 2000:33; Brusco & Castiglionesi, 2007:5; Strahan, 2008:2).

During the times of financial crises, a decrease in market liquidity and funding liquidity are reinforced and produce either margin spirals or loss spirals (BCBS, 2011:12). Margin spirals occurs when a decline in

funding motivates a dealer to provide less market liquidity. If margins rise as the market liquidity declines, the initial decrease in funding worsens the dealers' funding constraint further and this in turn forces them to diminish their trading; this is a margin spiral. In a similar way loss spirals occur. Apart from this, Brunnermeier and Pedersen (2009) explain that market liquidity is volatile and can unexpectedly shrink. Owing to this, market liquidity is interrelated across securities, closely linked to volatility, faces a flight towards liquidity events and it co-moves with the market (Brunnermeier & Pedersen, 2009:81).

In Cifuentes, Ferrucci and Shin (2005), it is shown that mark to market accounting⁷ can become a propagator for systemic risk and contagion. In this model, mark to market accounting is analysed by means of regulatory solvency requirements and the internal risk controls of banks (Cifuentes *et al.*, 2005:32). In their findings, a financial shock lowers the market value of banks' assets and banks might unwillingly sell some of their assets to meet the regulatory solvency requirements and internal risk limits. As a result, bank asset market values can decline even further if the markets fail to fully contain asset sales. Despite these risks, literature exposes that regulatory minimum liquidity requirements may reduce the effect of this mechanism, thereby reducing systemic risk (BCBS, 2011:12, Allen & Carletti, 2008:4). Similarly, Adrian and Shin (2008) point out that the increase of leveraged financial brokers that use the mark to market value coincides with responses and expand feedback effects on the real economy. Considering these findings, the collapse of the five biggest financial institutions during the recent global financial crisis was a warning to the forthcoming effects to the real economy (Adrian & Shin, 2008:418).

3.7 Summary

This chapter discussed the economic theories of general equilibrium (Section 3.2) and its application in the financial sector (Section 3.3). The available literature acknowledged the relationship between the monetary theory and general equilibrium theory. It has been noted that the interconnection between the financial economy and the real economy can be understood better through general equilibrium theory. This relationship between the financial sector and the economy can be explained by the income flow from the household sector to financial markets in the circular flow of income and output. Equally, savings flow to financial markets as leakages from the household sector. Given this explanation, shocks in the financial sector may influence the household income distribution; however, the transmission may vary within countries and within the structures of the financial markets.

Previous studies (Section 3.4) have identified working capital, intangibles and firm entry and exit as channels that transmit the effects of financial shocks from the macro perspective (Section 3.5). In similar literature, the bank balance sheet, the borrower balance sheet and the liquidity channels play a major role

⁷ The term mark to market is a practice of updating the value of an asset or liability to reflect its real market value. In financial firms, the mark to market value is established discovering the price of the financial instrument as it is trading via public exchanges rather than the book value (Cifuentes *et al.*, 2005:32).

in transmitting the impact of the financial shocks between the real and the financial sector (Section 3.6). This can be useful in order to understand the financial sector of South Africa so as to identify the transmission channels conveying the effects of the financial shocks into the economy.

The implementation of general equilibrium analysis was constrained by inadequate data and computational resources. Currently however, the existence of large-capacity computer technology has made possible applications of such models to actual market situations. One of the benefits of general equilibrium theory is that it encourages researchers not only to look on the direct effects of shocks, but to also assess the indirect effects of the same shocks. In addition, studies have shown that when using general equilibrium models, many of the indirect effects of these shocks offset the direct effects, or are at variance with the data. This knowledge can be useful in this study, since the channel of transmission can be either directly or indirectly linked to the macro-level shocks.

In order to capture the direct as well as the indirect effects of the shock, this study employs the SAM multipliers and for the network paths through which these effects are transmitted, the SPA method is used. Chapter 4 explores data, the SAM multiplier analysis and the structural path for the purpose of assessing the wide that the financial shock had on the South African economy. The chapter will also continue to describe how the flow-of-funds matrix is built; a tool that is used to expand the financial sector in the SAM.

Chapter 4: Research methodology

4.1 Introduction

In a general equilibrium framework, the distributional effect of any exogenous shock to the model (for example policy or foreign shocks) operates through the market system. Profit maximising firms will change their demand for factor inputs, intermediate inputs, and their supply of commodities. This change in a firm's demand for factors will influence factor prices (wages or salaries, non-labour income). This will, in turn, have consequences on the income distribution of different groups of households (McDonald, Kirsten & Van Zyl, 1997:516). The change in the income of each household revolves around the distribution of factor ownership (unskilled labour, skilled labour, capital, or land). Change in household income along with change in all commodity prices, in particular, will simultaneously influence household expenditures on various commodities. This will affect the distribution of income and expenditure even more. In a general equilibrium framework, this series of mechanisms, works simultaneously in inter-related markets (Yusuf, 2006:6).

Based on the market mechanism, this chapter aims to provide the reader with a better perception of how the interrelationships in terms of the structural features of an economy, distribution of income and expenditure among households between South Africa and other inter-related markets, behave during a financial crisis. In achieving this aim, this chapter outlines the data and methods used in analysing the impact of the financial shock (discussed in Chapter 2) to household income distribution in South Africa. The data will be discussed in Section 4.2. Thereafter, the methods are discussed, specifically the Social Accounting Matrix (SAM) framework (Section 4.3), multiplier analysis (4.4), and Structural Path Analysis (SPA) (Section 4.5). Since this study focusses mainly on South Africa, this chapter also provides an outline of the South African SAM (Section 4.6) as well as the incorporation of the flow-of-funds matrix, which will be used to expand the financial sector in the SAM (Section 4.7).

4.2 Data

The SAM data (2007-2009) was obtained from the Development Bank of Southern Africa (DBSA, 2009). This particular SAM is based on the 2006 prices and it contains interrelationships between sectors of the South African economy and a distribution of income and expenditure among household categories. Considering that a SAM interconnects macro-economic indicators, like the GDP to indicators of socio-economic interest, it is therefore suitable for this study (Breisinger, Thomas & Thurlow, 2009:8).

The specific 2006 SAM used in this analysis comprises of 122 endogenous and exogenous accounts. The endogenous accounts include 43 activities, 43 commodities, 43 factors of production and 47 institutions.

The exogenous class of accounts comprises 5 types of taxes and subsidies, 8 levels of government and the rest of the world.

4.3 Social Accounting Matrix

According to Kasumba and Ruhiiga (2014:77), the SAM is a comprehensive accounting framework that represents all economic agents or accounts in a socio-economic system. Furthermore, Thorbecke (2000) indicates that the matrix that constitutes a SAM is partitioned into accounts based on the number of economic agents to be represented. This section will provide the definition of a SAM (Section 4.3.1) as well as its basic structure (Section 4.3.2).

4.3.1 What is a SAM?

The SAM is an organised matrix outlining all transactions and transfers between various production activities, factors of production, and institutions (households, corporate sector, and government) within the economy and with respect to the rest of the world (McDonald *et al.*, 1997:513). A SAM particularly captures the entire circular flow of income from production to factor incomes, household income to household consumption, and back to production (Thorbecke, 2000; Courtney, Mayfield, Tranter, Jones & Errington, 2007). Similarly, Bellu (2008) define the SAM as a summary table, which refers to a given period, representing the production process, income distribution and redistribution that occurs between sectors, factors of production, and actors in an economic system and compare it to the rest of the world. This means that all actors outside the economic system should be studied. Since the SAM exemplify the entire economic system, it emphasises the inter-linkages as well as the circular flow of payments and receipts among the various elements of the system such as goods, activities, factors, and institutions (Robinson, Cattaneo & El-Said, 2001:47). Based on the definitions, Bellu (2008) identifies three aims of the SAM. Firstly, it organises the information on the social and economic structure of a country for a given period. Secondly, it provides a synoptic view of the flows of receipts and payments in an economic system, and finally, it forms a statistical basis for building models of the economic system, with a view to use this to simulate the socio-economic impact of policies (Bellu, 2008:25).

The SAM presents the transactions of an economy in the arrangement of a matrix. In this matrix, every economic account has both a row and a column (Robinson, Cattaneo & El-Said, 2001:48). The expenditures for every account are entered as column entries, while the incomes for every account are entered as row entries. In such a way, a SAM is a form of double entry bookkeeping in matrix form; the entries in each cell recognise the magnitude, source (expenditure) and destination (income) accounts of a transaction. Accordingly, the total expenditures by each account must exactly equal the total incomes for each account (Breisinger *et al.*, 2009:2). Hence the respective row and column sums for a SAM must, and will, equate and the matrix will be square.

Thorbecke, (1998) identified the three main features of a SAM. Firstly, the accounts are expressed as a square matrix. This is where the incomings and outgoings for each account are presented as a corresponding row and column of the matrix. The transactions are shown in the cells, therefore the matrix presents the interrelationships between brokers in a distinct manner. Secondly, it is inclusive. This is true in the sense that it represents all the economic activities of the system (consumption, production, accumulation and distribution), but in different ways. Thirdly, the SAM is adjustable. Even though it is generally set up in a standard, basic framework, there is a large measure of flexibility both in the degree of disaggregation and in the focus placed on various parts of the economic system. As it is an accounting framework, the SAM is not only square, but the corresponding row and column totals must also be equal (Thorbecke, 1998:9).

Studies have widely recognised that SAMs were originally stimulated by the work of Sir Richard Stone in the 1960s, therefore this matrix accounting framework has been in use for some time. Following this, Pyatt and Thorbecke (1976) among others advanced these thoughts and used them to analyse poverty and income distribution matters in developing economies (Thorbecke, 1998:10). Since then, a large number of SAM-based multiplier studies have been attempted (Hayden & Round, 1982; Thorbecke, *et al.*, 1992; Pyatt & Round, 1979; Tarp, Roland-Holst & Rand, 2002; Defourny & Thorbecke, 1984; Powell & Round, 2000). In all of these studies the focus has been to analyse the nature of the multiplier effects of an income injection in one part of an economic system on the functional and institutional distribution in general and on the incomes of socio-economic groups of households in particular (Bellu, 2008:25). It is remarkable that a related multiplier analysis, that was intended to terminate the Input-Output (IO)⁸ model, in relation to households were proposed in the same period (early 1970s) by Miyazawa (1976) among others. This IO framework forms the core of a SAM. The SAM, in particular, expands the IO by incorporating the social components of an economy. Owing to this, there has been a noticeable shift of interest from the basic IO table to the SAM in the past decades (Breisinger *et al.*, 2009:3). For the same reason, this study find the SAM appropriate for analysing the impact of the financial shock in South Africa.

For a better understanding of the above discussion, Figure 4.1 illustrates the economic flows and interconnections realised by a SAM. The industrial production produce value is added, which is used to pay for primary inputs. These primary inputs comprise of profits, wages, and payments to the government. Next, these incomes or receipts, produced in production, are given to households or the government. After the distribution process, incomes are either used for (final) consumption or they are saved. The final consumption leads to new production by industries, and the whole process starts again.

⁸ Input-Output analysis show how the relationship between industries through supplying inputs for output of a particular economy (Breisinger *et al.*, 2009:3)

Figure 4.1 shows that input-output tables, which only focus on production linkages, do not take into consideration the effects arising from other linkages, as exist, for example, between households' income and the production sectors (final demand). Similar to an input-output table, a SAM compiles a series of accounts in one matrix (Roberts, 2005: 393).

In addition, the SAM incorporates a complete list of accounts portraying income, expenditure, transfers and production flows (Breisinger *et al.*, 2009:3). In input-output models, generally only the production accounts are endogenous (implying that changes in the level of expenditures directly follows a change in income), and the factor and household accounts are exogenous (implying that expenditures are set independently of income changes). In a SAM, the production factors, as well as the households' accounts, are endogenous. The exogenous or independent accounts can consist of payments to, and receipts from, the government, actors outside the research area, and investments, value added or savings (Roberts, 2005: 394).

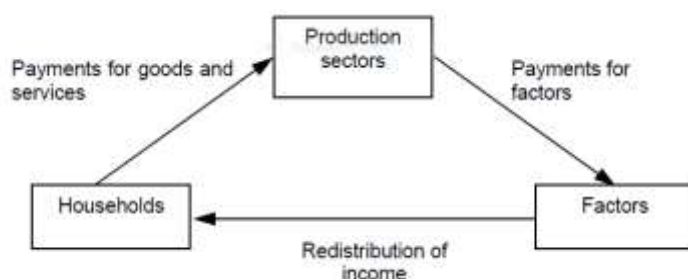


Figure 4.1 The direction of income flow

Source: Roberts (2005:393).

4.3.2 Structure of a SAM

As represented in Table 4.1 below, the basic structure of the SAM consists of commodity accounts, activity (or production) accounts, factor accounts, institutional accounts, capital accounts and the rest of the world's accounts. Each of these accounts may include a number of sub-accounts. Given these accounts, it is necessary to realise that there is a clear distinction between commodities and activities in a SAM (Breisinger *et al.*, 2009:2). Activities are organisations that manufacture goods and services whilst commodities are those goods and services manufactured by activities. The distinction between commodity and activity accounts has significant advantages. It allows the separate tracking of commodities and activities in particular, allowing for the construction of models in which the behavioural relationships are more intuitively appealing. One activity, for instance, can produce beyond one type of commodity (by-products). In the same manner, commodities can be produced by more than one type of activity. Furthermore, it allows greater detail about policy instruments, e.g. indirect taxes and subsidies relating to activities, and import tariffs relating to commodities.

The commodity accounts record the demand and supply of commodities. The column entries identify commodity transactions according to whether they are made domestically or imported, inclusive of tariff revenues (Breisinger *et al.*, 2009:2). The row entries sub-divide transactions in commodities between intermediate and final demands, where final demands are disaggregated across different institutions. In equilibrium, total demand for commodities is equal to total supply of commodities (Courtney *et al.*, 2007:1222). The row entries identify the production of commodities by activities, while the column entries sub-divide production expenditures between intermediate inputs and value. On the other side, the activity accounts record domestic production activities (Courtney *et al.*, 2007:1223). The row entries identify the production of commodities by activities, while the column entries sub-divide production expenditures between intermediate inputs and value added, and value added will be broken down into payments to different factors, expenditure taxes, for example VAT, paid by activities, and certain types of imports as shown in Table 4.1. The column sums for the production accounts record the total inputs to activities and are equal to the row sums (Breisinger *et al.*, 2009:3).

Apart from the commodity and activity accounts, factor accounts document the income produced by production activities in making use of various factors of production. These factor incomes must then be allocated amongst the institutions and households that basically possess the factors. These factors of production include labour, capital and land. Labour accounts are generally sub-divided by gender, education level and skills among others. In the same way capital accounts are distinguished by domestic and foreign supply. All these transactions are recorded in factor accounts of the SAM. The expenditures by the factor accounts are recorded by the column entries (Breisinger *et al.*, 2009:3).

In addition to the SAM accounts, the institutions are identified by the nature of the socio-economic groups classified according to location (urban/ rural), employment status, or assets among others. As a minimum, a SAM would typically contain sub-accounts for multiple types of households and the government, and may contain sub-accounts for corporations and non-profit organisations. Incomes to institutions are then recorded as row entries with expenditures as column entries (Courtney *et al.*, 2007:1223). There are three characteristics that are noticeable in these sub-accounts. Firstly, the behavioural determinants of commodity demand are probably not the same across sub-accounts. Secondly, intra- and inter-institutional transfers are economy specific and thirdly, the entries for the government account are related to government policy instruments. These are defined with reference to government income sources, e.g., VAT on intermediates, tariffs on imports, direct taxes, profit taxes and government expenditures, e.g., transfers to households, corporations (McDonald *et al.*, 1997:517).

Table 4.1 The Structure of a SAM

	Commodities	Activities	Factor Payments	Households	Government	Capital Account	Rest of world	Total Incomes
Commodities		Combined Use Matrix		Household Consumption Expenditure	Government Consumption Expenditure	Investment & Inventory Expenditures	Export Revenue incl. of Subsidies	Commodity demand
Activities	Domestic Make Matrix							Domestic production
Factors		Value Added		Domestic employment	Government employment		Factor Income from Abroad	Factor incomes
Institutions: Households			Labour incomes and distributed profits	Inter-household transfers	Government Transfer to Households		Remittances to Households from Abroad	Household incomes
Institutions: Governments	Tariff Revenue	Indirect tax revenue less subsidies plus tariff revenue	Taxes on labour and profits	Tax Revenue from Households		Tax Revenue from Capital Account	Government Income from World	Government revenue
Capital Account				Household Saving	Government Saving		Current Account BoP	Total savings
Rest of the world	Competitive Commodity Imports	Non-competitive Commodity Imports	Factor payments abroad	Household Transfer to World	Government Transfer to World			Total imports
Total expenditures	Commodity Supply	Production	Factor outlay	Household Expenditure	Government Expenditure	Capital Expenditure	Total Exports	

Source: McDonald et al. (1997:517).

Furthermore, the final two accounts are the capital account and the rest of the world account. The former refers to investments and its funding. Investments are recorded in the capital account column, while the funding of investments is compiled from savings by institutions and transfers from abroad, for example foreign investments. Trade transactions are recorded in the rest of the world account. This constitutes current and capital accounts, and visible and invisible trade. The way in which entries are made in the rest of the world account is important, because it reflects assumptions about the nature of trade relations and thus deeply influences the trade policy issues which can be analysed.

This knowledge is useful for this study since the literature review (Chapter 2) showed that capital linkages has been influential in channelling the spill-over effects of the financial shock to South Africa (McDonald *et al.*, 1997:516). For such an analysis, it is also important to note that a SAM can be used to construct multipliers that portray the direct, indirect and induced effects of the financial shock. In the next section (Section 4.4) the multiplier analysis will be discussed.

4.4 Multiplier analysis

As mentioned above (Section 4.3.2), the SAM represents a set of macro-meso data of an economy. From this data, matrix multipliers are computed. It is therefore important that one of the accounts must be specified as exogenous, otherwise the matrix is not destined and there are no multipliers. For this reason, the initial task is to designate endogenous and exogenous accounts (Sadoulet & De Janvry, 2003:5). Commonly, the transactions in the government account, capital account and the rest of the world account are regarded to be exogenous. The reason being that the government expenses, for example, are necessarily policy determined (Bellu, 2008:13). On the other hand, endogenous accounts are normally constrained to those of production, factors and households. This refers to the activities, commodities and private institutions. This identification of the endogenous transactions helps to focus on the interaction between production activities and households. The interaction of production activities and households happens through factors and commodities markets. To make it simple, the exogenous accounts can be combined into a single account. This account will record an aggregate set of injections and leakages into and out of the system (Bellu, 2008:14).

After determining the exogenous and endogenous account, the SAM multipliers can be computed based on the re-circulation of spending within the economy. In a practical way, a decrease in government expenditure directly lowers the activity levels as well as household incomes. However, on the other side, the indirect effect is that value added is decreased, lowering factor incomes and decreasing household incomes according to the combinations of factors each household owns. Consequently, the income of each of the latter translates into changes in the total income of each group or equivalently in the mean household group income (Sadoulet & De Janvry, 2003:6). This illustrates the focus of the SAM

multipliers in determining the total income effect on different household groups as a result of an exogenous shock, either policy determined or external.

When determining the effect of an external shock on the total income of households, SAM multipliers are superior to the IO model (Round, 2003:6). Input-output multipliers, in particular, only reveal the inter-industry effects, although these will reproduce some income effects in so far as changes in outputs directly and indirectly affect incomes. However, SAM-based multipliers consider not only the direct and indirect effects, but also the induced effects on factor and household incomes and activity outputs (Round, 2003:7). To clarify, direct effects are those pertaining to the industry that is directly affected by the shock, whilst indirect effects are as a result of inter-industrial linkages. Induced effects are those income and employment effects that are triggered by household consumption expenditures (Garcia, 2009:7).

Although the SAM-based multipliers are preferred over the IO multipliers, they are calculated under strong limiting assumptions (Round, 2003:7). This means that, just like the data side, simplicity and transparency will come at a cost. To start with, the implicit assumption comes when using the model to analyse the distributional effects of positive shocks. This refers to an expansion of export demand or an increase in either government spending or investment. The essence of this assumption is that there is excess capacity in all sectors and in the unemployed or underemployed factors of production. In this situation, the multipliers function through to the equilibrium solution. However, in the case of any type of capacity limitations, the multipliers will overestimate the total effects and the final distribution effects will be ambiguous. In addition, as prices are fixed, there is no allowance for substitution effects anywhere, or at any stage. Given this, any changes in demand will attribute to changes in output prices (Garcia, 2009:10). In contrast, when prices are not fixed, they are most likely to increase or drop to counterbalance excess demands or supplies in any of the markets (Round, 2003:8). As a result, any price changes would tend to lighten the total effects as directed by the fixed price model. Furthermore, the distinction between endogenous and exogenous accounts simply entails that there is a restriction to the endogenous responses that are apprehended in the multiplier model. The exogenous accounts will be influenced by the initial shock and by changes in the leakages from the endogenous to the exogenous accounts (Garcia, 2009:10). Apart from this, no other responses can occur within the exogenous accounts, whereas in practice government expenditures might change as a result of a trade shock and an effect on the trade balance. Therefore the multiplier effects will be under-estimated to this extent. Generally, it is not easy to make conclusions about the effectiveness of the SAM multipliers in all circumstances. In some scenarios, the assumption of a perfectly elastic supply of outputs and factors is feasible, while in others it is unreasonable. This is because an increase in supply is limited to factor resources (Garcia, 2009:10) At best, SAM multipliers provide people with a first-cut estimate of the effects of a policy or external shock, when relying only on the SAM structure (Round, 2003:9). For example, assume that a government policy

will lead to an increase in the demand of bank loans. This demand increase leads to a direct increase in banking activities. Indirectly, value added increases, increasing household income. The increase in household income leads to an induced effect, as the people now have more resources, which may lead to an increase in expenditure. This makes the SAM multiplier analysis useful for this study. The multiplier analysis allows the measurement of the effect of injections from exogenous accounts into the economy to be represented by the endogenous accounts. It reveals the interaction between and across SAM categories, as illustrated in Figure 4.2.

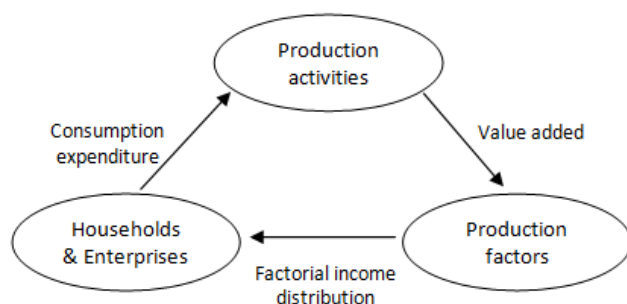


Figure 4.2: Inter-relationship among SAM

Source: Garcia (2009:25).

As discussed in the previous section (Section 4.3), Figure 4.2 shows the value added generated from production activities flowing to production factors as factor payments (wages, land rents, capital returns). Thereafter, income is distributed to households and enterprises. Lastly, households and enterprises spend their income to purchase goods and services from production activities.

In addition to the inter-relationships revealed by SAM-based multipliers, Breisinger *et al.* (2009) explore the impact of exogenous demand-side shocks (Garcia, 2009:7). These shocks refer to the changes in export demand, government spending and investment demand. Both direct and indirect effects are associated with these shocks. There are sectors which are straightforwardly impacted by the shock. When the demand for bank loans rise, for instance, the banking sector is directly affected. On the other hand, the indirect effects of the shock stems from one sector's networks to the other sectors and parts of the economy (Breisinger *et al.*, 2009:13). These indirect effects are transmitted through production and consumption linkages. The multiplier analysis captures both the direct as well as the indirect effects of the shock. This is illustrated in Figure 4.3 below.

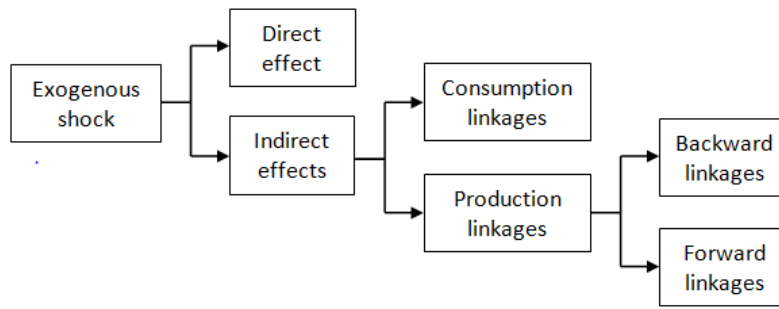


Figure 4.3: Direct and indirect linkages

Source: Breisinger *et al.* (2009:13).

The production interconnections or interdependence depends on the level of technology in that production industry to a large extent. These interconnections are included in the IO section of the SAM (Garcia, 2009:7). The same linkages are separated into two categories, namely forward and backward linkages. For producers to supply extra goods or services, they also need extra inputs, therefore that demand for extra or additional inputs is called backward production linkages. For the same reason, backward linkages are powerful in those industries that their production technologies utilise much inputs. On the other hand, when an increasing amount of inputs are supplied to the challenging industries, forward production linkages occur. For instance, when the production of an industry increases, it is then possible to provide more goods to the other industries which uses these goods as inputs and therefore the production of that sector will be stimulated. Therefore the strength of these forward production linkages is determined by the value that industry has for upstream industries (Breisinger *et al.*, 2009:13).

The size of the multipliers depends on the strength of these production linkages to a large extent, thus the stronger the forward and backward linkages, the larger the multipliers will be. In the case of the IO model, the multipliers are smaller because they only capture the effects of production linkages. Consumption linkages are unaccounted for with these multipliers. The SAM multipliers, however, measure production linkages as well as consumption and for this reason these multipliers are bigger than those of the IO model. They capture the direct and indirect effects, in the first and all consequent rounds of the circular income flow. In other words, multipliers convert initial changes in exogenous demand into total production and income changes of endogenous accounts (Garcia, 2009:8). Similarly, the fundamental features of an economy determine the largeness of the multipliers. For instance, the proportion of imported goods and services that is demanded by households for consumption serves as a major determinant. If households mainly consume goods that are produced locally, therefore local producers will benefit from an increase in the income of these households and the circular flow of income will lead to additional rounds of indirect linkage effects. On the other hand, an increase in households' demand for imported goods will favour external producers, thereby lessening the indirect linkage effects (Garcia, 2009:10).

Apart from the above linkages, multipliers can be classified into three types. Firstly, there is an output multiplier. This incorporates all direct and indirect effects across multiple rounds and presents the final increase in gross output of all production activities. Secondly, a GDP multiplier that captures the aggregate changes value added or factor incomes caused by direct and indirect effects. Finally, the income multiplier captures the total change in household incomes. For this study, the multiplier used is given in Equation 4.1 below.

The standard inverse of $(1 - A_n)$ from the following multiplier M_a

$$\gamma_n = A_n \gamma_n + (1 - A_n)x^1 = M_a^x \quad (4.1)$$

is a suitable instrument for measuring the effect of an external shock on the income of internal accounts (Azis & Mansury, 2003:113). It captures the direct and the indirect impact of the shock. Yet, the multiplier interpretation fails to expose the interconnection avenues through which an injection is conveyed (Defourney & Thorbecke 1984:111). In order to determine these primary networks of propagation, this study will make use of the SPA method that will be discussed in the next section (Section 4.5).

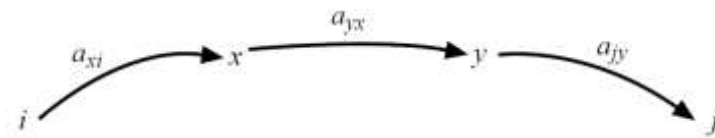
4.5 Structural Path Analysis (SPA)

As noted in the previous section (Section 4.4), an accounting multiplier matrix exposes the intensity of effects on other internal accounts caused by the change of external demand on a specific internal account (Shantong, Ying & Jianwu, 2004:8). In such an analysis, multiplier decomposition can help to comprehend the distribution of macro effects caused by the external injection. However, the results of multiplier analysis do not provide insight into the mechanism of interactions among these accounts. With the multiplier analysis, it is difficult to find the paths through which the impact among accounts spread as well as identifying the most influential paths in this transition mechanism. Understanding this paths composition is critical especially for the decision-making process. Based on multiplier analysis, the SPA additionally exposes the transmission mechanism of the interactions among accounts, thus it opens the “black box” (Azis & Mansury, 2003: 113).

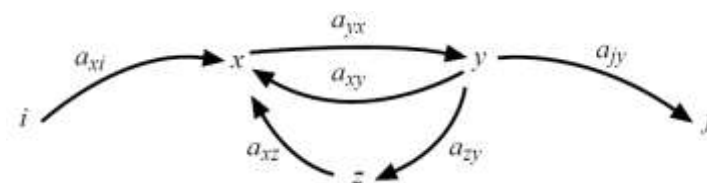
The SPA focuses on how single components lead to the global influence that is obtained from conventional SAM based multipliers by tracing the transmission of influence within an economic set. It is a tool that is used to identify the channels through which structural relationships in an economy lead to ultimate effects on internal variables. It exposes the aspects of an economy that are not clear from an analysis of either direct transactions between accounts or an examination of the global influence (Roberts, 2005:393). From this perspective, structural path analysis has two key objectives. The first one is to determine the most crucial interactions or paths within an economic set-up. Secondly, the SPA identifies

the individual poles (sectors, factors or households) that are most influential in transmitting the economic influence (Ngandu *et al.*, 2010:6). The SPA is fashioned to give a comprehensive view of the impact of shocks to external accounts. SAM multipliers determine the aggregate impact of a shock, whereas the SPA not only decomposes these multipliers into direct and indirect components, but it also shows the network of transmission channels. In this context, the structural path analysis is helpful when it comes to comprehending the nature and strength of linkages that operate through the economic sector (Roberts, 2005:394). Figure 4.4 below is used to describe the theory of structural path analysis.

a) Direct influence



b) Total influence



c) Global influence

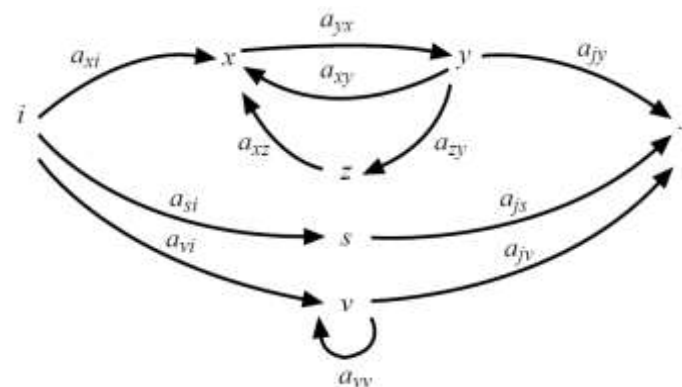


Figure 4.4: Types of influences in the Structural Path Analysis

Source: Azis and Mansury (2003:114).

This diagram will assist in describing the theory of SPA. Each endogenous account in the SAM is taken as a pole, while the link between any two poles is represented by arc (i, j) . The structural path analysis starts by assimilating the severity of an influence proceeding from post i to post j , as the SAM average propensity $a_j i$. The curve (i, j) is defined as the interconnection between the pole of the origin and that of destination (Azis & Mansury, 2003:113). The path is defined as the order of chronological arcs, in other words it is the dimension of which the number of arcs between the origin and destination poles. For

example, arc (i, j) is a path with a unit length, whilst path (i, x, y, j) has length equal to three units. A path that passes only once through the one pole, is referred to as an elementary path. A path whose pole of origin coincides with its pole of destination is a circuit (Shantong *et al.*, 2004:9). In Figure 4.4 $(i \rightarrow x \rightarrow y \rightarrow j)$ is an elementary path and $(x \rightarrow y \rightarrow z \rightarrow x)$ is a circuit. Suppose account i is disturbed by external injection and finally acts on account j by way of path s , then $s(i \rightarrow j)$ can be used to symbolise the influence of i on j . From this explanation, three types of influences between accounts are recognised by the SPA, namely direct influence (DI), total influence (TI) and global influence (GI). These three types of influences are illustrated by Figure 4.4 above. Figure 4.4 a) shows a direct influence (DI), Figure 4.4 b) a total influence (TI) and Figure 4.4 c) a global influence (GI). To provide a better understanding of how these influences work, the next sections explain direct influence (Section 4.5.1), total influence (Section 4.5.2) and global influence (Section 4.5.3)

4.5.1 Direct influence

The direct influence of i on j is conveyed through an underlying way that links parts i and j . This is expressed as the change in income or production of pole j , lured by a complete change in i , the income of all other poles other than those along the chosen elementary path that remain constant. In terms of numerical value, the direct influence of i on j is the intensity of arc (i, j) . This means that it is element a_{ji} of the average expenditure propensity (Shantong *et al.*, 2004:10).

$$DI_{(i \text{ to } j)} = a_{ji} \quad (4.2)$$

In this perspective of the path analysis method, the average expenditure propensity matrix is also defined as the direct influence matrix. While an underlying path, whose two ends are i and j , passes more than two poles, the direct influence conveyed from pole i to pole j along the path is equivalent to the product of the intensities of the arcs forming the path. However, $DI_{(i \rightarrow j)}$ might also transit along path (i, \dots, j) , with a length bigger than one, in which case its magnitude is the product of intensities of the arcs linking the path. The direct influence that travels across path (i, x, y, j) , for instance, has the magnitude $a_{xi} a_{yx} a_{jy}$ as indicated in Figure 4.4. In many circumstances, poles along an elementary path are linked to other poles or paths, constituting closed circuits that elaborate the direct influences. Therefore, the direct influence and all the indirect effects of the circuits created along the path (i, \dots, j) are referred to as the total influence (Ngandu *et al.*, 2010:6).

4.5.2 Total influence

Generally, poles on the elementary path are joined to other poles or paths. As a result, a lot of circuits are created on account of the presence of reaction effects (Azis & Mansury, 2003:113). The influence

conveyed from outset to destination along the elementary path along with all indirect effects inside the structure liable to that path constitute the total influence. To clarify, the total influence combines the direct influence conducted along the elementary path and the indirect effects represented by the circuits next to that very path. The direct influence $a_{xi} a_{yx}$ in Figure 4.4 b is, for example, conveyed back to y . Accordingly, a sequence of feedback stimuli are produced along that circuit,, creating a new set of multipliers.

On the principle of Figure 4.4, Figure 4.4 b adjoins a circuit $x \rightarrow y \rightarrow x$. The estimation process of the total influence represented by Figure 4.4 will now be clarified. The direct influence between pole i and pole j is $a_{xi} a_{yx}$. This influence is conveyed back to pole x through the following two circuits: $x \rightarrow y \rightarrow x$ and $x \rightarrow y \rightarrow z \rightarrow x$. The indirect influence is $a_{xi} a_{yx} (a_{xy} + a_{zy} a_{xz})$, and this influence circulates continuously between pole x and pole y , and eventually the following equation is obtained:

$$a_{xi} a_{yx} \{1 + a_{yx} (a_{xy} + a_{zy} a_{xz}) + [a_{yx} (a_{xy} + a_{zy} a_{xz})]^2 + \dots\} = a_{xi} a_{yx} [1 - a_{yx} (a_{xy} + a_{zy} a_{xz})]^{-1} \quad (4.3)$$

to calculate the total influence of the concept in Equation 4.4, it needs to be multiplied by a_{jy} , since an influence has to travel across the arc (j, j) before embracing the ultimate destination at pole j as depicted in Figure 4.4 b. The resulting total influence $TI_{(i \rightarrow j)}$ is therefore:

$$TI_{(i \rightarrow j)} = a_{xi} a_{yx} a_{jy} [1 - a_{yx} (a_{xy} + a_{zy} a_{xz})]^{-1} \quad (4.4)$$

From Equation 4.4 it is evident that the first term on the right hand side of the equation is depicting the direct influence as it is defined above. The second term is interpreted as the path multiplier that apprehends the extent to which the direct influence along the elementary path is amplified through adjacent feedback circuits. Accordingly, the total influence between two poles can be written in the form of the product of direct influence and path multiplier. The size of the path multiplier normally depends on the length of the path as well as the feedback intensity. If there are many poles passing through the elementary path, there is also a higher probability that the path contains feedback circuits and there is also a high possibility of large multipliers. On the other hand, the bigger the feedback intensity of the circuits contained in elementary path, the greater the path multiplier (Shantung *et al.*, 2004:11).

In addition, the inverse of this path multiplier basically shows the relative amount of the total influence conveyed along an elementary path that is a result of the instantaneous effects, namely the direct influence (Azis & Mansury, 2003:114). Since this index indicates the transmission time as well as the intensity of an external injection, it is of great importance for policy makers. The bigger the numerical value of the inverse, the bigger the rate of direct influence. This entails a rapid transmission of external

injection. In contrast, the greater path multiplier usually implies that the transmission momentum of the influence can be less (Shantung *et al.*, 2004:12).

4.5.3 Global influence

The sum of total influences $TI_{(i \rightarrow j)}$ between poles i and j constitutes the global influence. Furthermore, global influence is an abstraction of the results caused by all paths (Azis & Mansury, 2003:113). Global influence can be expressed by the element in the matrix M_a that is a result of Equation (4.2). Therefore the accounting multiplier matrix can also be called the global influence matrix from the perspective of path analysis. The global influence of an external injection x_i on the endogenous variable y_j , is the element of the matrix M_a that is in the j^{th} row and the i^{th} column. That is,

$$GI_{(i \rightarrow j)} = M_{aji} \quad (4.5)$$

Global influence determines the total changes in production or income of pole j due to the injection pole i with one dollar or additional income. In specific terms, the global influence $GI_{(i \rightarrow j)}$ summarises all the direct as well as the feedback effects produced by the adjacent circuits as shown in Figure 4.4 c.

To rephrase, global influence represents the sum of all the total influences created by different elementary paths between their origins and destination. It combines the effects of all the paths between the origin and the destination (including elementary paths and circuits). This means that global influence does not analyse the influence generated by a particular path independently (Shantung *et al.*, 2004:12). From this perspective, it is important to take into account the economic set-up of a particular economy, since some economies may have countless elementary paths. This process will help to identify the paths that have more global influence in order to assist policy makers to determine the available obstacles in the transmission mechanism of the influences induced by policies.

When analysing the impact of a crisis, it is important to know how the contraction in production as a result of a shock will affect labours and households at large. To explore how the structural path analysis can be utilised in relation to the background of the financial crisis, assume for instance, a hypothetical economy with two sectors (agriculture and manufacturing), two factors of production (capital and labour) and a single household. The total earnings of the household in that specific economy comprise of capital rents and labour wages (Azis & Mansury, 2003:114). To simplify matters, it can be assumed that agriculture only make use of labour, whereas the manufacturing sector utilises only capital. Furthermore, consider that creating goods and services in the agricultural sector need the intermediate input from the manufacturing industry and this order is reciprocal. In this particular compiled hypothetical economy, foreign investors unexpectedly decide to pull back their capital investments. This will be a financial shock

caused by the shift in the flows of foreign capital. The transition channels or paths of this specific exogenous shock in foreign capital to households are illustrated in Figure 4.5 below.

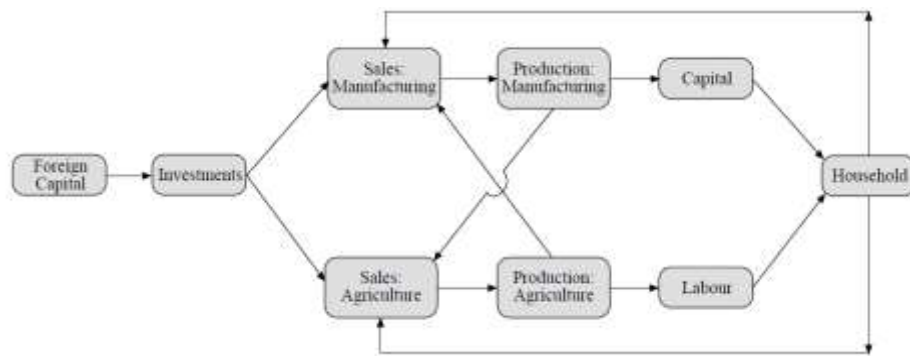


Figure 4.5: SPA of a hypothetical economy

Source: Azis and Mansury (2003:115).

The input of the Neo-classical theory in this case is that the reverse of foreign capital results in a shrinkage in real investments. Consequently, the sales of the manufactured products as well as the sales of the agricultural products decrease, putting stress on these two sectors. Proportionately, capital and labour face a decrease in income and this transforms into a lower household income. The Keynesian theory, on the other hand, has the following perspective. A possible financial crisis emanating from a reverse in foreign capital flows usually results in economic slowdown as well as lower earnings for businesses. In addressing this effect, business organisations may lower their production levels, leading to a reduction in output. Furthermore, in unfavourable economic situations a decrease in output may have an impact on the income of households (Azis & Mansury, 2003:115).

As illustrated in Figure 4.5, the principal channel, foreign capital - investments - manufacturing sales - manufacturing production - capital - household, shows a constituent of a shock that is conveyed directly. This represents an example of the direct influence $DI_{(Foreign\ capital - Household)}$. On the other hand, the other constituent of the shock moved from manufacturing production to agricultural sales through an IO interconnection and this then affected the manufacturing sales through the other IO interconnections. This path incorporates the circuit sales: manufacturing - manufacturing production - agriculture sales - agriculture production - manufacturing sales (Azis & Mansury, 2003:115). The direct influence together with the circuit feedback affect the aggregate to an example of total influence $TI_{(Foreign\ capital - Household)}$. At the end, the aggregate effect of all total influences between foreign capital and household explains the global influence $GI_{(Foreign\ capital - Household)}$.

In accordance with the SPA theory explained above, this study will apply the method to a SAM that is built for South Africa. This framework will help to analyse the effects resulting from a financial shock and

identify the transmission mechanisms of the interactions. In the next section (Section 4.6), the South African SAM will be discussed.

4.6 The South African SAM

South Africa as a diverse country has faced social, political and economic transformation over the last decade (Stats SA, 2008:1). The country has endorsed various strategies and policies intended at developing the welfare of individuals and households of South Africa. In evaluating the success of these strategies and policies, the SAM has proved to be one of the more useful measuring tools. Therefore, there are strong motivations for using the SAM-based models in studying the spill-over effects of the financial shock to the economy of South Africa. The social accounting matrix, in particular, shows the economic link between sectors of the economy by recognising monetary transactions (expenditure and receipts) between sectors (Stats SA, 2010:2). At the same time, this allows an analysis of critical matters that are of particular interest to the country. An example of this is an investigation of the inter-relationships between structural components of an economy and the distribution of income and expenditure among different households. This feature of the SAM makes it appropriate to use in this study. For the same reason, it is therefore important to understand how the South African SAM is constructed.

South African Statistics (Stats SA) have compiled five SAMs so far. The first SAM was compiled for the reference year of 1988 and was set up according to the recommendations of the 1968 System of National Accounts (SNA). The other four SAMs (1998, 2002, 2005 and updated 2005) were defined by the 1993 SNA. The SNA presentation in a matrix style amplifies the linkages between Supply and Use of Tables (SU-tables) and institutional sector accounts (Stats SA, 2008:2). This 1993 The SNA was implemented in combination with rebasing on and referencing to the GDP estimated values of 1999. The base year of the national accounts estimates at constant prices was changed from 1995 to 2000 in 2004 and from 2000 to 2005/2006 in 2009. To clarify, the SAM is built on the National Accounting Matrix (NAM) framework whereby each recording of the NAM is expanded into a sub matrix. In the sub-matrix, the rows and columns identify types of transactors. The totals in the NAM are used as control totals in the SAM. This expansion of the NAM further provides a group of sub matrices, which target the duty of households in the economy with a breakdown of households and their representation in the labour market. The 1998 and 2002 SAMs, for instance, assembled the income and expenditure patterns of households for South Africa, these are broken down into meaningful sub groups, thereby making the economic significance of each group apparent (Stats SA, 2010:7). The updated 2005 SAM focuses on household income and their expenditure patterns. In this SAM, the population of South Africa is divided into four groups (Black African, Coloured, Indian/ Asian, White) and twelve household final consumption expenditures. Since the focus of the analysis of this study is on household income distribution, the updated 2005 SAM becomes relevant. In other terms, it provides a detailed presentation of the South African economy (Stats

SA, 2010:3). To build the SAM, data from different sources such as national accounts, income and expenditure surveys, and integrated economic accounts, population census and others is required. This data from different sources is then incorporated and reconciled to ensure consistency (Stats SA, 2010:7).

However, as mentioned in Chapter 1, the SAM has been incomplete and fails to reflect the economic reality (Ayadi & Salemi, 2014:216). Consequently, this study proposes the introduction of financial transactions into the South African SAM for the year 2006. The choice of the base year is based on the fact that 2006 has been considered the key year before the GFC. The aim here is to produce a model that addresses the link between the financial economy and the real sector based on the flow of funds data.

Subsequently, the next section (Section 4.7) will discuss how the flow of funds matrix for South Africa is built.

4.7 The construction of the flow of funds matrix

The flow of funds data presents the financial assets and liabilities of all the institutional sectors of the economy and their connection with the rest of the world. By combining the flow of funds and SAM, details of real and financial transactions as well as flows recorded between the economic agents are provided (Emini & Fofack, 2004:11). Apart from this, the addition of financial transactions to the SAM allows the simulation of the impact of the financial shock on the economic aggregate of South Africa.

Similar studies that incorporate the financial sector to the SAM have been conducted in some developed countries (e.g. Leung & Secrieru, 2011; Hubic, 2012). Leung and Secrieru (2011) analyse the relationship between the financial economy and the real economy of Canada. Their results show that by taking financial flows into account, the impact of final shock on Canadian output can be increased (Leung & Secrieru, 2011:32). Furthermore, Leung and Secrieru (2011) found that financial flows are very useful in measuring the cumulative impact of an income shock or the accessibility of investments funds. Similarly, Hubic (2012) built a financial CGE model to examine the effect of the financial crisis on the Luxembourg economy. The findings of this study indicate that the financial CGE model allows the policy makers to trace the impact of the external shock from financial to non-financial side and vice versa (Hubic, 2012:75).

In the developing countries, related studies have been attempted (Emini & Fofack, 2004; Aslan, 2007; Li, 2008). The study of Aslan (2007) was aimed at constructing the financial social accounting matrix for Turkey. However, disaggregated data for households for financial as well as real variables was not found (Aslan, 2007:299). In addition, Li (2008) analyses the fundamental features of the Chinese economy from the flow of funds perspective. In this study the results show that the real side and financial side of China's economy are interconnected. As a result, the development of the Chinese financial system contributed to

economic growth (Li, 2008: 215). In general, developing countries lack data in the application of flow of funds (Green, Murinde & Moore, 2012:2). However, South Africa, in recent years has made significant attempts to regularly publish its flow of funds data. The availability of flow of funds data is important, especially in most African countries, where markets have disintegrated to a large extent, and financial markets are less regulated and less liquid (Ayadi & Salemi, 2014:217). Given such markets, very limited information is reflected by prices and this is not helpful for policy makers. In this case, information from the flow of funds will be of great use to the policy-makers. For this reason, the flow of funds may be of great value among the developing countries to help in the analysis and development of the financial system (Green *et al.*, 2012:3).

South Africa's financial system is complicated and consists of several institutional sectors. For this reason, the economic activity and transactions between residents and non-residents should be recorded for compiling the flow of funds (De Beer, Nhlapo & Nhleko, 2010:239). In this matrix, the rest of the world is defined as the foreign institutional sector, whilst the resident institutional units are separated into private and public sector. Institutional units within the private sector are not controlled or owned by the government. Conversely, the institutional units in the public sector are owned and controlled by the general government sector. The public sector therefore comprises of public financial and non-financial business enterprises and the general government (de Beer *et al.*, 2010:240).

Provided this financial system, the South African flow of funds framework presents data in a row (transactions) and a column (sectors) matrix. Net increase or decrease is shown in each cell representing flow of transactions by sector at a given period of time. This flow of funds framework is used by the SARB and is similar to the one suggested by the IMF. They only differ in that SARB uses the balance sheet approach to analyse data while the IMF use the transaction approach. When using the balance sheet approach, flows are calculated based on the change on the balance sheet position of institutions. On the other hand, flows are calculated based on detailed transaction data (de Beer *et al.*, 2010:240).

In this flow of funds framework, data is presented according to sources and uses of funds. When compiling data, it is therefore critical to process the data. The flow of funds data has been made available in the Quarterly Bulletin published by the SARB for every quarter since 2009 lagging by two quarters. Every June, the full flow of funds of the preceding year is also available. In this flow of funds there are five main economic sectors that are divided into 22 institutional groups or 11 sectors of the economy. It consists of 32 financial and non-financial transactions items. It is therefore important to closely process the data in order to counter the drawbacks of the flow of funds. These drawbacks include incomplete and incorrect data (De Beer *et al.*, 2010:241).

4.8 Summary

In this chapter, data and methods (the SAM, multiplier analysis and the Structural Path Analysis) used for this study were discussed. A SAM is an organised matrix showing all payments and earnings between various production activities, factors of production, and institutions (households, corporate sector, and government) of a particular economy in relation to other global economies. This chapter indicated that the IO and SAM models are among the most popularly used models. In addition to this, forward as well as backward interconnections have become basic practice in IO type study. It was also suggested that a SAM-based tool can be a better instrument in analysing the influence of a financial shock on the economy and socioeconomic aggregates of South Africa.

Considering this perspective, SAM multipliers are useful in determining the influence of an external shock on income of the endogenous accounts. Though the multiplier analysis is a useful tool, it fails to expose the interconnection channels through which an injection is propagated. Therefore, in order to determine the dominant path of propagation, the SPA method is proposed. Furthermore, this chapter explained the way in which the South African SAM changed over years. It was also indicated that the information obtained from the flow-of-funds can be useful to policy makers and research studies.

When reflecting on the previous studies referred to in this chapter, there are strong motivations behind using the SAM, multiplier analysis, SPA and flow of funds in analysing the impact of a financial shock. However, the effectiveness of these methods depends much on the appropriate interpretation of the results. The next chapter, therefore present the results obtained from applying the above mentioned methods.

Chapter 5: Empirical results

5.1 Introduction

The present chapter focuses on the empirical results and findings from the methods applied in the purpose of attaining the goal of this dissertation as stated in Chapter 1. As mentioned before, this study aims to identify the transition networks or channels through which a financial shock influences the household income distribution within the South African economy. It is necessary to heed the financial shock evaluated to determine the channels. In this study the financial shocks refer to the 2008-09 GFC and the on-going Eurozone crisis (as discussed in Chapter 2).

In the purpose of opening the “black box” of economic complexities, another action is adopted to unfold the inevitably connected interrelation between the real sector, financial sector and the income block. It is only through the utilisation of the structural path analysis mechanism that this relationship can be understood. The SPA divides the SAM multipliers or the global influences into direct and indirect influences. This chapter, therefore, presents the SPA results on the impact of the financial shock to the local economy. In achieving this, the present chapter presents and discusses the SPA results on production activities, commodities and labour (Section 5.2). In addition, this chapter also looks at the transmitting channels through which the financial shock (GFC and the Eurozone crisis) influenced the households of South Africa (Section 5.3).

5.2 Structural path analysis

In this study, the 2006 South African SAM was obtained from the Development Bank of Southern Africa (DBSA, 2009). The specific 2006 SAM include a total of 122 accounts, which are divided into endogenous and exogenous accounts (see Section 4.2). Incorporating the real SAM with the flow-of-funds guarantees that the base run is equilibrated in two fronts (Robinson, 1991). First, the real SAM soothe equilibrium in the commodity markets and in the balance of payments. The second equilibrium is in the market for loanable funds endorsed by the flow-of-funds matrix versus the matching of aggregate savings (supply of funds) with total investments (demand for funds). The matrix of flow-of-funds can be integrated into the real SAM by replacing the column of investments and row of savings with the saving/investment account. However, the SARB only started publishing the flow-of-funds tables since June 2009 in its Quarterly Bulletin every quarter with a lag of two quarters and full preceding year is published every June (see Section 4.7). Given this, the data for the construction of flow-of-fund matrix was compiled from different sources. The savings and investments data are derived from the real SAM, which is critical in order to guarantee the consistency between the real economy and the financial sector. The other sources for the flow-of-funds data are obtained from 2006 December Quarterly Bulletin, 2007 December Quarterly Bulletin, 2007 September Quarterly Bulletin, 2008 December Quarterly Bulletin and 2009 December Quarterly Bulletin.

The companies are then divided into a single institution in the real SAM, into commercial banks and non-bank companies. The former is broken down further into domestic banks and foreign banks. The government which was a single entity in the real SAM is divided into the central bank and the government. The former regulates the monetary sector, while the latter affects the economy primarily through fiscal policies. Hence, the financial actors comprises of the central bank, the government, households, production sectors, domestic banks, foreign banks, companies and the rest of the world. After this, the financial instruments are then categorised into foreign non-equity assets, domestic currency and bank deposits, equity, domestic loans and interbank instruments. Foreign non-equity assets include those assets issued from abroad and foreign holding of domestically issued debts (long term /short term debts of both government and private sector). Bank deposits include those components of broad money M_2 such as demand deposits, time deposits and deposits denominated in foreign currencies. Equity is further classified in according to whether the owner is domestic or foreign. The interbank instruments refer to those at the disposal of the central bank to regulate the banking system, including required reserves and liquidity support.

It should be noted that this analysis of the resulting change in income distribution needs a disaggregation of households' flow-of-funds. Since the breakdown of the flow-of-funds is not available, this study use the distribution of currency and bank deposits by households groups as in Thorbecke (1992). To guarantee that savings of household group j are consistent with the real SAM figures, this study compute household j 's change in equity holding as the residual (i.e by subtracting changes in currency and bank deposits from savings (see Figure 4.4). In this analysis, the financial shock due to the crises was constructed through the flow-of-fund matrix. In this study, the series of shocks are replicated according to the actual changes of these exogenous variables between 2006 and 2009. As explained before (see Section 1.3), constructing the shock through the flow-of-funds matrix allows the financial variables to be the original source of the shock. In addition, this practise of constructing a shock captures the actual mechanics of the crisis which was triggered by the movements in the financial variables (i.e foreign capital). Apart from recognising the original of the crisis this way of introducing a shock exposes the linkage between financial sector and the rest of the economy.

In order to understand the SPA results presented in this section, note that the multiplier analysis identifies low-income, middle-income and high-income households in South Africa as institutions to analyse the impact of the flight of import payments. The aim here is to determine the transition channels of the shock originating from import payments to the households of these identified institutions. Similarly, five sectors of which the results can be analysed (agriculture, coal, gold, other mining and food) have been selected. The selection of these sectors rests on the fact that these sectors are among the sectors that suffered most from the financial shock (Ruch, 2031:3). However, it should be noted that the detailed results are in the Appendix.

Based on the selected sectors mentioned above, this section presents SPA results on production activities (Table 5.1), commodities (Table 5.2) and labour (Table 5.3). At the same time, this section analyses the results of the impact of the financial shock on production activities (Section 5.2.1), commodities (Section 5.2.2) and labour (Section 5.2.3). Furthermore, Section 5.2.3 will graphically present the effect of the financial shock on the labour market of South Africa. The aim is to determine the transition channels of the financial shock to the low-, middle- and high-income households via the low-skilled, medium-skilled and high-skilled workers of South Africa.

5.2.1 Production activities

Table 5.1⁹ indicates the paths that link import payments to the production activities of agriculture, coal, gold, other mining and food. Path analysis helps to identify the sectors that were most affected by the financial shock originating from the import payments. It is also possible to identify different paths through which the financial shock flows from import payments to different sectors of the economy. From Table 5.1, the most prevalent path transmitting the impact of the financial shock to the agriculture production activities, shows linkages within the agricultural sector. As is shown in Case 1 of Table 5.1 the path Imp/payments→CAGri→IAGri constituted 29.7 per cent of the global influence originating in import payments. This path probably is a result of South Africa purchasing agriculture inputs internationally. In addition to the paths shown under Case 1 in Table 5.1, the Imp/payments→CFood→IFood→CAGri→IAGri path reveals a significant part of the global influence of import payments on agricultural inputs (10.8 per cent). This is experienced indirectly through the demand of imported inputs for the food industry. From these results, the most important sector for transmitting the influence between import payments and agriculture activities is the food sector with the global influence of 0.34 (Case V Table 5.1). It is also shown that about 71 per cent of that comes from the direct path that links the agriculture and food sectors. The smaller portion comes from indirect paths via agricultural production activities and commodities.

Similarly, the path Imp/payments→CCoal→ICoal proved to be the most influential in transmitting the impact from import payments to coal activities (Case II in Table 5.1). This path has a global influence of 0.16 of which 63 per cent is transmitted through the linkages between coal commodities and coal activities. Furthermore, the results in Table 5.1 show an interesting path Imp/payments→CGold→IGold in which the financial shock is transmitted to the gold production sector (Case III in Table 5.1). Contrarily to other sectors, the transition to gold production has only one path with a lot of global influence at 0.30. It is also thought-provoking to observe that 95 per cent of this global influence is directly transmitted through linkages within the same sector. Moreover, Table 5.1 reveals another significant path Imp/payments→COTHMN→IOTHMN, transmitting the impact of the financial shock from import payments to other mining production (Case IV in Table 5.1). This path has a global influence of 0.30 and about 66 per cent of this is directly transmitted via the linkages in the same sector.

⁹ The prefixes I and C denotes production activity and domestic commodities respectively. Imp/payments = import payments, Dest. = destination, Global infl. = Global influence, Direct infl. = Direct influence, Path mult. = Path multiplier, Total infl. = Total influence, Prop. = Proportion, Accum. Prop. = Accumulated Proportion.

Table 5.1 Structural path analysis: Selected production activities

Case	Origin	Dest.	Global Infl.	Path	Direct Infl.	Path Mult.	Total Infl.	Prop.	Accum. Prop.
I	Imp/payments	I Agri	0.3	Imp/payments→CAgri→IAgri	0.0327	2.69	0.879	29.7	29.7
				Imp/payments→CFood→IFood→CAgri→IAgri	0.01	3.2	0.032	10.8	40.5
				Imp/payments→CWood→IWood→CAgri→IAgri	0.0011	3.1	0.0034	1.2	41.7
II	Imp/payments	I Coal	0.16	Imp/payments→CCoal→Icoal	0.0438	2.36	0.1032	63.1	63.1
				Imp/payments→CIron→IIron→CCoal→ICoal	0.0029	2.6	0.0074	4.5	67.6
				Imp/payments→CGold→IGold→CELEGS→IELEGS→CCoal→ICoal	0.0012	2.57	0.0031	1.9	69.5
III	Imp/payments	I Gold	0.3	Imp/payments→CGold→Igold	0.1231	2.3	0.2859	95	95
IV	Imp/payments	IOTHMN	0.3	Imp/payments→COTHMN→IOTHMN	0.0898	2.41	0.2161	66.5	66.5
				Imp/paments→CIron→IIron→COTHMN→IOTHMN	0.0054	2.64	0.0142	4.4	70.9
				Imp/payments→CGold→IOTHMN	0.0032	2.4	0.0076	2.3	73.2
				Imp/payments→CPETRO→IPETRO→COTHMN→IOTHMN	0.0022	2.51	0.0056	1.7	74.9
				Imp/payments→CNOFER→INOFER→COTHMN→IOTHMN	0.0017	3.04	0.0052	1.6	76.5
				Imp/payments→CChem→IChem→COTHMN→IOTHMN	0.0015	2.93	0.0044	1.4	77.9
V	Imp/payments	IFood	0.34	Imp/payments→CFood→IFood	0.0271	2.98	0.0807	24	24
				Imp/payments→CAgri→IAgri→CFood→IFood	0.0018	3.2	0.0058	1.7	25.7

Source: Author's calculations based on structural path analysis

Hence, the results in Table 5.1 show significant paths transmitting the impact of the financial shock from import payments to agriculture, gold mining, other mining, coal and the food production of South Africa. The transmission path to the gold mining production, in particular, proved to be the most influential. Furthermore, the impact on production activities entails a decline in production activity. This is in conjunction with the earlier discussion (Chapter 2) that acknowledges that the decline in production activity was one of the initial spill-over effects of the financial crisis in South Africa (Ruch, 2013; Duncan & Kabundi, 2013). Consequently, a decrease in production activity leads to a decrease in commodities or output (Ruch, 2013:9). To further explore the effect of the financial shock on the South African economy, the next section will discuss the SPA results on the commodities.

5.2.2 Commodities

The results in Table 5.2 show that commodities were more affected by the financial shock originating from import payments. Unlike the previous section, a larger portion of the global influence was transmitted directly to the commodities without any other pole. Case III in Table 5.2 reveals that the influence on gold commodities was a direct influence, which added up to 98 per cent of the GI. Similar to the scenario of the production activities, the gold mining sector proved to be the most influential channel transmitting the impact of the financial shock to commodities in South Africa. The impact from import payments in particular was the only channel through which the shock was directly transmitted to the gold mining commodities. This impact entails a decline in demand of commodities and investment flow to the South African gold mining industry. This is in line with the South African Reserve Bank's finding indicating that when the country entered the recession, the manufacturing activity declined and the demand for mining products fell (SARB, 2009:12). Again, the same transition channel has consequences on the trade industry of South Africa. In agreement with this argument, Calvo, (2013:3) acknowledges that the effect of the financial crisis on the economy of South Africa was felt mainly through the trade channel.

In addition, the results in Table 5.2 indicate that other mining commodities also have been impacted during the crisis (Case 2 and 4 in Table 5.2). In other words, there was a more direct impact on the mining industry during the time of the financial shock. As for the agriculture and food sectors, these sectors also caused direct channels that had an impact of 30 and 20.7 per cent respectively on the global influence respectively.

Given this influence on production activity and commodities, the financial shock has also had consequences on the labour market of South Africa (Essers, 2013:3). The next session will therefore discuss the SPA results on the labour market of South Africa.

Table 5.2¹⁰ Structural path analysis: Selected commodities

Case	Origin	Dest.	Global Infl.	Path	Direct Infl.	Path Mult.	Total Infl.	Prop.	Accum. Prop.
I	Imp/payments	C Agri	0.35	Imp/payments→CAgri	0.0394	2.68	0.1056	30	30
				Imp/payments→CFood→IFood→CAgri	0.012	3.2	0.0385	10.9	40.9
				Imp/payments→CWood→IWood→CAgri	0.0013	3.12	0.0041	1.2	42.1
II	Imp/payments	C Coal	0.18	Imp/payments→Ccoal	0.0452	2.36	0.1065	63.5	63.5
				Imp/payments→CIron→IIron→CCoal	0.0029	2.6	0.0077	4.5	68
				Imp/payments→CGold→IGold→CELEGS→IELEGS→CCoal	0.0013	2.57	0.0032	1.9	69.9
III	Imp/payments	C Gold	0.3	Imp/payments→CGold	0.1263	2.31	0.2923	98	98
IV	Imp/payments	C OTHMN	0.48	Imp/payments→COTHMN	0.0454	1.12	0.0509	33.2	33.2
				Imp/payments→CIron→IIron→COTHMN	0.0081	1.53	0.0124	8.1	41.3
				Imp/payments→CPETRO→IPETRO→COTHMN	0.0052	1.31	0.0068	4.5	45.8
				Imp/payments→CNOFER→INOFER→COTHMN	0.003	1.44	0.0043	2.8	48.6
V	Imp/payments	C Food	0.53	Imp/payments→CFood	0.0338	1.6	0.0542	20.7	20.7
				Imp/payments→→CAgri→IAGri→CFood	0.0359	1.25	0.0449	17.2	37.9

Source: Author's calculations based on structural path analysis

¹⁰ The prefixes I and C denotes production activity and domestic commodities respectively. Imp/payments = import payments, Dest. = destination, Global infl. = Global influence, Direct infl. = Direct influence, Path mult. = Path multiplier, Total infl. = Total influence, Prop. = Proportion, Accum. Prop. = Accumulated Proportion, Agri = Agriculture, OTHMN = Other mining, ELEGS = Other industries, PETRO = Petroleum, INOFER = Basic iron and steel.

5.2.3 Labour

Table 5.3 shows the effect of the financial shock on one of the factors of production, namely labour. In all of the five cases indicated in Table 5.3, the impact of the financial shock from import payments is transmitted to commodities, production activities and workers respectively. This entails that a decrease in the demand of commodities reduced production activity, this in turn had a negative influence on employment through either retrenchments or unfavourable working terms. Similar to the impact on commodities and production activities, the gold mining workers were mostly affected by the spill-over effects of the financial shock. The degree of influence to which the workers were impacted by the contraction in mining activity, however, varies. The low-skilled workers from the mining industry, for example, were mostly exposed, most likely due to the fact that the mines are highly dependent on lowly-skilled jobs. The transmission effect caused by the financial shock on the lowly-skilled workers is most significant through the linkages in the mining industry when compared to the other sectors (Case I in Table 5.3).

In the case of medium-skilled labourers, some of the transition channels through which these workers were affected are similar to those that affected the lowly-skilled workers. However, some of the other channels that influenced the medium-skilled workers are transport and finance (Case II in Table 5.3). In contrast to the low- and medium-skilled groups, various avenues of employment are available for highly-skilled workers. For the highly-skilled workers, the effect of the shock originating from import payments was conveyed mostly via the gold sector (Case III in Table 5.3). This was probably due to the fact that this sector depends more on the foreign markets (2.5 per cent of GI). The conveyance of the effects of the shock through the iron sector to this group of workers was nearly as severe (2.1 per cent of GI). From the results in Table 5.3 it is clear that the financial crisis had real consequences for labour employment in South Africa.

Since Table 5.3 only presents the quantitative results generated by the SPA, a graphical illustration will most possibly explain the impact of the shock better. Figures 5.1 to 5.3 disclose the principal paths. The width of each arc that connects two poles represents the importance of the path, with the wider arcs representing a larger proportion of the accounting multiplier. In other words, the thickness of the connecting lines determines the degree of influence. It is necessary to understand that the thickness is unrelated to income magnitudes. The importance of the path rather relates to both its influence and the path multiplier of the adjacent circuits.

The graphs in Figures 5.1 to 5.3 were drawn using NodeXL Excel 2007. This is a useful tool through which the created figures can provide useful insights (Garcia, 2009:20). These figures are drawn using the data from the SPA tables.

Table 5.311 Structural path analysis: Labour

Case	Origin	Dest.	Global Infl.	Path	Direct Infl.	Path Mult.	Total Infl.	Prop.	Accum. Prop.
I	Imp/payments	lo	0.53	Imp/payments→CGold→IGold→lo	0.0387	2.69	0.104	19.6	19.6
				Imp/payments→COTHMN→IOTHMN→lo	0.014	2.77	0.0389	7.3	26.9
				Imp/payments→CAgri→IAgri→lo	0.0047	3.01	0.0141	2.6	29.5
				Imp/payments→CCoal→ICoal→lo	0.0049	2.73	0.0134	2.5	32
				Imp/payments→CIron→IIron→lo	0.0045	2.94	0.0131	2.5	34.5
				Imp/payments→Sav/inv→CConst→IConst→lo	0.0019	3.78	0.007	1.3	35.8
				Imp/payments→CNOFER→INOFER→lo	0.0016	3.39	0.0054	1	36.8
II	Imp/payments	med	0.51	Imp/payments→CGold→IGold→med	0.0067	2.81	0.0187	3.7	3.7
				Imp/payments→CFINAN→IFINAN→med	0.0034	3.94	0.0133	2.6	6.3
				Imp/payments→CTRANS→ITRANS→med	0.0043	2.99	0.0128	2.5	8.8
				Imp/payments→COTHMN→IOTHMN→med	0.0038	2.89	0.011	2.1	10.9
				Imp/payments→CIron→IIron→med	0.003	3.07	0.0091	1.8	12.7
				Imp/payments→COTHMN→IOTHMN→CTRANS→ITRANS→med	0.0028	3.07	0.0086	1.7	14.4
				Imp/payments→CCoal→ICoal→med	0.0028	2.84	0.0079	1.6	16
III	Imp/payments	hi	0.33	Imp/payments→CGold→IGold→hi	0.0031	2.63	0.0081	2.5	2.5
				Imp/payments→CIron→IIron→hi	0.0024	2.88	0.0068	2.1	4.6
				Imp/payments→COTHMN→IOTHMN→hi	0.0023	2.72	0.0064	1.9	6.5
				Imp/payments→CChem→IChem→hi	0.0014	3.19	0.0046	1.4	7.9
				Imp/payments→CFINAN→IFINAN→hi	0.0012	3.78	0.0044	1.3	9.2
				Imp/payments→CCoal→ICoal→hi	0.0015	2.67	0.004	1.2	10.4
				Imp/payments→CTRANS→ITRANS→hi	0.0012	2.85	0.0035	1.1	11.5
				Imp/payments→CVEHIC→IVEHIC→hi	0.0009	3.7	0.0035	1.1	12.6

Source: Author's calculations based on structural path analysis.

¹¹ The prefixes I and C denotes production activity and domestic commodities respectively. Imp/payments = import payments, Dest. = destination, Global infl. = Global influence, Direct infl. = Direct influence, Path mult. = Path multiplier, Total infl. = Total influence, Prop. = Proportion, Accum. Prop. = Accumulated Proportion, Agri = Agriculture, OTHMN = Other mining, TRANS = Transport, FINAN = Finance, Chem = Chemicals, VEHIC = Vehicles, sav/inv = savings and investments, Const. = construction, INOFER = lo = low-skilled, med = medium-skilled, hi = high-skilled.

The width of each arc that connects two poles or accounts represents the importance of the path. The wider arcs represent a larger proportion of the accounting multiplier. Therefore, the thicker the arc, the greater the impacts of the financial shock to that account or sector.

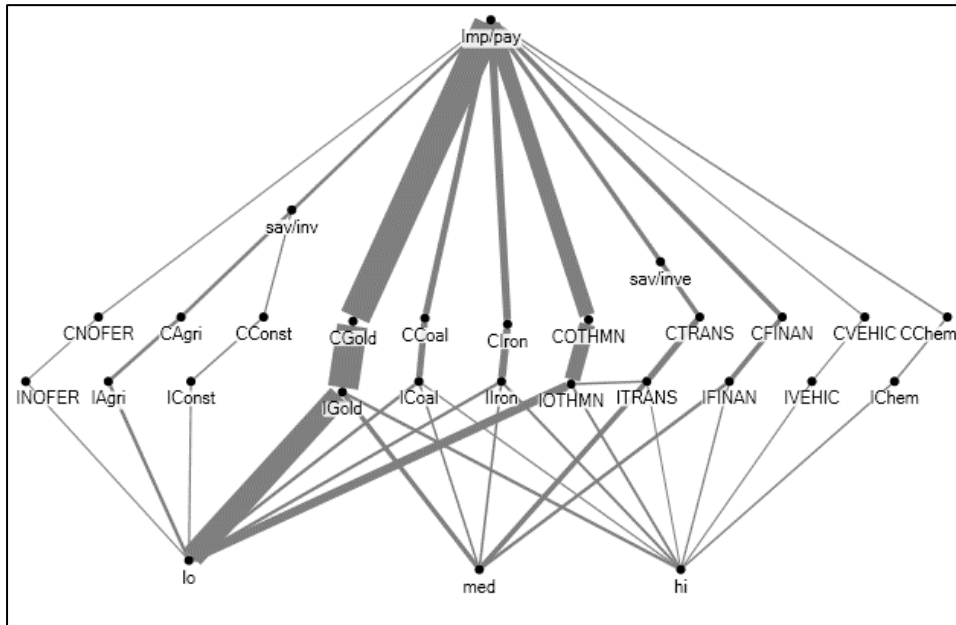


Figure 5.1. ¹² Paths from a shock in import payments: Channels through which the labour market has been affected by the financial crisis

Source: Author's calculations based on structural path analysis and NodeXL Excel 2007

Figure 5.1 exhibits various paths (in terms of TI/GI) of transmission through which a financial shock affects the lowly-skilled, medium-skilled and highly-skilled workers of South Africa. Based on the results obtained from the graph in Figure 5.1, it was confirmed that gold mining is the leading channel through which the effect of the financial shock is conveyed to the low-skilled workers. It was found that other mining industries, namely the iron and coal mining industries, were nearly as significant as channels of transmission to the lowly-skilled workers. This shows that the mining sector was the main channel of transmission of the influence during a financial crisis.

In addition, Figure 5.1 shows the influence of the agricultural and construction channels on lowly-skilled workers. The influence via agriculture was relatively significant through savings and investment and its effect was only transmitted to the lowly-skilled workers, leaving the medium- and highly-skilled groups unaffected. This is probably due to the fact that agriculture is among the main employers of low-skilled or unskilled labour in South Africa (Essers, 2013:13). Similarly, construction only acted as a transmission channel to the low-skilled workers, although its effect was less than that of agriculture. This may be a result of the loss of income that manual-paid workers in the construction industry received.

Like the agricultural and construction channels, the transport channel stems from the saving and investment path. The impact through the transport channel is, however, transmitted to all three groups of workers in South Africa. It is striking that the transport industry indirectly influenced the low-income group via the mining sector. Concerning this channel, Figure 5.1 indicates that the medium-skilled group was more affected by the transport sector than the low- and highly-skilled groups. The finance path also proved to be nearly as significant as a channel transmitting the impact of the financial shock to medium and high-skilled groups only. Figure 5.1 also illustrates that chemical, vehicle and basic iron and steel are less significant channels. The basic iron and steel channel affected the lowly-skilled, whilst the chemical and vehicle sectors transmitted to the highly-skilled groups. All the channels indicated in the figure above, show that the impact on lowly-skilled workers was more than the impact on the medium and highly-skilled workers. To closely analyse this finding, Figure 5.2 illustrates the impact of the financial shock originating from import payments to lowly-skilled workers in South Africa.

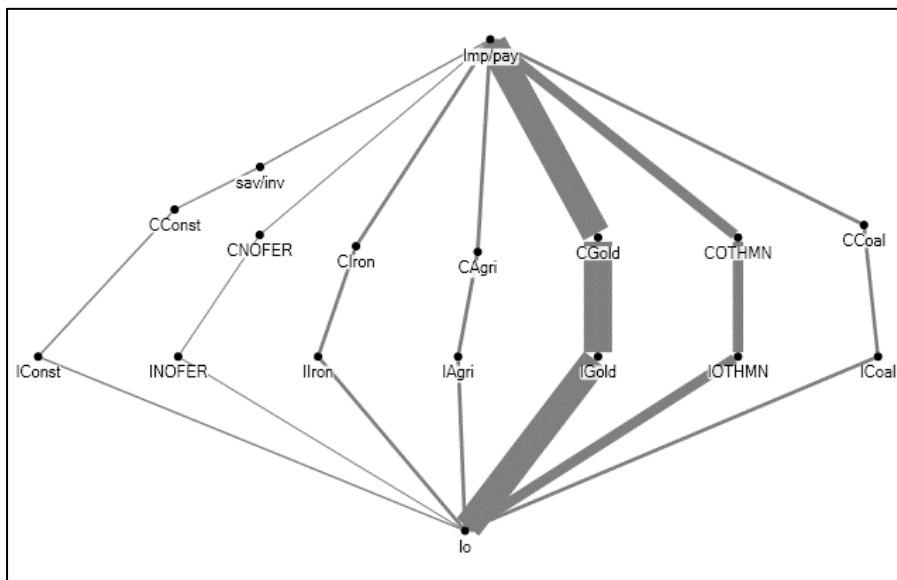


Figure 5.2¹² Channels through which import payments influence the low-skilled workers

Source: Author's calculations based on structural path analysis and NodeXL Excel 2007

The above diagram (Figure 5.2) shows the seven important channels through which the low-skilled workers were affected by the financial crisis. Among these channels, gold mining and other mining industries proved to be the channels with greater influence. On the other hand, coal, iron, construction, agriculture and basic iron and steel were also transmitting channels, although their influence was less when compared to gold and other mining. It is also interesting that the impact on savings and investments influenced the workers through the construction sector. However, when compared to all other channels of transmission, the basic iron and steel as well as construction sectors affected the low-

¹² The prefixes I and C denotes production activity and domestic commodities respectively. NOFER = Basic iron and steel, Agri = Agriculture, Const. = Construction, Gold = Gold mining, OTHMN = Other mining, Coal = Coal mining, sav/in v= savings and investments, Imp/pay = Import payments, lo = low-skilled workers

skilled workers to the lesser extent. One of the reasons why the impact through the construction sector was less, is probably due to the heavy investments made for the 2010 FIFA World Cup (Ngandu *et al.*, 2010:11).

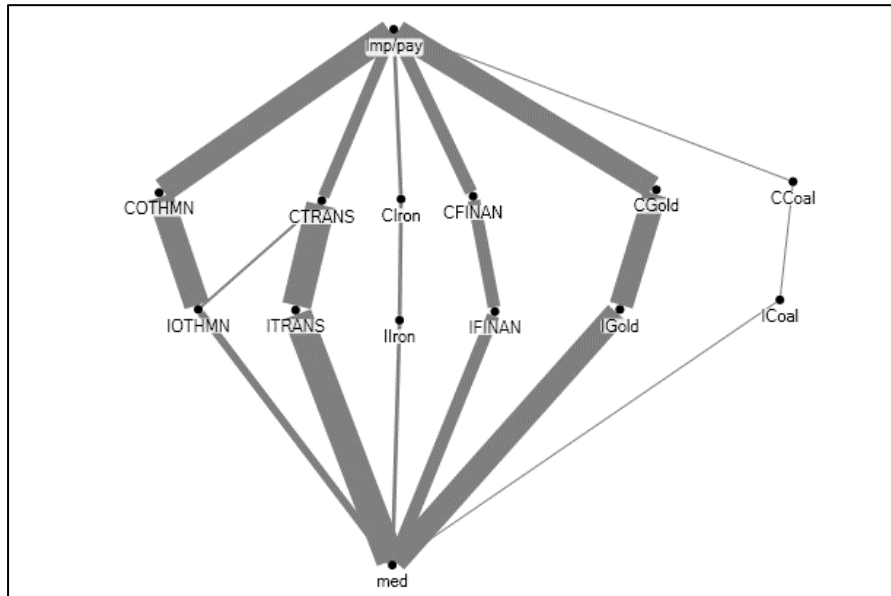


Figure 5.3¹⁵ Channels through which the middle-skilled is affected by the financial crisis

Source: Author's calculations based on structural path analysis and NodeXL Excel 2007

Whereas Figure 5.2 illustrates the influence of the financial shock on low-skilled workers, Figure 5.3 above graphically represents the transmission channels of the effects of the financial crisis to the middle-skilled workers in South Africa. In this case, the gold and transport sectors are the channels through which the middle-skilled group was mostly affected. Unlike the indication of the influence for low-skilled workers, the transport channel is now thicker, therefore the transmission of the impact of the financial shock to the medium-skilled employees is more significant. Other significant channels illustrated by Figure 5.3 are finance and other mining. It is also interesting to note that finance is one of the most influential channels, yet this was not case for the low-skilled workers. In the light of finance being more active in transmitting the influence of the financial shock to the medium-skilled workers, limited funds was one of the spill-over effects of the financial crisis. With limited funds, businesses fail to expand or start new businesses and this leads to less production, high unemployment and even retrenchments. This is in line with the findings of Nelson *et al.* (2012). In addition, Figure 5.3 reveals coal and iron mining as less significant transmission channels of the financial shock to the medium-skilled.

Following the analysis of low and medium-skilled workers, Figure 5.4 illustrates the transmission channels of the financial shock to the high-skilled workers of South Africa. The transmission to highly-skilled

¹⁵ The prefixes I and C denotes production activity and domestic commodities respectively. Gold = Gold mining, OTHMN = Other mining, Coal = Coal mining, Iron = Iron mining, FINAN = Finance, TRANS = Transport, Imp/pay = Import payments, med = medium-skilled workers.

labour in Figure 5.4 is more channels are significant than the transmission to low- and medium-skilled labour. Among these channels of transmission, gold, iron and other mining are the most influential channels to highly-skilled workers. It is also interesting to note that the chemical and financial channels had a greater impact on highly-skilled labour when compared to the other two groups. However, in all four illustrations (Figure 5.1, 5.2, 5.3 and 5.4) gold mining was the most powerful transition channel. Since this study aims at identifying transmission channels of the financial crisis to household income distribution in South Africa, the following section (Section 5.3) will discuss the results of SPA on households of South Africa.

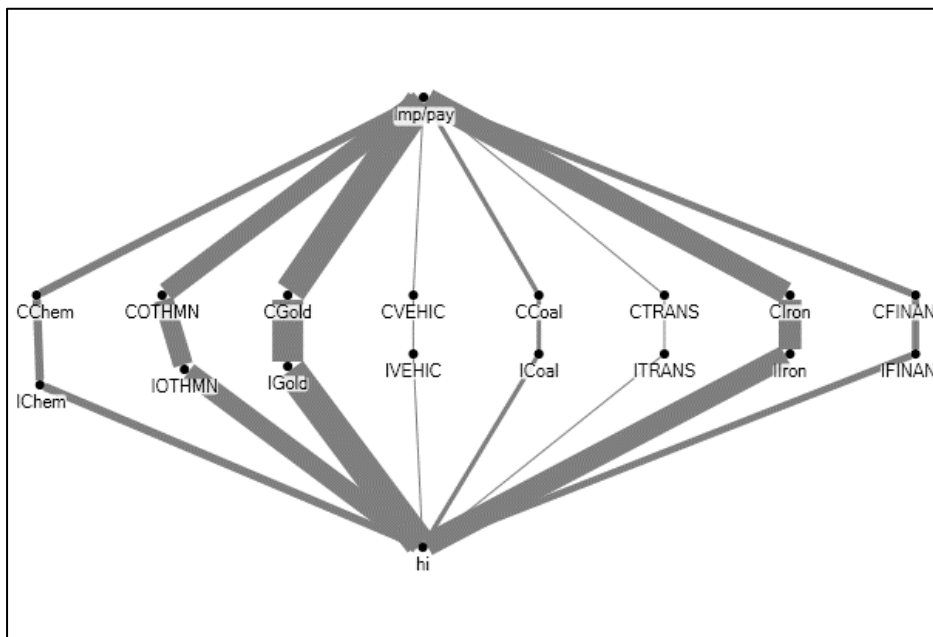


Figure 5.4¹⁴ Channels to highly-skilled labour

Source: Author's calculations based on structural path analysis and NodeXL Excel 2007

5.3 Channels transmitting the influence of the financial shock to households

The results in Table 5.4 show the effect of the financial shock on the households of South Africa. Three groups of households were identified, namely low-income (d3), middle-income (d6) and high-income (d924). Here the aim is to determine the transition paths of the financial shock from import payments to the aforementioned household categories. Case I in Table 5.4 shows that the low-income households were mainly affected by a decrease in demand for workers in the mining and agricultural sectors. The major indirect impact was felt via the gold and other mining industries, while the impact is lesser through capital and firms. Table 5.4 also indicates the agricultural and coal and iron sectors as significant channels

¹⁴ The prefixes I and C denotes production activity and domestic commodities respectively. Gold = Gold mining, OTHMN = Other mining, Coal = Coal mining, Iron = Iron mining, FINAN = Finance, TRANS = Transport, VEH = Vehicle, Chem. = Chemicals, Imp/pay = Import payments, hi = highly-skilled workers.

influencing low-income households. For all these channels, the influence to the low-income households is caused by lowly-skilled workers.

Table 5.415 Structural path analysis: Selected households

Case	Origin	Destination	Global Infl.	Path	Direct Infl.	Path Multiplier	Total Influence	Prop.	Accum. Prop.
I	Imp/payments	d3	0.05	Imp/payments→CGold→IGold→lo→d3	0.0022	2.71	0.0061	11.5	11.5
				Imp/payments→COTHMN→IOTHMN→lo→d3	0.0008	2.79	0.0023	4.2	15.7
				Imp/payments→CAgri→IAgri→lo→d3	0.0003	3.02	0.0008	1.5	17.2
				Imp/payments→CCoal→ICoal→lo→d3	0.0003	2.74	0.0008	1.5	18.7
				Imp/payments→CIron→IIron→lo→d3	0.0003	2.96	0.0008	1.4	20.1
				Imp/payments→GOS→Firms→d3	0.0002	3.26	0.0008	1.4	21.5
				Imp/payments→COTHMN→IOTHMN→GOS→Firms→d3	0.0002	3.33	0.0006	1.1	22.6
				Imp/payments→d3	0.0001	2.36	0.0003	0.5	23.1
				II	Imp/payments	d6	0.16	Imp/payments→CGold→IGold→lo→d6	0.0047
Imp/payments→COTHMN→IOTHMN→lo→d6	0.0017	2.86	0.0049					3	11.1
Imp/payments→GOS→Firms→d6	0.0009	3.32	0.003					1.8	12.9
Imp/payments→COTHMN→IOTHMN→GOS→Firms→d6	0.0007	3.4	0.0023					1.5	14.4
Imp/payments→CGold→IGold→GOS→Firms→d6	0.0006	3.33	0.0018					1.1	15.5
Imp/payments→CAgri→IAgri→lo→d6	0.0006	3.09	0.0018					1.1	16.6
Imp/payments→CCoal→ICoal→lo→d6	0.0006	2.82	0.0017					1	17.6
Imp/payments→CGold→IGold→med→d6	0.0006	2.9	0.0017					1	18.6
Imp/payments→CIron→IIron→lo→d6	0.0005	3.04	0.0016					1	19.6
Imp/payments→d6	0.0001	2.45	0.0002					0.1	19.7
III	Imp/payments	d924	0.3					Imp/payments→GOS→Firms→d924	0.0055
				Imp/payments→COTHMN→IOTHMN→GOS→Firms→d924	0.0043	3.34	0.0144	4.8	10.9
				Imp/payments→CGold→IGold→GOS→Firms→d924	0.0034	3.28	0.0113	3.8	14.7
				Imp/payments→CAgri→IAgri→GOS→Firms→d924	0.0019	3.63	0.0069	2.3	17
				Imp/payments→CCoal→ICoal→GOS→Firms→d924	0.002	3.31	0.0067	2.3	19.3
				Imp/payments→CNOFER→INOFER→GOS→Firms→d924	0.0013	4.11	0.0054	1.8	21.1
				Imp/payments→CFINAN→IFINAN→GOS→Firms→d924	0.001	4.51	0.0043	1.5	22.6
				Imp/payments→COTHMN→IOTHMN→GOS→Firms→d924	0.0013	3.34	0.0043	1.5	24.1
				Imp/payments→CTRANS→ITRANS→GOS→Firms→d924	0.0012	3.47	0.0041	1.4	25.5
				Imp/payments→CGold→IGold→lo→d924	0.0012	2.95	0.0036	1.2	26.7
				Imp/payments→CIron→IIron→GOS→Firms→d924	0.0009	3.54	0.0032	1.1	27.8
				Imp/payments→CHotel→IHotel→GOS→Firms→d924	0.001	3.32	0.0032	1.1	28.9
				Imp/payments→d924	0	2.57	0	0	28.9

Source: Author's calculations based on structural path analysis

¹⁵ The prefixes I and C denotes production activity and domestic commodities respectively. Imp/payments = import payments, Dest. = destination, Global infl. = Global influence, Direct infl. = Direct influence, Path mult. = Path multiplier, Total infl. = Total influence, Prop= Proportion, Accum. Prop = Accumulated Proportion, Agri = Agriculture, OTHMN = Other mining, TRANS = Transport, FINAN = Finance, GOS = Capital, INOFER = Basic iron and steel, lo = low-skilled, med = medium-skilled, hi = highly-skilled, d3 = low-income households, d6 = middle-income households, d924 = high-income households.

In the case of the middle-income households of South Africa, the gold and other mining industries are the most influential channels (Case II in Table 5.4). Gold mining, in particular, proved to be the dominant channel indirectly transmitting the financial shock to middle-income households. This is also evident from the fact that the gold channel appeared three times, followed by other mining that appeared two times (Case II in Table 5.4). Unlike in Case I, the global influence is higher at 0.16. Furthermore, the impact of the shock via capital and firms is much higher than in the case of low-income households. This is clear because firms appeared three times in the channels in Case II. The transmission through the lowly-skilled labour is also dominant even in middle-income households. The direct influence of the financial crisis to the middle-income households is very little when compared to other indirect channels.

Considering the high-income households, more influential channels are presented than for the low- and middle-income households (Case III in Table 5.4). Unlike low- and middle-income households, the most influential channels to high-income households are capital and firms. This entails that the high-income households were most affected by the financial crisis through the drop in investments. Similar to other households, gold mining was confirmed to be the most influential channel of transmission. Other mining also proved to be a significant channel transmitting the shock to high-income households in South Africa. Moreover, the basic iron and steel, finance, transport and hotel channels influenced only the high-income households as indicated in Table 5.4. The direct channel from import payments to high-income households, on the other hand, also transmitted the least impact just like in other households. From the results shown in Table 5.4, the low-income households were hardest-hit by the financial crisis with a proportion of 11.5 per cent of GI. The influence on the middle income households at 8.1 per cent of the GI was nearly as invasive. The high-income households were less affected by the financial shock. Figure 5.5 illustrates the relationships contained in Table 5.4.

In consensus with Table 5.4, Figure 5.5 reveals that gold mining is the dominant channel of transmission to low-, middle- and high-income households. This influence through gold mining was more severe towards low-income and middle income respectively. The impact on high-income households was less when compared to the other two groups of households. Unlike in the case of low and middle-income households in which the influence of the gold mining industry occurred through lowly- and medium-skilled labour, the high-income households were affected through capital. This may mean that the financial shock to the low- and middle-income households affected mainly employment, whilst the high-income households were affected through investments. In addition, Figure 5.5 shows that other mining proved to be the second highest channel transmitting the impact of the financial shock to South African households. This channel transmitted almost the same influence to all three groups of households. However, the difference is that the influence to low and middle-income households was through the lowly-skilled labour, whilst the influence to the high-income households was through capital and firms.

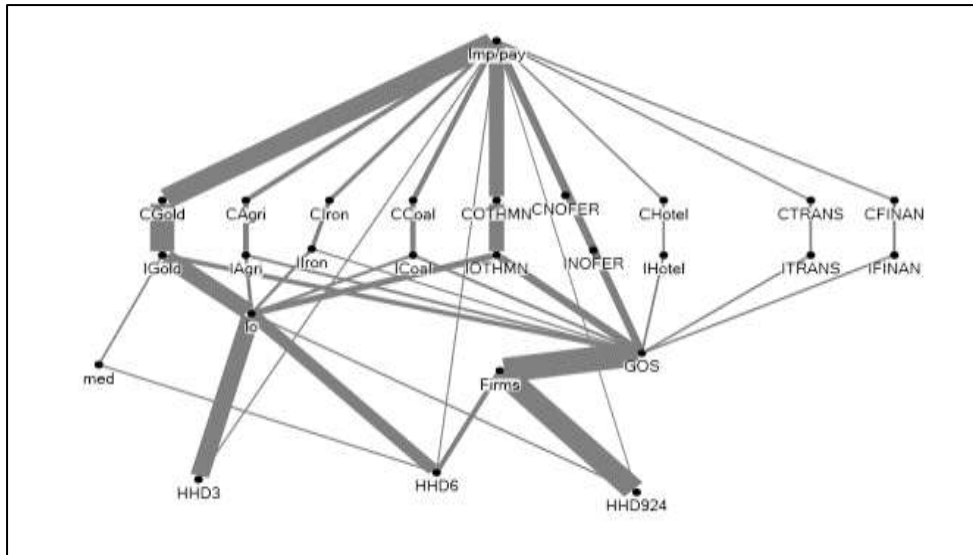


Figure 5.5¹⁶ Channels to households in South Africa

Source: Author's calculations based on structural path analysis and NodeXL Excel 2007

The transmission to the basic iron and steel sector is close to that of other mining, but this channel only affected the high-income households through capital and firms. Other significant channels illustrated in Figure 5.5 are agriculture, coal and iron. The impact of these channels is more on the low- and middle-income households than on high-income households. In the case of the hotel, finance and transport channels, the impact is less when compared to the other channels and the impact is only to the high-income households. Figure 5.5 also show that the direct influence of the financial crisis from import payments to the three household groups was not significant. The impact of the financial shock on low-income households (Figure 5.6), middle-income households (Figure 5.7) and high-income households (Figure 5.8) respectively will now be analysed.

Figure 5.6 below illustrates seven channels through which the financial crisis affected the low-income households of South Africa. Again, gold and other mining were the sectors that were predominant in transmitting the effect of the crisis to the low-income households. The agriculture, coal and iron sectors were also significant channels of transmission. In light of the fact that mining and agricultural sectors were the main channels of transmission during the crisis, Figure 5.6 shows that the lowly-skilled workers received the impact from all these sectors. The illustration also proves that the greater portion of the influence of the financial crisis that affected the low-income households of South Africa was indirect rather than direct.

¹⁶ The prefixes I and C denotes production activity and domestic commodities respectively. Imp/payments = import payments, Agri = Agriculture, OTHMN = Other mining, TRANS = Transport, FINAN = Finance, GOS = Capital, INOFER = Basic iron and steel, lo = low-skilled, med = medium-skilled, hi = highly-skilled, HHD3 = low-income households, HHD6 = middle-income households, HHD924 = high-income households.

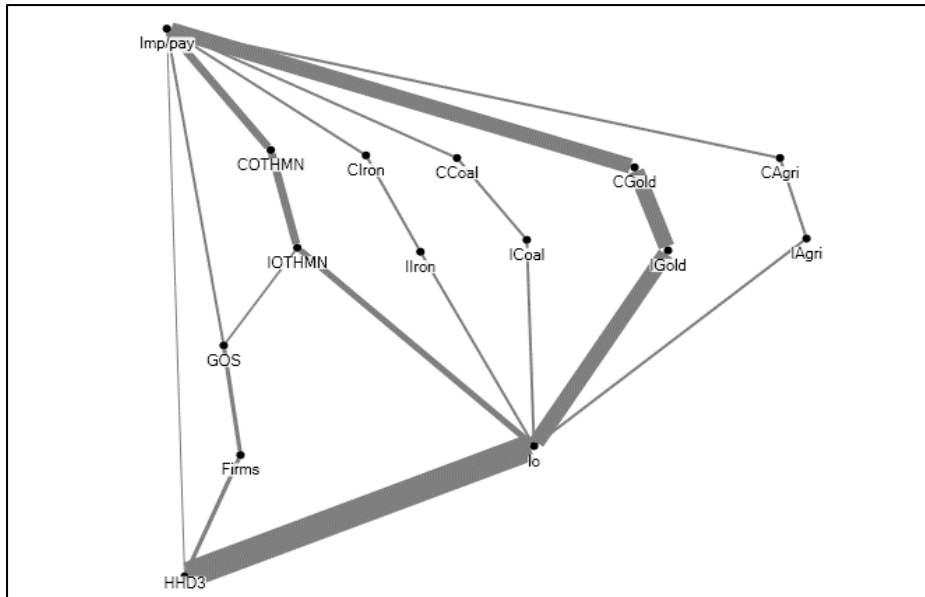


Figure 5.6¹⁷ Channels to low-income households

Source: Author's calculations based on structural path analysis and NodeXL Excel 2007

Similarly, Figure 5.7 reveals gold and other mining as the main paths of transmission to the middle-income households.

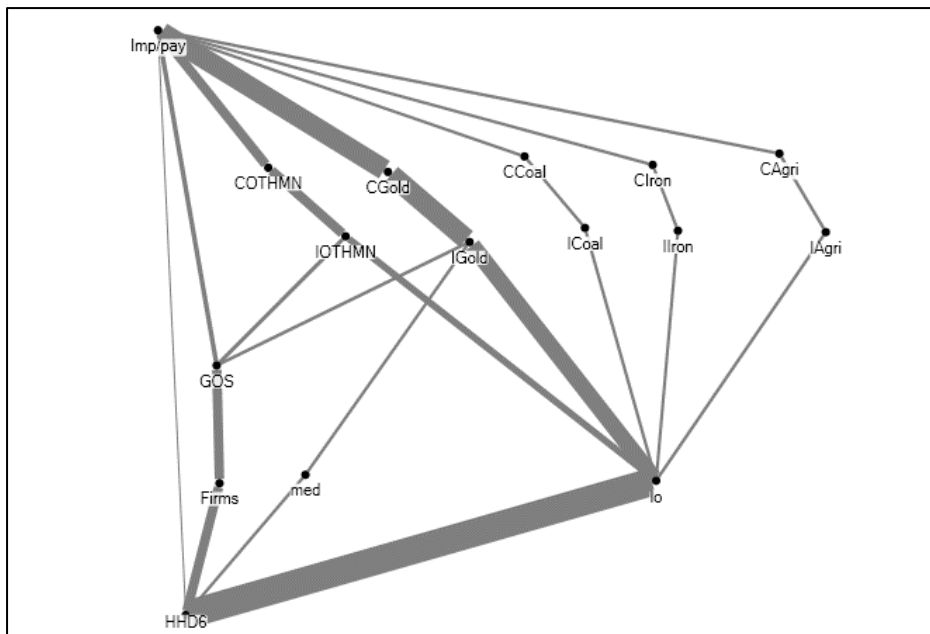


Figure 5.7¹⁸ Channels to middle-income household

Source: Author's calculations based on structural path analysis and NodeXL Excel 2007

¹⁷ The prefixes I and C denotes production activity and domestic commodities respectively. Imp/payments = import payments, Agri = Agriculture, OTHMN = Other mining, GOS = Capital, Iron = Iron mining, Coal = Coal mining, lo = low-skilled workers, HHD3 = low-income households.

¹⁸ The prefixes I and C denotes production activity and domestic commodities respectively. Imp/payments = import payments, Agri = Agriculture, OTHMN = Other mining, GOS = Capital, Iron= Iron mining, Coal = Coal mining, lo = low-skilled workers, med = medium-skilled workers, HHD6 = middle-income households.

However, the capital and firms channels have more impact on the middle-income households than on the low-income households. It is also interesting to note that the greater impact is on the low-skilled workers, whilst the impact on the medium-skilled workers was less. As in Figure 5.6, much of the impact transmitted was indirect and less direct. The direct influence is due to the loss of remittances by the households whose members are working abroad.

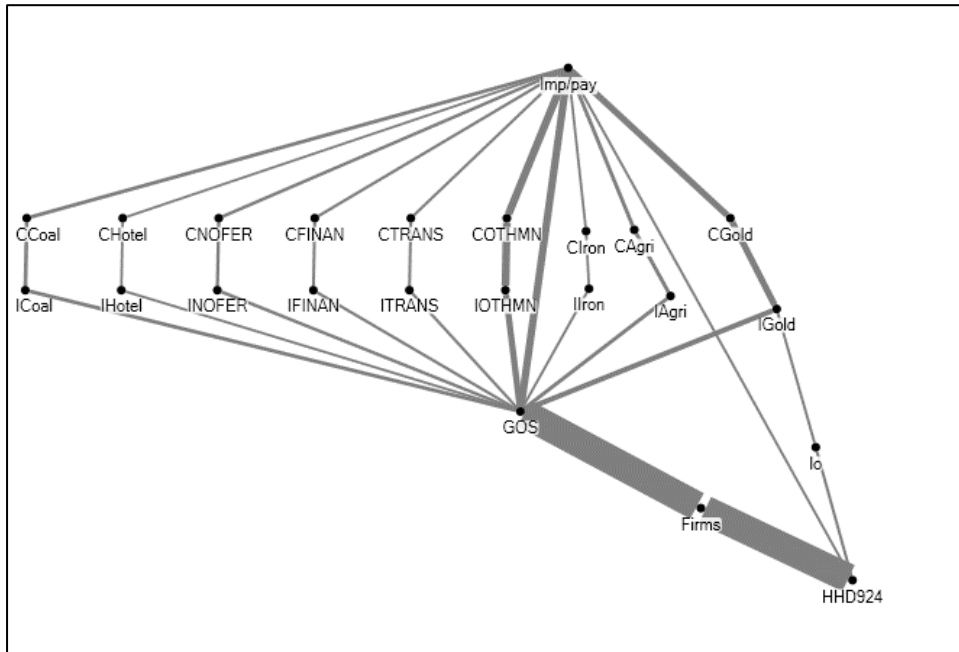


Figure 5.8¹⁹ Channels to high-income households of South Africa

Source: Author's calculations based on structural path analysis and NodeXL Excel 2007

5.4 Summary

As mentioned before, the goal of this dissertation is to determine the transition channels through which a financial shock influences income distribution in South Africa. In achieving this aim, this chapter focused on analysing the SPA results on the impact of the financial crisis to the South African economy. This was done by analysing the influence on the agriculture, coal, gold, food and other mining sectors that was transmitted by the impact of the 2008-09 financial crisis. The results indicated that gold mining in South Africa received most of the impact during the crisis. The impact on the other mining sector is close to the impact on the gold sector. On the basis of these findings, it can be concluded that the mining industry played a significant role in transmitting the impact of the financial shock to the South African economy.

¹⁹ The prefixes I and C denotes production activity and domestic commodities respectively. Imp/payments = import payments, Agri = Agriculture, OTHMN = Other mining, TRANS = Transport, FINAN = Finance, GOS = Capital, INOFER = Basic iron and steel, lo = low-skilled workers, HHD924 = high-income households

The financial crisis initially led to a decline in the demand for commodities (Section 5.2.2), then the production activity (Section 5.2.1) also decreased. The impact then spilled over to the labour market, mainly to the lowly-skilled workers (Section 5.2.3). However, the degree of influence differs across the different groups of workers and in most cases, the lowly-skilled workers were mostly affected. Owing to this finding, the impact on the construction sector, was only on the lowly-skilled worker of South Africa. This is probably due to the loss of jobs as lowly-skilled employees in the construction sector. However, this impact was less, probably because of the heavy investment towards the 2010 FIFA world cup. The impact on the transport sector was more severe for the medium-skilled labour when compared to the lowly- and highly-skilled workers. Concerning high-skilled labour, the transmission channels had a significant impact on the finance and chemical sectors. This is probably because most of the high-skilled workers are within the service industry.

After the financial crisis had impacted the production and employment in South Africa, the influence then spilled over to the households' income (Section 5.3). The impact of the financial crisis on the households of South Africa was mostly indirect and less direct. The direct influence is due to the loss of remittances by the households whose members are working abroad. Both the low- and middle-income households suffered mainly because of a loss of income from by the low-skilled workers. However, this impact to the lowly-skilled workers had very little influence on the high-income households. Furthermore, there were more channels of transmission to the high-income households when compared to the other households. Transmission to capital and firms was severe in the case of high-income households. It can be concluded that the high-income households were more affected on their investments.

Based on the findings of this chapter, it has been shown that the financial shock influences the low-income households of South Africa to a greater extent through the loss of wages and salaries in the mining sector (especially gold mining). Other significant transmission channels influencing the low-income households are agriculture and construction; though with lesser impact. In the case of middle-income households in South Africa, the transmission channel also had a dominant effect on employment. In addition, the finance and transport sectors proved to be significant channels of a financial shock to the middle-income households of South Africa. However, the transition channels of the financial shock to high-income households were mainly through capital and firms.

Chapter 6: Conclusion and recommendations

6.1 Overview of study

The transposal of financial shock to household income distribution is evaluated for the local economy of South Africa. For the purpose of countering the main shortcomings of the basic SAM-based approach, a general equilibrium framework inaugurated on a financial sector-augmented SAM seemed appropriate to obtain results in this study. By incorporating the real and the financial sector, the model may congregate understandable interconnections among variables, answering some of the arbitrary hypotheses. The aim of this study, therefore, was to identify the transition channels or networks through which a financial shock influence household income distribution in South Africa. The 2008-09 GFC that was stimulated by the disintegration of the Subprime Mortgage Market in the US was considered. The origin of the European financial crisis is also linked to the US housing 'bubble' that fuelled the debt crisis in the Euro zone area. The financial shock had a global effect as banks around the globe started to limit the availability of credit in perception of a decline in financial market confidence and high risks of defaults. The consequences of the financial crises did not spare South Africa. The country went into recession after 17 years. There was a decline in growth, manufacturing activity and the demand for mining products. Financial crises tend to generate a particular pattern of income distribution. It is generally assumed that currency devaluation as well as high interest rates in the times of a crisis favour the high-income households and individuals. In some circumstances, however, this may not always be true. For instance, if the same group of households have invested in sectors that rely much on imports, they can also be negatively affected. In the case of South Africa, the impact of the financial crisis on income distribution varies among households.

In this dissertation, the primary objectives were, firstly to analyse the transition of a financial shock from the financial sector to the real sector and in doing so the primary paths or networks of transition to households was determined. Secondly, the objective was to provide policy makers with a deeper understanding of the effect of a financial shock within the current economic structure. Finally, the aim was to make relevant policy proposals regarding the implementation of ways to counter the aggregate effects of a financial shock. To achieve the aforementioned objectives, this study empirically dissected the economy-wide impact of a shock by means of a SAM multiplier model approach. By using a general equilibrium approach for this investigation, the standard inverse matrix calculated from a SAM was used to estimate the impact of a financial crisis on income of internal accounts. Furthermore, the SAM multiplier analysis identifies the direct and indirect effects of a shock. However, the multiplier decomposition failed to identify the network of paths through which an injection is conveyed. To determine these primary transition paths, this study adopted the SPA method. Since there are limitations in using the SAM multipliers and SPA method (mentioned in Chapter 1 Section 1.2), this study countered

these limitations in that it amplified the basic SAM by integrating a relatively comprehensive financial sector established from the flow of funds data. This allows financial variables to be the original source of the shock. The shocks evaluated in analysing the transition to the household income distribution of South Africa refer to the GFC and the Eurozone financial crisis. Thus, this study analyses the total change in flow-of-funds between year 2006 and year 2009.

The methods used comprised of both literature and empirical studies. The literature study presented an overview of the relevant financial and economic crises and their effect on the South African economy. In addition, the literature review focused on crucial knowledge concerning the general equilibrium theories and how this has contributed to the development of quantitative assessment tools. The empirical study used the SPA and SAM data to examine the transmission of a financial crisis induced shock to the economy of South Africa.

The first chapter (Chapter 1) is an introduction to the study in that it provided an overview of the influence of the GFC and European financial crisis on the real sector of South Africa, as well as the problem statement, objectives, motivation, research methods and chapter outline. In Chapter 2, the literature study presented an overview of the 2008-09 global financial crisis, the on-going European crisis and the spill-over effects of these events on the South African economy. Apart from this, this chapter also provided a literature review on the previous studies conducted on the economy-wide impacts of financial shocks. Chapter 3 gave an overview of the economic theories of general equilibrium and its application to the financial sector in an economy. The economic theories of general equilibrium which were reviewed, include the Neo-Walrasian and the Neo-classical theory.

In Chapter 4, the data and the SAM, multiplier analysis and SPA methods used for the economy-wide impact analysis were discussed. Chapter 4 also presented the characteristics of the South African SAM as well as describing how the flow-of-funds matrix that is used to expand the financial sector in the SAM is built. Chapter 5 presented the results from the analysis and summarised the effects of the financial shock on the South African economy. A summary of the dissertation's key findings, policy recommendations and recommendations for future research are discussed in the present chapter.

6.2 Main findings

Chapter 2 has focused on the specification of the financial shocks, which in this study are the 2008-09 GFC and the on-going Eurozone debt crisis. The origin of these crises is linked to the US housing 'bubble' that fuelled the debt crisis in the Eurozone area. These financial crises effects have spilled over to the world economies, including the developing and emerging economies. In terms of transition channels, previous studies have identified borrower balance sheet, bank balance sheet and liquidity as the main channels of transmission of a financial shock between the financial economy and the real economy. In

this regard, literature has identified financial linkages and trade linkages as some of the main transmission channels of the financial shock to households in developing countries as well as in emerging countries. In addition, the literature also indicated export decline as one of the common transmitted impacts of the financial crisis among the emerging as well as the developing economies.

In South Africa the literature revealed that the recession in the country was triggered by a decrease in economic growth, manufacturing products and a sharp decline in the demand for mining products. The relatively higher lending rates and the uncertainty within the global financial markets may have led to the slowdown in real economic activity in South Africa. The effect of the financial shock on the real economy of South Africa was also noticeable in the high loss of jobs as well as business terminations, specifically in the manufacturing and mining industries. Furthermore, the literature has evidence of net directional spill-overs for South Africa, the US, China, Japan and the Eurozone. According to this review, the literature has revealed that South Africa has been the main recipient of spill-overs, especially from the beginning of the 2008-09 financial crisis. The literature on international spill-over channels pointed out that capital linkages and trade linkages are dominant in conveying the effects of the financial shock to the local economy of South Africa.

From the literature on analysing the aggregate influence of a financial crisis, it has been shown that general equilibrium models are preferred most. One of the reasons that favour the general equilibrium framework for the specific type of study is that it allows the capturing of the direct along with indirect effects of the financial shock. Chapter 3 gave a summary of the relationship between the general equilibrium theory and the financial sector. The different economic theories which include Walras, Marshall, Pareto, Cobb Douglas, Ricardo and Arrow have different views on the link between the financial economy and the general equilibrium theory. However, from these theories, it has been noted that the interconnections between the financial sector and the economy can be understood better through the general equilibrium theory.

This relationship between the real economy and the financial economy can be explained by the income flow from the household sector to financial markets in the circular flow of income and output. At the same time, savings flow to financial markets as leakages from the household sector. Based on this explanation, shocks in the financial sector may influence the household income distribution. From this literature study, it has been revealed that, in theory, the world has become more connected through trade, financial and goods market and other factors. This integration in markets and theory entails that global events, such as a financial crisis have impacted not only the country in which they originated, but also the rest of the world. Previous studies have acknowledged that global events such as a financial crisis, impact countries through various channels and networks. As discussed in Chapter 3 (Section 3.5), literature have identified the working capital, intangibles and the firm entry and exit as channels of financial shocks from the macro perspective. In similar literature, the bank balance sheet, the borrower balance sheet and the

liquidity channels were prevalent in transmitting the influence of the financial shocks between the real and the financial sector (Section 3.6). For South Africa the literature indicated capital linkages and trade linkages as the main transmission channels (Chapter 2).

The literature review in Chapter 3 has also indicated that the application of the general equilibrium approach was limited by the unavailability of data as well computational means in previous times. At present, however, the availability of wide-potentiality computer technology has enabled the implementation of the general equilibrium models.

Chapter 4 provided an overview of the SAM, SPA and multiplier analysis used as research methods in this study. From the literature review in Chapter 4, it has been highlighted that, when determining the impact of a financial or an exogenous shock on the total income of households, SAM multipliers are better than the IO model. In effect, IO multipliers only determine the inter-industrial effects, even though these will reproduce some income effects in so far as changes in outputs directly and indirectly affect incomes. However, SAM-based multipliers account not only for the direct and indirect effects, but also for the induced effects on factor and household incomes and activity outputs.

There are strong motivations for using the SAM-based models in studying the spill-over effects of the financial shocks to the South African economy. South Africa is a dynamic country and has experienced social, political and economic developments since 1994. The country has also adopted several strategies and policies aimed at improving the lives of its citizens. In evaluating the effectiveness of these policies and systems, the SAM has proved to be one of the more useful measuring tools. In addition, the SAM shows the economic relationship between sectors of the economy by identifying the monetary transactions (expenditure and receipts) between sectors. At the same time, the use of this tool allows a study of the vital issues that are of particular interest to the country. The SAM, for example, allows an analysis of inter-relationships between structural features of an economy and the distribution of income and expenditure among different households. According to the literature reviewed in Chapter 4, this feature of the SAM makes it appropriate to use in this study. Moreover, the way the SAM is constructed provides a detailed presentation of the South African economy.

From the literature review in Chapter 4, it was evident that by combining the flow of funds and SAM firstly, the aforementioned limitations of the standard SAM-based approach (as discussed in Chapter 1) can be countered. Secondly, this provides details of real and financial transactions as well as flows recorded between the economic agents. Thirdly, the addition of financial transactions to the SAM allows researchers to simulate the influence of the financial shock on the economic aggregate of South Africa. Finally, this allows the financial variables to be the original source of the shock.

In addition, the literature review in Chapter 4 (Section 4.5) acknowledged that the SPA method further disclosed the transmission mechanism of the interactions among accounts. The SPA particularly aims at determining how respective components attribute to the GI that we obtain from conventional SAM based multipliers by tracking the transmission of influence within an economic set-up. By so doing, the networks or paths through which structural interconnections in an economy are indicated lead to ultimate effects on internal variables. The SPA reveals the traits of an economy that are not evident from an analysis of either direct transactions between accounts or an examination of the global influence. The literature review has identified two key objectives of the SPA. Firstly, it identifies the most prominent interconnections or networks within an economic structure. Secondly, the SPA identifies specific poles (sectors, factors or households) that are most prevalent in the transmission of the economic influence. The literature also stated that the SPA is intended to portray a more comprehensive view of the effects of shocks to exogenous accounts. SAM multipliers measure the aggregate effects from a shock, whilst the SPA not only decomposes these multipliers into direct and indirect components, but it also reveals the network of transmission channels. Thus, the SPA decomposition is essential in coming to grips with the nature and strength of the linkages that work through the economic sector.

Using the SAM data, multiplier analysis and SPA, Chapter 5 modelled the propagation of a financial shock to household income distribution in South Africa. This helped to determine the transition networks or channels through which a financial shock influences the household income distribution in South Africa. In the findings of this study, the mining sector (mainly gold) of South Africa played a major role in the transition of a financial shock to the households' income in South Africa. It was evident from the results that the low-income households were more vulnerable because of their high dependence on lowly-skilled jobs in the mining industry. The influence was severe on low-income households since the mining industry is one of the major employers in South Africa. Similarly, employment was also a significant sector that was influenced by the financial shock to the middle-income households of South Africa. Apart from employment, the finance and transport sectors proved to be significant channels transmitting the impact of the financial crisis to middle-income households. However, in the case of high-income households, capital and firms were instrumental in transmitting the impact of the shock.

To provide the reader with a better understanding, Table 6.1 below provides a summary on the research question and the primary objectives of this study and how they were achieved.

Table 6.1 Summary of research objectives

	Research question	How it was achieved
1.	Through which transition networks or channels does a financial shock influence household income distribution using the case of South Africa?	From the SPA results analysed in Chapter 5, this study identified the mining sector (especially gold mining) to be the dominant channel in transmitting the impact of the financial shock to the household income distribution in South Africa. The loss of employment had a major influence on low-income and middle-income households respectively. The transition to the middle-income households was also significant through the transport and finance sectors. In the case of high-income households most of the transmission happened through capital and firm linkages. This shows that the transmission is more indirect, operating through meso-level economics and social-political structures. Thus, a lower availability of credit and an increase in unemployment and under-employment are the most influential effects influencing the household income distribution of households in South Africa.
	Primary research objectives	
1.	Analyse the transmission of a financial shock from the financial sector to the real sector and in doing so identify the principal paths or networks of transmission to households.	A complete overview of the impact of the GFC and the European financial crises on the real sector of the South African economy was provided in Chapter 2. This includes the analysis of the financial shock and its entry-point into the economy of South Africa. In addition, Chapter 3 and Chapter 4 gave an overview of the CGE, SAM data, multiplier analysis and SPA methods that were used for this analysis. According to the literature review this indicated the transmission channels from the financial to the real sector. In Chapter 5 this knowledge was useful in identifying the transmission channels of a financial shock to the household income distribution in South Africa.
2.	Provide policy makers with a deeper understanding of the effects of a financial shock within the current economic structure.	Based on the literature review in Chapter 2 and Chapter 3, the impact of the financial shock on South Africa was provided. These include the linkages through which these spill-over effects manifested themselves. A better picture of the impact of the financial shock is revealed in Chapter 5 where the results of the analysis are presented. In Chapter 5 the results showed how a financial shock will lead to a decline in the income of households in South Africa.
3.	Make relevant policy proposals regarding the implementation of ways to counter the economy-wide impacts of a financial shock.	This is answered in the present chapter (Chapter 6, Section 6.3). In Section 6.3, ten policy recommendations are suggested in order to counter the impacts of the financial shock to the local economy.

Source: Author's calculations based on the findings of the research

6.3 Policy implications

From the literature discussed in Chapter 2, Chapter 3, Chapter 4 and the simulation of the results in Chapter 5, a number of insights can be drawn concerning the economic growth of South Africa since the 2008-09 financial crisis. As discussed in Chapter 2, the decrease in GDP confirmed that the country was in recession. This was in agreement with the decline in manufacturing activity and the drop in demand for the mining products. This may probably entail that South Africa's GDP is mostly defined by commodity exports and manufactured products. Furthermore, the literature review (Chapter 2) indicated that higher interest rates may have triggered the slowdown in real economic activity. Based on this finding, it can be concluded that the South African economy relies strongly on external funds to boost its economic growth. Though borrowing and exporting commodities can form part of the development policies (such as the National Development Plan) of the country, this may be insufficient in sustaining the economy during times of crises.

Based on this perspective, a wide range of changes to policy initiatives are required to stimulate economic growth and create employment during the times of a financial crisis. Since the findings of this study revealed the networks through which the households' income is influenced by a financial shock, this will help government policy makers to counter the effects of the crisis. The following are some of the recommendations that might help South Africa to sustain its economy during times of global slow-down.

- Based on the findings pertaining the income of households, the government of South Africa should identify ways to boost the income of households during a time of crisis. On the basis that the low-income households of South Africa were more vulnerable, the government can provide social funds to households with very little income.
- Government spending may promote production in the particular industries that are the main employers for low- and middle-income households.
- Considering that the mining sector was dominant in transmitting the impact of financial shock to households' income in South Africa, the government and stakeholders may explore and eliminate the affairs that limit the sector to contribute positively to the financial crisis. Reducing cost pressures on the mining sector can for instance keep the mines viable and thereby it can help to preserve employment for the citizens.
- In addition, the study also showed the vulnerability of lowly-skilled workers within the manufacturing industries. To counter this, the South African policy makers can consider to investigate significant pressures that limit the sustainability of manufacturing companies during the crisis.
- The results of this study also showed that capital and firms are main channels through which the financial shock is transmitted to the high-income households of South Africa. This knowledge

can assist investors and entrepreneurs to decide where to invest, source funds or start businesses in the time of crisis.

- On the macro-level of risk management, the policy makers of South Africa can create and maintain a flexible international trade system in both the developed and developing countries. As noted in the literature (Chapter 2, Section 2.6), trade openness in the emerging markets has proved to be helpful in buffering the impact of sudden stops on capital inflows. Trade opening should also contribute towards sustaining jobs in the trade sector as well as promoting competitive real exchange rates. This policy has been useful, for example in Vietnam.
- The South African policy makers can keep high international reserves obtained during times of economic boom for other times. These can therefore be used as a last of lender resort. This can help to buffer the impact on credit and to sustain economic policy credibility and hence contribute to cushioning the onset impact of the financial shock. It is remarkable to recognise that a liquidity injection during the financial shock may not guarantee output acceleration. Chile, for example, followed this policy recommendation, but suffered one of the largest drops in output in the LAC region.
- Furthermore, the South African policy makers may restructure the labour legislation of the country. Taking into consideration that loss of employment was one of the linkages impacting on the income of households, a more responsive labour market can be desirable to counter the consequences of the financial shock. The labour legislation may be designed to avoid strikes and attract the investment and skills needed. In this perspective, the massive strikes in the mining sector (such as the Marikana incident) could have fuelled the impact of the financial crisis to the households of South Africa.
- The South African financial system may have strong regulatory and supervisory structures in place. However, politically it may be difficult to implement adjusted measures and to achieve more equitable outcomes once the country is in crisis.
- Finally, there is also a need to study the approaches implemented by other countries in countering the impact of financial shocks on household income distribution to learn from their successes and failures.

6.4 Future research

The analytical framework produced in this study opens up a number of avenues for future research regarding the effects of financial crises on the economy of South Africa. Since this study focused only on the impact of the financial crises to the households' income in South Africa, a detailed study on the effect of a financial crisis on other South African financial sectors, e.g. bond market, foreign exchange market, can be performed. Furthermore, future studies can look at the possibility of including a greater number of countries in this analysis to ensure a more accurate representation of country-specific shocks. Further work could also focus on the transition to other African countries.

In addition, this study only considered the period since the GFC began up to the current time, further analyses can be done on the impact of the on-going Eurozone crisis on the South African economy. Since the SAM is available for South Africa, it might be valuable to perform a related study for the country at province level. This framework can, for example, be utilised to determine the impact of a financial shock on Gauteng or the North West province. Topics like the impact on oil price increase, changes in interest rates and monetary policies can also be analysed using the same framework.

Moreover, there are also various aspects in the current modelling effort that may be improved. Since the number of household categories is usually limited in the SAM-based CGE models, it is necessary to build an intra-group distribution for each of the household categories. If representative households are defined according to income alone, then many politically relevant dimensions are missed.

The limitations of the research include a lack in the availability of data. Due to the lack of data, it is often impossible to use the data sets without a certain amount of adjustment. The compilation of the SAM, for instance, requires a lot of data from different sources, in which the national accounts ought to be adjusted in some cases. Owing to this, the overall effect of a financial shock is difficult to determine and therefore future studies should address this shortcoming. Furthermore, the effectiveness of the SAM-based models depends mainly on whether the underlying assumptions are met. Yet there are circumstances in which these assumptions are not met. Based on this, future research should continue revising the assumptions, the parameters, the structure and all the details of SAM-based models.

7. Appendices

Appendix A: Detailed Structural path analysis results per industry

Table 7.1 Detailed Structural path analysis results

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
Imp/payments	I_AGRI	0.2965	Imp/payments / C_AGRI / I_AGRI	0.0327	2.6856	0.0879	29.6603
			Imp/payments / C_FOOD / I_FOOD / C_AGRI / I_AGRI	0.01	3.2021	0.032	10.8033
			Imp/payments / C_WOOD / I_WOOD / C_AGRI / I_AGRI	0.0011	3.1233	0.0034	1.1548
Imp/payments	I_COAL	0.1635	Imp/payments / C_COAL / I_COAL	0.0438	2.3573	0.1032	63.1138
			Imp/payments / C_IRON / I_IRON / C_COAL / I_COAL	0.0029	2.598	0.0074	4.5341
			Imp/payments / C_GOLD / I_GOLD / C_ELEGS / I_ELEGS / C_COAL / I_COAL	0.0012	2.5738	0.0031	1.9083
Imp/payments	I_GOLD	0.3008	Imp/payments / C_GOLD / I_GOLD	0.1231	2.3222	0.2859	95.0244
Imp/payments	I_OTHMN	0.3251	Imp/payments / C_OTHMN / I_OTHMN	0.0898	2.4057	0.2161	66.4837
			Imp/payments / C_IRON / I_IRON / C_OTHMN / I_OTHMN	0.0054	2.6432	0.0142	4.3562
			Imp/payments / C_GOLD / I_OTHMN	0.0032	2.398	0.0076	2.33
			Imp/payments / C_PETRO / I_PETRO / C_OTHMN / I_OTHMN	0.0022	2.5057	0.0056	1.7116
			Imp/payments / C_NOFER / I_NOFER / C_OTHMN / I_OTHMN	0.0017	3.0432	0.0052	1.5977
			Imp/payments / C_CHEM / I_CHEM / C_OTHMN / I_OTHMN	0.0015	2.9295	0.0044	1.3614
Imp/payments	I_FOOD	0.3368	Imp/payments / C_FOOD / I_FOOD	0.0271	2.9812	0.0807	23.96
			Imp/payments / C_AGRI / I_AGRI / C_FOOD / I_FOOD	0.0018	3.2021	0.0058	1.7203
Imp/payments	I_BEV&T	0.1222	Imp/payments / C_BEV&T / I_BEV&T	0.006	2.6458	0.0158	12.8878
Imp/payments	I_TEXT	0.0953	Imp/payments / C_TEXT / I_TEXT	0.0074	2.9351	0.0216	22.686
			Imp/payments / C_APPAR / I_APPAR / C_TEXT / I_TEXT	0.001	3.0094	0.0031	3.2383
			Imp/payments / C_FURN / I_FURN / C_TEXT / I_TEXT	0.0004	2.9943	0.0011	1.123
Imp/payments	I_APPAR	0.0662	Imp/payments / C_APPAR / I_APPAR	0.0037	2.3959	0.0089	13.5126
			Imp/payments / C_GOLD / I_GOLD / C_APPAR / I_APPAR	0.0003	2.4096	0.0007	1.07
Imp/payments	I_LEATH	0.0136	Imp/payments / C_LEATH / I_LEATH	0.0028	2.3965	0.0067	48.8866
			Imp/payments / C_FOOTW / I_FOOTW / C_LEATH / I_LEATH	0.0002	2.5124	0.0006	4.396
			Imp/payments / C_FURN / I_FURN / C_LEATH / I_LEATH	0.0002	2.4467	0.0005	3.8335
Imp/payments	I_FOOTW	0.018	Imp/payments / C_FOOTW / I_FOOTW	0.0012	2.4236	0.0029	16.1247
Imp/payments	I_WOOD	0.0689392	Imp/payments / C_WOOD / I_WOOD	0.0068	2.6978	0.0182	26.4415
			Imp/payments / C_GOLD / I_GOLD / C_WOOD / I_WOOD	0.0038	2.713	0.0104	15.0957
			Imp/payments / C_FURN / I_FURN / C_WOOD / I_WOOD	0.0018	2.7449	0.0049	7.1604
			Imp/payments / sav-inv / C_CONST / I_CONST / C_WOOD / I_WOOD	0.0004	3.9271	0.0014	2.0108
			Imp/payments / C_PAPER / I_PAPER / C_WOOD / I_WOOD	0.0002	3.516	0.0008	1.2027
			Imp/payments / C_FURN / I_WOOD	0.0003	2.7428	0.0008	1.1945
Imp/payments	I_PAPER	0.1166	Imp/payments / C_PAPER / I_PAPER	0.0142	3.0136	0.0427	36.6099
			Imp/payments / C_FOOD / I_FOOD / C_PAPER / I_PAPER	0.0004	3.8666	0.0014	1.2002
Imp/payments	I_PRINT	0.0502	Imp/payments / C_PRINT / I_PRINT	0.0017	2.5277	0.0042	8.4398
			Imp/payments / C_FINAN / I_FINAN / C_PRINT / I_PRINT	0.0004	3.7305	0.0015	3.0646
			Imp/payments / C_OTHCH / I_PRINT	0.0003	3.1477	0.0008	1.6337
Imp/payments	I_PETRO	0.1456	Imp/payments / C_PETRO / I_PETRO	0.0086	2.4522	0.0212	14.544
			Imp/payments / C_CHEM / I_PETRO	0.0032	2.9713	0.0096	6.6111
			Imp/payments / C_TRANS / I_TRANS / C_PETRO / I_PETRO	0.0015	2.6553	0.0039	2.6733
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / C_PETRO / I_PETRO	0.001	2.7004	0.0026	1.7793
			Imp/payments / C_AGRI / I_AGRI / C_PETRO / I_PETRO	0.0009	2.8363	0.0025	1.6892

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_CHEM / I_CHEM / C_PETRO / I_PETRO	0.0008	2.9832	0.0025	1.6862
			Imp/payments / C_OTHMN / I_OTHMN / C_PETRO / I_PETRO	0.0007	2.5057	0.0018	1.2588
Imp/payments	I_CHEM	0.1784	Imp/payments / C_CHEM / I_CHEM	0.026	2.8291	0.0737	41.2844
			Imp/payments / C_AGRI / I_AGRI / C_CHEM / I_CHEM	0.0012	3.2689	0.0039	2.1579
			Imp/payments / C_GOLD / I_GOLD / C_CHEM / I_CHEM	0.0013	2.8448	0.0036	2.0325
			Imp/payments / C_OTHCH / I_OTHCH / C_CHEM / I_CHEM	0.0009	3.5158	0.0033	1.8577
			Imp/payments / C_TEXT / I_TEXT / C_CHEM / I_CHEM	0.0007	3.5767	0.0024	1.3588
			Imp/payments / C_PAPER / I_PAPER / C_CHEM / I_CHEM	0.0005	3.68	0.002	1.1305
Imp/payments	I_OTHCH	0.2027	Imp/payments / C_OTHCH / I_OTHCH	0.0124	2.9048	0.036	17.7724
			Imp/payments / C_GOLD / I_GOLD / C_OTHCH / I_OTHCH	0.0028	2.9206	0.0083	4.1034
			Imp/payments / C_OTHMN / I_OTHMN / C_OTHCH / I_OTHCH	0.0014	3.0144	0.0043	2.1271
			Imp/payments / C_AGRI / I_AGRI / C_OTHCH / I_OTHCH	0.0009	3.3502	0.0029	1.4338
			Imp/payments / C_COAL / I_COAL / C_OTHCH / I_OTHCH	0.0009	2.9615	0.0026	1.2939
			Imp/payments / C_FOOD / dstk / C_OTHCH / I_OTHCH	0.0006	3.9011	0.0022	1.0991
Imp/payments	I_RUBB	0.0289	Imp/payments / C_RUBB / I_RUBB	0.002	2.3522	0.0047	16.2936
			Imp/payments / C_GOLD / I_GOLD / C_RUBB / I_RUBB	0.0005	2.3658	0.0013	4.3919
			Imp/payments / C_COAL / I_COAL / C_RUBB / I_RUBB	0.0005	2.4004	0.0012	4.0648
			Imp/payments / C_OTHMN / I_OTHMN / C_RUBB / I_RUBB	0.0005	2.4489	0.0011	3.9069
			Imp/payments / C_TRANS / I_TRANS / C_RUBB / I_RUBB	0.0003	2.595	0.0007	2.5485
			Imp/payments / C_VEHIC / I_VEHIC / C_RUBB / I_RUBB	0.0002	3.3564	0.0007	2.4684
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / C_RUBB / I_RUBB	0.0002	2.6697	0.0005	1.7158
Imp/payments	I_PLAST	0.061	Imp/payments / C_PLAST / I_PLAST	0.0029	2.5083	0.0073	11.8959
			Imp/payments / C_OTHCH / I_OTHCH / C_PLAST / I_PLAST	0.0006	3.1381	0.0019	3.1179
			Imp/payments / C_CHEM / I_PLAST	0.0004	3.027	0.0012	1.9027
			Imp/payments / C_OTHIN / I_OTHIN / C_PLAST / I_PLAST	0.0003	2.591	0.0009	1.4703
			Imp/payments / C_GOLD / I_GOLD / C_PLAST / I_PLAST	0.0003	2.5227	0.0009	1.3969
			Imp/payments / C_OTHIN / I_PLAST	0.0003	2.586	0.0008	1.3909
			Imp/payments / C_FOOD / I_FOOD / C_PLAST / I_PLAST	0.0002	3.222	0.0008	1.2496
			Imp/payments / C_PAPER / I_PAPER / C_PLAST / I_PLAST	0.0002	3.2669	0.0008	1.2329
			Imp/payments / C_VEHIC / I_VEHIC / C_PLAST / I_PLAST	0.0002	3.5777	0.0007	1.1174
			Imp/payments / C_CHEM / I_CHEM / C_PLAST / I_PLAST	0.0002	3.0421	0.0006	1.0648
Imp/payments	I_GLASS	0.0148608	Imp/payments / C_GLASS / I_GLASS	0.0012	2.6042	0.003	20.2743
			Imp/payments / C_BEV&T / I_BEV&T / C_GLASS / I_GLASS	0.0001	2.979	0.0004	2.7289
			Imp/payments / C_VEHIC / I_VEHIC / C_GLASS / I_GLASS	0.0001	3.7182	0.0003	2.2704
			Imp/payments / C_OTHCH / I_OTHCH / C_GLASS / I_GLASS	0.0001	3.2727	0.0002	1.552
			Imp/payments / C_FOOD / I_FOOD / C_GLASS / I_GLASS	0.0001	3.3591	0.0002	1.1783
			Imp/payments / sav-inv / C_CONST / I_CONST / C_GLASS / I_GLASS	0	3.8053	0.0002	1.1592
Imp/payments	I_NOMET	0.0596	Imp/payments / C_NOMET / I_NOMET	0.0045	2.5035	0.0112	18.708
			Imp/payments / sav-inv / C_CONST / I_CONST / C_NOMET / I_NOMET	0.0013	3.6151	0.0048	8.1063
			Imp/payments / C_GOLD / I_GOLD / C_NOMET / I_NOMET	0.0009	2.5178	0.0023	3.8815
			Imp/payments / C_FOOD / dstk / C_CONST / I_CONST / C_NOMET / I_NOMET	0.0001	4.421	0.0007	1.092
Imp/payments	I_IRON	0.2634	Imp/payments / C_IRON / I_IRON	0.0555	2.554	0.1416	53.7696
			Imp/payments / C_NOFER / I_IRON	0.0073	3.1782	0.0232	8.8236
			Imp/payments / C_METPR / I_METPR / C_IRON / I_IRON	0.0019	2.7621	0.0052	1.9697
			Imp/payments / C_MACHN / I_MACHN / C_IRON / I_IRON	0.0013	2.819	0.0036	1.372
			Imp/payments / C_VEHIC / I_VEHIC / C_IRON / I_IRON	0.0009	3.6233	0.0034	1.2917
Imp/payments	I_NOFER	0.1435	Imp/payments / C_NOFER / I_NOFER	0.0313	2.9273	0.0916	63.8694
			Imp/payments / C_IRON / I_NOFER	0.002	3.1596	0.0063	4.3747
			Imp/payments / C_IRON / I_IRON / C_NOFER / I_NOFER	0.0006	3.2039	0.002	1.4155
			Imp/payments / C_ELMAC / I_ELMAC / C_NOFER / I_NOFER	0.0005	3.3816	0.0017	1.1946
			Imp/payments / C_METPR / I_METPR / C_NOFER / I_NOFER	0.0004	3.2866	0.0015	1.0168

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
Imp/payments	I_METPR	0.1809	Imp/payments / C_METPR / I_METPR	0.01	2.6096	0.026	14.3588
			Imp/payments / C_IRON / I_IRON / C_METPR / I_METPR	0.0059	2.7621	0.0162	8.958
			Imp/payments / C_GOLD / I_GOLD / C_METPR / I_METPR	0.0034	2.6236	0.0089	4.8989
			Imp/payments / sav-inv / C_METPR / I_METPR	0.0015	2.9536	0.0045	2.4749
			Imp/payments / sav-inv / C_CONST / I_CONST / C_METPR / I_METPR	0.0008	3.7266	0.0031	1.6938
			Imp/payments / C_OTHMN / I_OTHMN / C_METPR / I_METPR	0.0011	2.7064	0.0031	1.6869
			Imp/payments / C_NOFER / I_IRON / C_METPR / I_METPR	0.0008	3.4387	0.0027	1.4706
			Imp/payments / C_MACHN / I_MACHN / C_METPR / I_METPR	0.0008	2.8922	0.0024	1.3477
			Imp/payments / C_COAL / I_COAL / C_METPR / I_METPR	0.0009	2.6579	0.0023	1.2676
			Imp/payments / C_MACHN / I_MACHN	0.012	2.5822	0.0309	20.4215
			Imp/payments / sav-inv / C_MACHN / I_MACHN	0.0055	2.8758	0.0158	10.4074
			Imp/payments / C_GOLD / I_GOLD / C_MACHN / I_MACHN	0.0018	2.5956	0.0047	3.1298
			Imp/payments / GOS / Firms / sav-inv / C_MACHN / I_MACHN	0.0011	3.4968	0.004	2.6154
			Imp/payments / C_IRON / I_IRON / C_MACHN / I_MACHN	0.0011	2.819	0.0032	2.1373
Imp/payments	I_MACHN	0.1513	Imp/payments / C_OTHMN / I_OTHMN / C_MACHN / I_MACHN	0.0011	2.6807	0.003	1.9747
			Imp/payments / C_COAL / I_COAL / C_MACHN / I_MACHN	0.0008	2.6298	0.002	1.3145
			Imp/payments / C_ELMAC / I_ELMAC	0.0059	2.677	0.0159	18.0761
			Imp/payments / sav-inv / C_ELMAC / I_ELMAC	0.0012	3.0538	0.0036	4.0817
			Imp/payments / sav-inv / C_CONST / I_CONST / C_ELMAC / I_ELMAC	0.0007	3.8588	0.0027	3.0133
			Imp/payments / C_GOLD / I_GOLD / C_ELMAC / I_ELMAC	0.0007	2.6922	0.0019	2.1579
			Imp/payments / C_VEHIC / I_VEHIC / C_ELMAC / I_ELMAC	0.0005	3.8151	0.0017	1.9535
			Imp/payments / C_MACHN / I_MACHN / C_ELMAC / I_ELMAC	0.0004	2.9844	0.0012	1.4074
			Imp/payments / C_COAL / I_COAL / C_ELMAC / I_ELMAC	0.0004	2.7308	0.0011	1.2502
			Imp/payments / GOS / Firms / sav-inv / C_ELMAC / I_ELMAC	0.0002	3.7174	0.0009	1.0269
			Imp/payments / C_COMEQ / I_COMEQ	0.0016	2.5521	0.004	14.9809
			Imp/payments / sav-inv / C_COMEQ / I_COMEQ	0.0008	2.94	0.0025	9.3442
			Imp/payments / GOS / Firms / sav-inv / C_COMEQ / I_COMEQ	0.0002	3.5847	0.0006	2.3548
			Imp/payments / C_COMM / I_COMM / C_COMEQ / I_COMEQ	0.0001	3.0884	0.0004	1.3797
Imp/payments	I_SCIEQ	0.0088	Imp/payments / C_SCIEQ / I_SCIEQ	0.0005	2.3416	0.0011	12.6302
			Imp/payments / sav-inv / C_SCIEQ / I_SCIEQ	0.0002	2.7045	0.0005	6.1902
			Imp/payments / GOS / Firms / sav-inv / C_SCIEQ / I_SCIEQ	0	3.2992	0.0001	1.5606
			Imp/payments / C_GOLD / I_GOLD / C_SCIEQ / I_SCIEQ	0	2.3553	0.0001	1.1783
			Imp/payments / C_VEHIC / I_VEHIC	0.0205	3.2984	0.0677	28.2111
Imp/payments	I_VEHIC	0.24	Imp/payments / sav-inv / C_VEHIC / I_VEHIC	0.0039	3.7482	0.0145	6.0614
			Imp/payments / GOS / Firms / sav-inv / C_VEHIC / I_VEHIC	0.0008	4.5348	0.0036	1.5156
			Imp/payments / C_TRNEQ / I_TRNEQ	0.0029	2.4943	0.0074	36.6296
Imp/payments	I_TRNEQ	0.0201	Imp/payments / sav-inv / C_TRNEQ / I_TRNEQ	0.0005	2.8777	0.0014	6.9747
			Imp/payments / C_GOLD / I_GOLD / C_TRNEQ / I_TRNEQ	0.0004	2.5088	0.001	4.9353
			Imp/payments / C_TRANS / I_TRANS / C_TRNEQ / I_TRNEQ	0.0002	2.7569	0.0006	2.7412
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / C_TRNEQ / I_TRNEQ	0.0001	2.8373	0.0004	1.8462
			Imp/payments / GOS / Firms / sav-inv / C_TRNEQ / I_TRNEQ	0.0001	3.5116	0.0004	1.759
			Imp/payments / C_OTHMN / I_OTHMN / C_TRNEQ / I_TRNEQ	0.0001	2.5983	0.0003	1.3543
			Imp/payments / C_FURN / I_FURN	0.0097	2.3578	0.023	44.1032
			Imp/payments / sav-inv / C_FURN / I_FURN	0.0003	2.7136	0.0009	1.7032
			Imp/payments / C_OTHIN / I_OTHIN	0.0169	2.3889	0.0404	48.3402
			Imp/payments / C_IRON / I_OTHIN	0.0004	2.5966	0.001	1.1643
Imp/payments	I_ELEGS	0.1546	Imp/payments / C_GOLD / I_GOLD / C_ELEGS / I_ELEGS	0.0088	2.5453	0.0225	14.5438
			Imp/payments / C_IRON / I_IRON / C_ELEGS / I_ELEGS	0.0036	2.7862	0.01	6.4608
			Imp/payments / C_NOFER / I_NOFER / C_ELEGS / I_ELEGS	0.0028	3.2022	0.009	5.8401
			Imp/payments / C_ELEGS / I_ELEGS	0.0026	2.5331	0.0066	4.2639
			Imp/payments / C_OTHMN / I_OTHMN / C_ELEGS / I_ELEGS	0.002	2.6326	0.0054	3.4695

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_CHEM / I_CHEM / C_ELEGS / I_ELEGS	0.0009	3.0943	0.0027	1.7636
			Imp/payments / C_COAL / I_COAL / C_ELEGS / I_ELEGS	0.0008	2.5616	0.002	1.2995
			Imp/payments / C_NOFER / I_IRON / C_ELEGS / I_ELEGS	0.0005	3.4619	0.0016	1.0586
Imp/payments	I_WATER	0.0350945	Imp/payments / C_GOLD / I_GOLD / C_WATER / I_WATER	0.0007	3.7337	0.0025	7.052
			Imp/payments / C_OTHMN / I_OTHMN / C_WATER / I_WATER	0.0005	3.8664	0.0021	5.8979
			Imp/payments / C_AGRI / I_AGRI / C_WATER / I_WATER	0.0001	4.3142	0.0006	1.6644
			Imp/payments / C_WATER / I_WATER	0.0001	3.7122	0.0006	1.5797
			Imp/payments / C_IRON / I_IRON / C_WATER / I_WATER	0.0001	4.1046	0.0004	1.2403
			Imp/payments / C_HOTEL / I_HOTEL / C_WATER / I_WATER	0.0001	3.8561	0.0004	1.1117
			Imp/payments / C_TRANS / I_TRANS / C_WATER / I_WATER	0.0001	4.1029	0.0004	1.0809
Imp/payments	I_CONST	0.3407017	Imp/payments / sav-inv / C_CONST / I_CONST	0.0153	3.3789	0.0517	15.1707
			Imp/payments / GOS / Firms / sav-inv / C_CONST / I_CONST	0.0032	4.0938	0.0129	3.7988
			Imp/payments / C_FOOD / dstk / C_CONST / I_CONST	0.0017	4.1406	0.007	2.0478
			Imp/payments / C_OTHMN / dstk / C_CONST / I_CONST	0.0018	3.518	0.0063	1.8583
			Imp/payments / C_GOLD / I_GOLD / C_CONST / I_CONST	0.0014	3.1667	0.0044	1.29
			Imp/payments / C_IRON / dstk / C_CONST / I_CONST	0.0011	3.6823	0.0041	1.2095
Imp/payments	I_TRADE	0.1028566	Imp/payments / C_TRADE / I_TRADE	0.0013	2.5036	0.0032	3.1438
			Imp/payments / C_IRON / I_IRON / C_TRADE / I_TRADE	0.0005	2.7633	0.0015	1.4566
			Imp/payments / C_TRANS / I_TRANS / C_TRADE / I_TRADE	0.0005	2.7489	0.0014	1.3623
			Imp/payments / C_CHEM / I_CHEM / C_TRADE / I_TRADE	0.0004	3.0607	0.0011	1.0723
Imp/payments	I_HOTEL	0.1105315	Imp/payments / C_HOTEL / I_HOTEL	0.0129	2.3995	0.0309	27.9176
Imp/payments	I_TRANS	0.3201992	Imp/payments / C_TRANS / I_TRANS	0.0252	2.5545	0.0644	20.1183
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS	0.0165	2.6295	0.0434	13.5525
			Imp/payments / C_COAL / I_COAL / C_TRANS / I_TRANS	0.0066	2.5946	0.017	5.3248
			Imp/payments / C_IRON / I_IRON / C_TRANS / I_TRANS	0.0031	2.8064	0.0087	2.7234
			Imp/payments / C_CHEM / I_CHEM / C_TRANS / I_TRANS	0.0014	3.111	0.0043	1.3276
			Imp/payments / C_AGRI / I_AGRI / C_TRANS / I_TRANS	0.0014	2.9383	0.0042	1.3055
Imp/payments	I_COMM	0.1497883	Imp/payments / C_COMM / I_COMM	0.0063	2.7988	0.0176	11.7423
			Imp/payments / C_FOOD / dstk / C_COMM / I_COMM	0.0007	3.7651	0.0026	1.7086
			Imp/payments / C_OTHMN / dstk / C_COMM / I_COMM	0.0007	3.2021	0.0023	1.552
			Imp/payments / C_IRON / dstk / C_COMM / I_COMM	0.0005	3.3498	0.0015	1.0096
Imp/payments	I_FINAN	0.4233938	Imp/payments / C_FINAN / I_FINAN	0.0183	3.4351	0.0629	14.8479
			Imp/payments / C_TRANS / I_TRANS / C_FINAN / I_FINAN	0.0014	3.7432	0.0054	1.2659
Imp/payments	I_BUS	0.4052908	Imp/payments / C_BUS / I_BUS	0.006	2.9355	0.0177	4.3698
			Imp/payments / C_GOLD / I_GOLD / C_BUS / I_BUS	0.0027	2.9493	0.0079	1.9574
			Imp/payments / C_FINAN / I_FINAN / C_BUS / I_BUS	0.001	4.1239	0.0042	1.0307
Imp/payments	I_M&OTHS	0.0974	Imp/payments / C_M&OTHS / I_M&OTHS	0.0025	2.4168	0.006	6.2016
			Imp/payments / C_FOOD / dstk / C_M&OTHS / I_M&OTHS	0.0004	3.2686	0.0014	1.437
			Imp/payments / C_OTHMN / dstk / C_M&OTHS / I_M&OTHS	0.0005	2.7788	0.0013	1.3048
Imp/payments	I_OTHPR	0.2255528	Imp/payments / C_GOLD / I_GOLD / C_OTHPR / I_OTHPR	0.0039	2.6825	0.0105	4.651
			Imp/payments / C_OTHPR / I_OTHPR	0.0034	2.6693	0.0091	4.0504
			Imp/payments / C_OTHMN / I_OTHMN / C_OTHPR / I_OTHPR	0.0024	2.7616	0.0067	2.9591
			Imp/payments / C_IRON / I_IRON / C_OTHPR / I_OTHPR	0.0019	2.9232	0.0057	2.5272
			Imp/payments / C_COAL / I_COAL / C_OTHPR / I_OTHPR	0.0013	2.7165	0.0035	1.5439
			Imp/payments / C_FOOD / I_FOOD / C_OTHPR / I_OTHPR	0.0009	3.3276	0.0031	1.3803
			Imp/payments / C_CHEM / I_CHEM / C_OTHPR / I_OTHPR	0.0009	3.2398	0.003	1.3496
Imp/payments	I_GVTSRV	0.0094655	Imp/payments / C_FOOD / dstk / C_GVTSRV / I_GVTSRV	0.0001	3.3462	0.0003	3.3646
			Imp/payments / C_OTHMN / dstk / C_GVTSRV / I_GVTSRV	0.0001	2.8392	0.0003	3.0491
			Imp/payments / C_GVTSRV / I_GVTSRV	0.0001	2.4495	0.0003	3.0098
			Imp/payments / C_IRON / dstk / C_GVTSRV / I_GVTSRV	0.0001	2.9701	0.0002	1.9834
Imp/payments	C_AGRI	0.3524	Imp/payments / C_AGRI	0.0394	2.6822	0.1056	29.9609

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_FOOD / I_FOOD / C_AGRI	0.012	3.1989	0.0385	10.9158
			Imp/payments / C_WOOD / I_WOOD / C_AGRI	0.0013	3.1194	0.0041	1.1665
Imp/payments	C_COAL	0.1679	Imp/payments / C_COAL	0.0452	2.3563	0.1065	63.4597
			Imp/payments / C_IRON / I_IRON / C_COAL	0.0029	2.597	0.0077	4.559
			Imp/payments / C_GOLD / I_GOLD / C_ELEGS / I_ELEGS / C_COAL	0.0013	2.5729	0.0032	1.9189
Imp/payments	C_GOLD	0.2982	Imp/payments / C_GOLD	0.1263	2.3147	0.2923	98.0048
Imp/payments	C_OTHMN	0.4757	Imp/payments / C_OTHMN	0.1378	2.3989	0.3307	69.5113
			Imp/payments / C_IRON / I_IRON / C_OTHMN	0.0082	2.6361	0.0217	4.5554
			Imp/payments / C_PETRO / I_PETRO / C_OTHMN	0.0034	2.4988	0.0085	1.7897
			Imp/payments / C_NOFER / I_NOFER / C_OTHMN	0.0026	3.0351	0.0079	1.6708
			Imp/payments / C_CHEM / I_CHEM / C_OTHMN	0.0023	2.9214	0.0068	1.4235
Imp/payments	C_FOOD	0.5316	Imp/payments / C_FOOD	0.0455	2.9554	0.1345	25.2969
			Imp/payments / C_AGRI / I_AGRI / C_FOOD	0.003	3.1863	0.0097	1.823
Imp/payments	C_BEV&T	0.2206	Imp/payments / C_BEV&T	0.0115	2.6361	0.0302	13.6909
Imp/payments	C_TEXT	0.1254	Imp/payments / C_TEXT	0.0103	2.9264	0.0301	24.0299
			Imp/payments / C_APPAR / I_APPAR / C_TEXT	0.0014	3.002	0.0043	3.4318
			Imp/payments / C_FURN / I_FURN / C_TEXT	0.0005	2.9855	0.0015	1.1896
Imp/payments	C_APPAR	0.0867	Imp/payments / C_APPAR	0.0051	2.3864	0.0121	14.0037
			Imp/payments / C_GOLD / I_GOLD / C_APPAR	0.0004	2.4	0.001	1.1088
Imp/payments	C_LEATH	0.0171	Imp/payments / C_LEATH	0.0036	2.3962	0.0085	49.8652
			Imp/payments / C_FOOTW / I_FOOTW / C_LEATH	0.0003	2.5121	0.0008	4.484
			Imp/payments / C_FURN / I_FURN / C_LEATH	0.0003	2.4464	0.0007	3.9102
Imp/payments	C_FOOTW	0.0343	Imp/payments / C_FOOTW	0.0023	2.4231	0.0057	16.5253
			Imp/payments / C_GOLD / I_GOLD / C_FOOTW	0.0001	2.4372	0.0003	1.0092
Imp/payments	C_WOOD	0.0733	Imp/payments / C_WOOD	0.0076	2.6939	0.0204	27.821
			Imp/payments / C_GOLD / I_GOLD / C_WOOD	0.0043	2.7091	0.0116	15.8834
			Imp/payments / C_FURN / I_FURN / C_WOOD	0.002	2.7421	0.0055	7.5373
			Imp/payments / sav-inv / C_CONST / I_CONST / C_WOOD	0.0004	3.9225	0.0016	2.1162
			Imp/payments / C_PAPER / I_PAPER / C_WOOD	0.0003	3.5111	0.0009	1.2655
Imp/payments	C_PAPER	0.1455	Imp/payments / C_PAPER	0.0188	3.0046	0.0566	38.9122
			Imp/payments / C_FOOD / I_FOOD / C_PAPER	0.0005	3.8566	0.0019	1.2762
Imp/payments	C_PRINT	0.0612	Imp/payments / C_PRINT	0.0024	2.518	0.006	9.8479
			Imp/payments / C_FINAN / I_FINAN / C_PRINT	0.0006	3.7176	0.0022	3.5773
Imp/payments	C_PETRO	0.2358	Imp/payments / C_PETRO	0.0178	2.4314	0.0434	18.397
			Imp/payments / C_TRANS / I_TRANS / C_PETRO	0.003	2.6375	0.008	3.3877
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / C_PETRO	0.002	2.6891	0.0053	2.2604
			Imp/payments / C_CHEM / I_CHEM / C_PETRO	0.0017	2.971	0.0051	2.1424
			Imp/payments / C_AGRI / I_AGRI / C_PETRO	0.0018	2.815	0.005	2.1388
			Imp/payments / C_OTHMN / I_OTHMN / C_PETRO	0.0015	2.4923	0.0038	1.5972
			Imp/payments / C_IRON / I_IRON / C_PETRO	0.0011	2.6848	0.0028	1.2045
			Imp/payments / C_GOLD / I_GOLD / C_PETRO	0.001	2.4448	0.0024	1.0025
Imp/payments	C_CHEM	0.2696	Imp/payments / C_CHEM	0.0418	2.8172	0.1177	43.6666
			Imp/payments / C_AGRI / I_AGRI / C_CHEM	0.0019	3.2561	0.0062	2.2831
			Imp/payments / C_GOLD / I_GOLD / C_CHEM	0.002	2.8329	0.0058	2.1499
			Imp/payments / C_OTHCH / I_OTHCH / C_CHEM	0.0015	3.5047	0.0053	1.9669
			Imp/payments / C_TEXT / I_TEXT / C_CHEM	0.0011	3.562	0.0039	1.4373
			Imp/payments / C_PAPER / I_PAPER / C_CHEM	0.0009	3.665	0.0032	1.1959
Imp/payments	C_OTHCH	0.2819	Imp/payments / C_OTHCH	0.0179	2.8937	0.0518	18.3896
			Imp/payments / C_GOLD / I_GOLD / C_OTHCH	0.0041	2.9094	0.012	4.246
			Imp/payments / C_OTHMN / I_OTHMN / C_OTHCH	0.0021	3.0032	0.0062	2.2012
			Imp/payments / C_AGRI / I_AGRI / C_OTHCH	0.0013	3.3381	0.0042	1.4839

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_COAL / I_COAL / C_OTHCH	0.0013	2.9503	0.0038	1.3389
			Imp/payments / C_FOOD / dstk / C_OTHCH	0.0008	3.8884	0.0032	1.1379
			Imp/payments / C_OTHMN / dstk / C_OTHCH	0.0009	3.3074	0.0029	1.0337
Imp/payments	C_RUBB	0.0427	Imp/payments / C_RUBB	0.0031	2.3501	0.0072	16.9774
			Imp/payments / C_GOLD / I_GOLD / C_RUBB	0.0008	2.3637	0.002	4.5762
			Imp/payments / C_COAL / I_COAL / C_RUBB	0.0008	2.3982	0.0018	4.2354
			Imp/payments / C_OTHMN / I_OTHMN / C_RUBB	0.0007	2.4468	0.0017	4.071
			Imp/payments / C_TRANS / I_TRANS / C_RUBB	0.0004	2.5929	0.0011	2.6556
			Imp/payments / C_VEHIC / I_VEHIC / C_RUBB	0.0003	3.3534	0.0011	2.5721
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / C_RUBB	0.0003	2.6676	0.0008	1.788
Imp/payments	C_PLAST	0.0663	Imp/payments / C_PLAST	0.0037	2.4936	0.0091	13.7656
			Imp/payments / C_OTHCH / I_OTHCH / C_PLAST	0.0008	3.1207	0.0024	3.6089
			Imp/payments / C_OTHIN / I_OTHIN / C_PLAST	0.0004	2.577	0.0011	1.7022
			Imp/payments / C_GOLD / I_GOLD / C_PLAST	0.0004	2.508	0.0011	1.6164
			Imp/payments / C_FOOD / I_FOOD / C_PLAST	0.0003	3.2047	0.001	1.4467
			Imp/payments / C_PAPER / I_PAPER / C_PLAST	0.0003	3.2484	0.0009	1.4269
			Imp/payments / C_VEHIC / I_VEHIC / C_PLAST	0.0002	3.5577	0.0009	1.2934
			Imp/payments / C_CHEM / I_CHEM / C_PLAST	0.0003	3.0366	0.0008	1.2372
Imp/payments	C_GLASS	0.0217	Imp/payments / C_GLASS	0.0017	2.6036	0.0045	20.8479
			Imp/payments / C_BEV&T / I_BEV&T / C_GLASS	0.0002	2.9784	0.0006	2.8061
			Imp/payments / C_VEHIC / I_VEHIC / C_GLASS	0.0001	3.7174	0.0005	2.3346
			Imp/payments / C_OTHCH / I_OTHCH / C_GLASS	0.0001	3.2721	0.0003	1.5959
			Imp/payments / C_FOOD / I_FOOD / C_GLASS	0.0001	3.3584	0.0003	1.2117
			Imp/payments / sav-inv / C_CONST / I_CONST / C_GLASS	0.0001	3.8046	0.0003	1.1921
			Imp/payments / C_GOLD / I_GOLD / C_GLASS	0.0001	2.6188	0.0002	1.0007
Imp/payments	C_NOMET	0.0662	Imp/payments / C_NOMET	0.0051	2.5007	0.0128	19.3907
			Imp/payments / sav-inv / C_CONST / I_CONST / C_NOMET	0.0015	3.6118	0.0056	8.4036
			Imp/payments / C_GOLD / I_GOLD / C_NOMET	0.0011	2.515	0.0027	4.0232
			Imp/payments / GOS / Firms / sav-inv / C_CONST / I_CONST / C_NOMET	0.0003	4.3714	0.0014	2.1021
			Imp/payments / C_FOOD / dstk / C_CONST / I_CONST / C_NOMET	0.0002	4.4174	0.0007	1.1322
			Imp/payments / C_OTHMN / dstk / C_CONST / I_CONST / C_NOMET	0.0002	3.7524	0.0007	1.0271
Imp/payments	C_IRON	0.2817	Imp/payments / C_IRON	0.071	2.5151	0.1786	63.4204
			Imp/payments / C_METPR / I_METPR / C_IRON	0.0024	2.7382	0.0066	2.3387
			Imp/payments / C_MACHN / I_MACHN / C_IRON	0.0016	2.7795	0.0046	1.6202
			Imp/payments / C_VEHIC / I_VEHIC / C_IRON	0.0012	3.5702	0.0043	1.5244
Imp/payments	C_NOFER	0.1926	Imp/payments / C_NOFER	0.0456	2.9216	0.1333	69.216
			Imp/payments / C_IRON / I_IRON / C_NOFER	0.0009	3.201	0.003	1.5356
			Imp/payments / C_ELMAC / I_ELMAC / C_NOFER	0.0007	3.3753	0.0025	1.2947
			Imp/payments / C_METPR / I_METPR / C_NOFER	0.0006	3.2825	0.0021	1.1027
Imp/payments	C_METPR	0.2057	Imp/payments / C_METPR	0.0118	2.6007	0.0306	14.8953
			Imp/payments / C_IRON / I_IRON / C_METPR	0.0069	2.7549	0.0191	9.2998
			Imp/payments / C_GOLD / I_GOLD / C_METPR	0.004	2.6148	0.0105	5.082
			Imp/payments / sav-inv / C_METPR	0.0018	2.9457	0.0053	2.5693
			Imp/payments / sav-inv / C_CONST / I_CONST / C_METPR	0.001	3.7169	0.0036	1.7585
			Imp/payments / C_OTHMN / I_OTHMN / C_METPR	0.0013	2.6977	0.0036	1.7502
			Imp/payments / C_NOFER / I_IRON / C_METPR	0.0009	3.4302	0.0031	1.527
			Imp/payments / C_MACHN / I_MACHN / C_METPR	0.001	2.8849	0.0029	1.3993
			Imp/payments / C_COAL / I_COAL / C_METPR	0.001	2.6492	0.0027	1.3151
			Imp/payments / C_VEHIC / I_VEHIC / C_METPR	0.0006	3.7	0.0021	1.0367
Imp/payments	C_MACHN	0.4278	Imp/payments / C_MACHN	0.0351	2.5754	0.0904	21.1195
			Imp/payments / sav-inv / C_MACHN	0.0161	2.869	0.0461	10.7662

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_GOLD / I_GOLD / C_MACHN	0.0053	2.5887	0.0138	3.2368
			Imp/payments / GOS / Firms / sav-inv / C_MACHN	0.0033	3.49	0.0116	2.7068
			Imp/payments / C_IRON / I_IRON / C_MACHN	0.0034	2.8129	0.0095	2.2114
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / sav-inv / C_MACHN	0.0026	3.5659	0.0092	2.153
			Imp/payments / C_OTHMN / I_OTHMN / C_MACHN	0.0033	2.6738	0.0087	2.0424
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / sav-inv / C_MACHN	0.0021	3.4988	0.0072	1.6892
			Imp/payments / C_COAL / I_COAL / C_MACHN	0.0022	2.623	0.0058	1.3595
			Imp/payments / C_AGRI / I_AGRI / GOS / Firms / sav-inv / C_MACHN	0.0011	3.8696	0.0044	1.0342
			Imp/payments / C_COAL / I_COAL / GOS / Firms / sav-inv / C_MACHN	0.0012	3.5303	0.0043	1.0069
Imp/payments	C_ELMAC	0.1288	Imp/payments / C_ELMAC	0.009	2.674	0.0239	18.5755
			Imp/payments / sav-inv / C_ELMAC	0.0018	3.051	0.0054	4.1952
			Imp/payments / sav-inv / C_CONST / I_CONST / C_ELMAC	0.001	3.8554	0.004	3.0972
			Imp/payments / C_GOLD / I_GOLD / C_ELMAC	0.0011	2.6893	0.0029	2.2176
			Imp/payments / C_VEHIC / I_VEHIC / C_ELMAC	0.0007	3.8111	0.0026	2.0075
			Imp/payments / C_MACHN / I_MACHN / C_ELMAC	0.0006	2.9813	0.0019	1.4464
			Imp/payments / C_COAL / I_COAL / C_ELMAC	0.0006	2.7279	0.0017	1.2848
			Imp/payments / GOS / Firms / sav-inv / C_ELMAC	0.0004	3.7148	0.0014	1.0557
Imp/payments	C_COMEQ	0.0904	Imp/payments / C_COMEQ	0.0055	2.551	0.0141	15.5403
			Imp/payments / sav-inv / C_COMEQ	0.003	2.9389	0.0088	9.6937
			Imp/payments / GOS / Firms / sav-inv / C_COMEQ	0.0006	3.5836	0.0022	2.443
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / sav-inv / C_COMEQ	0.0005	3.6646	0.0018	1.9448
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / sav-inv / C_COMEQ	0.0004	3.5933	0.0014	1.5249
			Imp/payments / C_COMM / I_COMM / C_COMEQ	0.0004	3.0872	0.0013	1.4312
Imp/payments	C_SCIEQ	0.0489	Imp/payments / C_SCIEQ	0.0028	2.3409	0.0065	13.212
			Imp/payments / sav-inv / C_SCIEQ	0.0012	2.7038	0.0032	6.4756
			Imp/payments / GOS / Firms / sav-inv / C_SCIEQ	0.0002	3.2983	0.0008	1.6326
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / sav-inv / C_SCIEQ	0.0002	3.3729	0.0006	1.2997
			Imp/payments / C_GOLD / I_GOLD / C_SCIEQ	0.0003	2.3546	0.0006	1.2326
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / sav-inv / C_SCIEQ	0.0002	3.3072	0.0005	1.0191
Imp/payments	C_VEHIC	0.387	Imp/payments / C_VEHIC	0.0341	3.2909	0.1123	29.0129
			Imp/payments / sav-inv / C_VEHIC	0.0065	3.7409	0.0241	6.2356
			Imp/payments / GOS / Firms / sav-inv / C_VEHIC	0.0013	4.5276	0.006	1.5598
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / sav-inv / C_VEHIC	0.001	4.6266	0.0048	1.2408
			Imp/payments / C_FOOD / dstk / C_VEHIC	0.0009	4.4426	0.004	1.0245
Imp/payments	C_TRNEQ	0.0523	Imp/payments / C_TRNEQ	0.0079	2.4937	0.0197	37.594
			Imp/payments / sav-inv / C_TRNEQ	0.0013	2.8771	0.0037	7.1585
			Imp/payments / C_GOLD / I_GOLD / C_TRNEQ	0.0011	2.5082	0.0026	5.0652
			Imp/payments / C_TRANS / I_TRANS / C_TRNEQ	0.0005	2.7563	0.0015	2.8134
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / C_TRNEQ	0.0003	2.8367	0.001	1.8949
			Imp/payments / GOS / Firms / sav-inv / C_TRNEQ	0.0003	3.5111	0.0009	1.8055
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / sav-inv / C_TRNEQ	0.0002	3.5902	0.0008	1.4372
			Imp/payments / C_OTHMN / I_OTHMN / C_TRNEQ	0.0003	2.5977	0.0007	1.3899
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / sav-inv / C_TRNEQ	0.0002	3.5205	0.0006	1.1269
Imp/payments	C_FURN	0.0771	Imp/payments / C_FURN	0.0148	2.3557	0.0349	45.2916
			Imp/payments / sav-inv / C_FURN	0.0005	2.7114	0.0013	1.7492
Imp/payments	C_OTHIN	0.1179	Imp/payments / C_OTHIN	0.025	2.3852	0.0596	50.5526
			Imp/payments / C_FOOD / dstk / C_OTHIN	0.0004	3.2445	0.0012	1.0196
Imp/payments	C_ELEGS	0.1735	Imp/payments / C_GOLD / I_GOLD / C_ELEGS	0.0102	2.5396	0.0259	14.9255
			Imp/payments / C_IRON / I_IRON / C_ELEGS	0.0041	2.7801	0.0115	6.6308
			Imp/payments / C_NOFER / I_NOFER / C_ELEGS	0.0033	3.195	0.0104	5.9935
			Imp/payments / C_ELEGS	0.003	2.5273	0.0076	4.3758

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_OTHMN / I_OTHMN / C_ELEGS	0.0024	2.6269	0.0062	3.5607
			Imp/payments / C_CHEM / I_CHEM / C_ELEGS	0.001	3.0874	0.0031	1.81
			Imp/payments / C_COAL / I_COAL / C_ELEGS	0.0009	2.5564	0.0023	1.3339
			Imp/payments / C_NOFER / I_IRON / C_ELEGS	0.0005	3.4543	0.0019	1.0864
Imp/payments	C_WATER	0.0359	Imp/payments / C_GOLD / I_GOLD / C_WATER	0.0007	3.7337	0.0025	7.052
			Imp/payments / C_OTHMN / I_OTHMN / C_WATER	0.0005	3.8664	0.0021	5.8979
			Imp/payments / C_AGRI / I_AGRI / C_WATER	0.0001	4.3142	0.0006	1.6644
			Imp/payments / C_WATER	0.0002	3.7122	0.0006	1.5797
			Imp/payments / C_IRON / I_IRON / C_WATER	0.0001	4.1046	0.0004	1.2403
			Imp/payments / C_HOTEL / I_HOTEL / C_WATER	0.0001	3.8561	0.0004	1.1117
			Imp/payments / C_TRANS / I_TRANS / C_WATER	0.0001	4.1029	0.0004	1.0809
Imp/payments	C_CONST	0.3734	Imp/payments / sav-inv / C_CONST	0.017	3.3741	0.0572	15.3221
			Imp/payments / GOS / Firms / sav-inv / C_CONST	0.0035	4.0895	0.0143	3.8381
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / sav-inv / C_CONST	0.0027	4.1695	0.0114	3.0464
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / sav-inv / C_CONST	0.0022	4.0972	0.0089	2.3938
			Imp/payments / C_FOOD / dstk / C_CONST	0.0019	4.1353	0.0077	2.0686
			Imp/payments / C_OTHMN / dstk / C_CONST	0.002	3.5134	0.007	1.8771
			Imp/payments / C_AGRI / I_AGRI / GOS / Firms / sav-inv / C_CONST	0.0012	4.5281	0.0055	1.4644
			Imp/payments / C_COAL / I_COAL / GOS / Firms / sav-inv / C_CONST	0.0013	4.138	0.0053	1.4282
			Imp/payments / C_GOLD / I_GOLD / C_CONST	0.0015	3.1617	0.0049	1.3027
			Imp/payments / C_IRON / dstk / C_CONST	0.0012	3.6776	0.0046	1.2218
			Imp/payments / C_NOFER / I_NOFER / GOS / Firms / sav-inv / C_CONST	0.0008	5.1362	0.0043	1.145
			Imp/payments / C_CONST	0.0003	3.1527	0.0009	0.2459
Imp/payments	C_TRADE	0.0912	Imp/payments / C_TRADE	0.0014	2.4877	0.0034	3.739
			Imp/payments / C_IRON / I_IRON / C_TRADE	0.0006	2.7467	0.0016	1.733
			Imp/payments / C_TRANS / I_TRANS / C_TRADE	0.0005	2.7336	0.0015	1.6215
			Imp/payments / C_CHEM / I_CHEM / C_TRADE	0.0004	3.0423	0.0012	1.2757
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / C_TRADE	0.0004	2.8112	0.001	1.0913
Imp/payments	C_HOTEL	0.107	Imp/payments / C_HOTEL	0.0156	2.3789	0.0371	34.6432
Imp/payments	C_TRANS	0.3979	Imp/payments / C_TRANS	0.0313	2.5545	0.0801	20.1183
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS	0.0205	2.6295	0.0539	13.5525
			Imp/payments / C_COAL / I_COAL / C_TRANS	0.0082	2.5946	0.0212	5.3248
			Imp/payments / C_IRON / I_IRON / C_TRANS	0.0039	2.8064	0.0108	2.7234
			Imp/payments / C_CHEM / I_CHEM / C_TRANS	0.0017	3.111	0.0053	1.3276
			Imp/payments / C_AGRI / I_AGRI / C_TRANS	0.0018	2.9383	0.0052	1.3055
Imp/payments	C_COMM	0.1582	Imp/payments / C_COMM	0.0067	2.7969	0.0188	11.868
			Imp/payments / C_FOOD / dstk / C_COMM	0.0007	3.7631	0.0027	1.7272
			Imp/payments / C_OTHMN / dstk / C_COMM	0.0008	3.2003	0.0025	1.5688
			Imp/payments / C_IRON / dstk / C_COMM	0.0005	3.3479	0.0016	1.0205
Imp/payments	C_FINAN	0.4132	Imp/payments / C_FINAN	0.0194	3.3848	0.0657	15.9086
			Imp/payments / C_TRANS / I_TRANS / C_FINAN	0.0015	3.6917	0.0056	1.3575
Imp/payments	C_BUS	0.4917	Imp/payments / C_BUS	0.0076	2.9237	0.0221	4.5024
			Imp/payments / C_GOLD / I_GOLD / C_BUS	0.0034	2.9375	0.0099	2.0168
			Imp/payments / C_FINAN / I_FINAN / C_BUS	0.0013	4.1095	0.0052	1.0625
Imp/payments	C_M&Oths	0.1052	Imp/payments / C_M&Oths	0.0027	2.4162	0.0066	6.2467
			Imp/payments / C_FOOD / dstk / C_M&Oths	0.0005	3.268	0.0015	1.4476
			Imp/payments / C_OTHMN / dstk / C_M&Oths	0.0005	2.7782	0.0014	1.3144
Imp/payments	C_OTHPR	0.3584	Imp/payments / C_GOLD / I_GOLD / C_OTHPR	0.0062	2.6825	0.0167	4.651
			Imp/payments / C_OTHPR	0.0054	2.6693	0.0145	4.0504
			Imp/payments / C_OTHMN / I_OTHMN / C_OTHPR	0.0038	2.7616	0.0106	2.9591
			Imp/payments / C_IRON / I_IRON / C_OTHPR	0.0031	2.9232	0.0091	2.5272

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_COAL / I_COAL / C_OTHPR	0.002	2.7165	0.0055	1.5439
			Imp/payments / C_FOOD / I_FOOD / C_OTHPR	0.0015	3.3276	0.0049	1.3803
			Imp/payments / C_CHEM / I_CHEM / C_OTHPR	0.0015	3.2398	0.0048	1.3496
Imp/payments	C_GVTSRV	0.0095	Imp/payments / C_FOOD / dstk / C_GVTSRV	0.0001	3.3462	0.0003	3.3646
			Imp/payments / C_OTHMN / dstk / C_GVTSRV	0.0001	2.8392	0.0003	3.0491
			Imp/payments / C_GVTSRV	0.0001	2.4495	0.0003	3.0098
			Imp/payments / C_IRON / dstk / C_GVTSRV	0.0001	2.9701	0.0002	1.9834
Imp/payments	lo	0.530696	Imp/payments / C_GOLD / I_GOLD / lo	0.0387	2.6918	0.104	19.6046
			Imp/payments / C_OTHMN / I_OTHMN / lo	0.014	2.7707	0.0389	7.3333
			Imp/payments / C_AGRI / I_AGRI / lo	0.0047	3.0063	0.0141	2.6478
			Imp/payments / C_COAL / I_COAL / lo	0.0049	2.7261	0.0134	2.5188
			Imp/payments / C_IRON / I_IRON / lo	0.0045	2.9437	0.0131	2.4696
			Imp/payments / sav-inv / C_CONST / I_CONST / lo	0.0019	3.7791	0.007	1.3256
			Imp/payments / C_NOFER / I_NOFER / lo	0.0016	3.3918	0.0054	1.026
Imp/payments	med	0.5109534	Imp/payments / C_GOLD / I_GOLD / med	0.0067	2.8078	0.0187	3.655
			Imp/payments / C_FINAN / I_FINAN / med	0.0034	3.9364	0.0133	2.6092
			Imp/payments / C_TRANS / I_TRANS / med	0.0043	2.9908	0.0128	2.4957
			Imp/payments / C_OTHMN / I_OTHMN / med	0.0038	2.8907	0.011	2.1497
			Imp/payments / C_IRON / I_IRON / med	0.003	3.0665	0.0091	1.7775
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / med	0.0028	3.0652	0.0086	1.6739
			Imp/payments / C_COAL / I_COAL / med	0.0028	2.8405	0.0079	1.5553
Imp/payments	hi	0.3276002	Imp/payments / C_GOLD / I_GOLD / hi	0.0031	2.6318	0.0081	2.4661
			Imp/payments / C_IRON / I_IRON / hi	0.0024	2.8801	0.0068	2.0721
			Imp/payments / C_OTHMN / I_OTHMN / hi	0.0023	2.7152	0.0064	1.9435
			Imp/payments / C_CHEM / I_CHEM / hi	0.0014	3.1871	0.0046	1.393
			Imp/payments / C_FINAN / I_FINAN / hi	0.0012	3.7849	0.0044	1.332
			Imp/payments / C_COAL / I_COAL / hi	0.0015	2.6662	0.004	1.2127
			Imp/payments / C_TRANS / I_TRANS / hi	0.0012	2.8507	0.0035	1.0691
			Imp/payments / C_VEHIC / I_VEHIC / hi	0.0009	3.7017	0.0035	1.068
Imp/payments	GOS	1.467	Imp/payments / GOS	0.0342	3.2186	0.1099	7.494
			Imp/payments / C_OTHMN / I_OTHMN / GOS	0.0266	3.2942	0.0876	5.9711
			Imp/payments / C_GOLD / I_GOLD / GOS	0.0213	3.2277	0.0686	4.6782
			Imp/payments / C_AGRI / I_AGRI / GOS	0.0118	3.5751	0.0421	2.8684
			Imp/payments / C_COAL / I_COAL / GOS	0.0126	3.2589	0.0409	2.7904
			Imp/payments / C_NOFER / I_NOFER / GOS	0.0081	4.0452	0.0328	2.2371
			Imp/payments / C_FINAN / I_FINAN / GOS	0.0059	4.4595	0.0265	1.8052
			Imp/payments / C_OTHIN / I_OTHIN / GOS	0.008	3.2878	0.0263	1.7909
			Imp/payments / C_TRANS / I_TRANS / GOS	0.0073	3.4188	0.0248	1.6929
			Imp/payments / C_IRON / I_IRON / GOS	0.0056	3.488	0.0195	1.3304
			Imp/payments / C_HOTEL / I_HOTEL / GOS	0.006	3.2669	0.0195	1.3293
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / GOS	0.0048	3.4747	0.0165	1.126
			Imp/payments / C_CHEM / I_CHEM / GOS	0.0041	3.8854	0.0161	1.096
			Imp/payments / C_FOOD / I_FOOD / C_AGRI / I_AGRI / GOS	0.0036	4.106	0.0148	1.0064
Imp/payments	sav-inv	0.7519	Imp/payments / sav-inv	0.0611	2.6696	0.1631	21.6945
			Imp/payments / GOS / Firms / sav-inv	0.0126	3.2589	0.0412	5.4736
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / sav-inv	0.0098	3.3327	0.0328	4.3576
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / sav-inv	0.0079	3.2678	0.0257	3.4165
			Imp/payments / C_AGRI / I_AGRI / GOS / Firms / sav-inv	0.0044	3.6167	0.0157	2.0933
			Imp/payments / C_COAL / I_COAL / GOS / Firms / sav-inv	0.0046	3.2992	0.0153	2.0378
			Imp/payments / C_NOFER / I_NOFER / GOS / Firms / sav-inv	0.003	4.0948	0.0123	1.6335
			Imp/payments / C_FINAN / I_FINAN / GOS / Firms / sav-inv	0.0022	4.5121	0.0099	1.3176

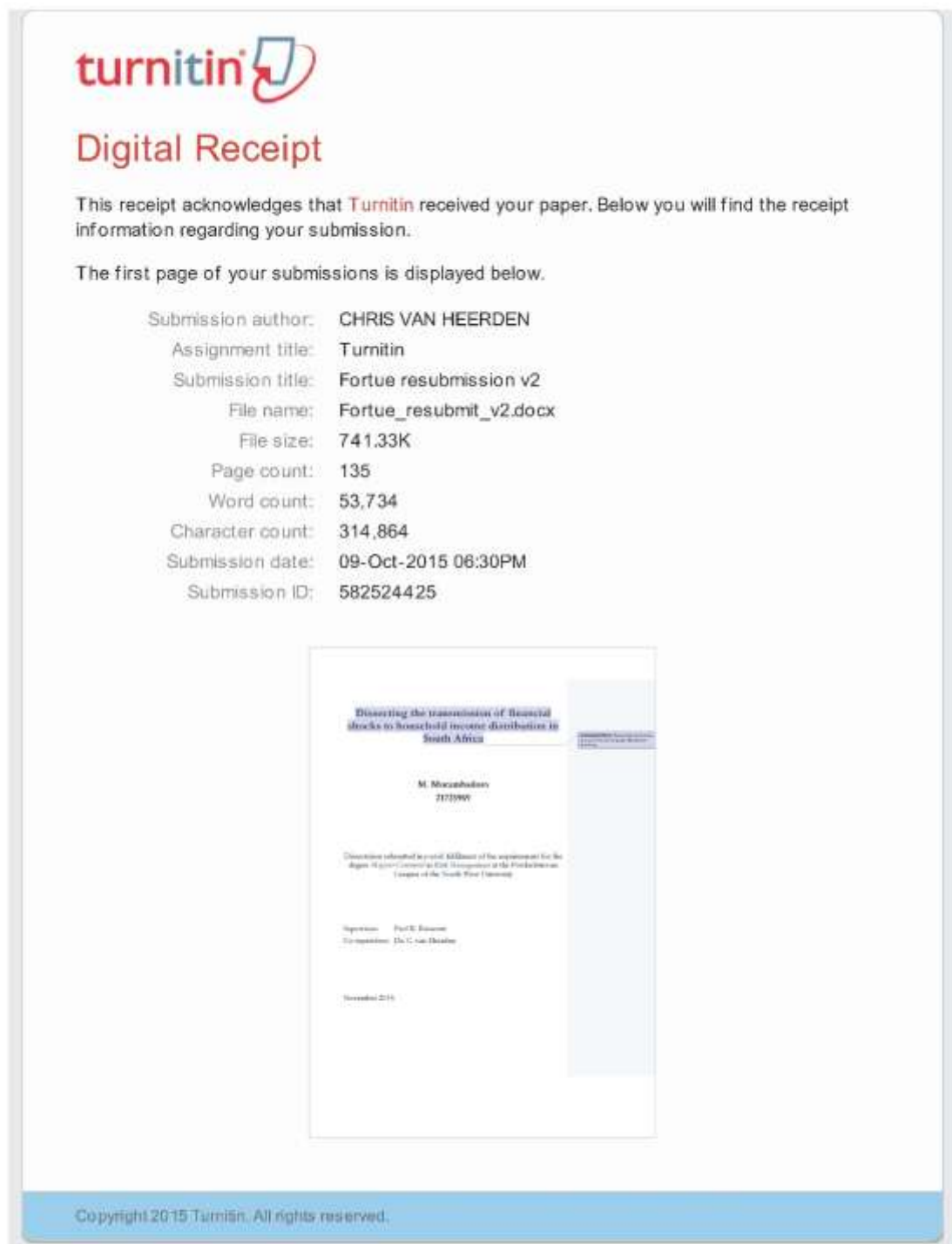
Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_OTHIN / I_OTHIN / GOS / Firms / sav-inv	0.003	3.3287	0.0098	1.308
			Imp/payments / C_TRANS / I_TRANS / GOS / Firms / sav-inv	0.0027	3.4586	0.0093	1.2354
Imp/payments	dstk	0.419391	Imp/payments / C_FOOD / dstk	0.0117	3.1599	0.0369	8.8092
			Imp/payments / C_OTHMN / dstk	0.0125	2.6806	0.0335	7.9814
			Imp/payments / C_IRON / dstk	0.0078	2.8041	0.0218	5.1919
			Imp/payments / C_MACHN / dstk	0.0036	2.8462	0.0103	2.4463
			Imp/payments / C_AGRI / dstk	0.0034	2.9743	0.0101	2.3972
			Imp/payments / C_BEV&T / dstk	0.0025	2.9096	0.0072	1.7229
			Imp/payments / C_PAPER / dstk	0.002	3.3676	0.0067	1.5971
			Imp/payments / C_FURN / dstk	0.0025	2.6467	0.0067	1.5926
			Imp/payments / C_TRANS / dstk	0.002	2.8354	0.0056	1.341
			Imp/payments / sav-inv / C_MACHN / dstk	0.0016	3.1164	0.0051	1.2257
Imp/payments	Imp/payments	2.3086106	Imp/payments / C_OTHMN / Imp/payments	0.0346	2.3989	0.0831	3.5978
			Imp/payments / C_MACHN / Imp/payments	0.0173	2.5754	0.0445	1.9283
			Imp/payments / C_VEHIC / Imp/payments	0.0114	3.2909	0.0376	1.627
			Imp/payments / C_CHEM / Imp/payments	0.0111	2.8172	0.0313	1.3545
Imp/payments	Firms	1.3671376	Imp/payments / GOS / Firms	0.0318	3.2186	0.1025	7.494
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms	0.0248	3.2942	0.0816	5.9711
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms	0.0198	3.2277	0.064	4.6782
			Imp/payments / C_AGRI / I_AGRI / GOS / Firms	0.011	3.5751	0.0392	2.8684
			Imp/payments / C_COAL / I_COAL / GOS / Firms	0.0117	3.2589	0.0381	2.7904
			Imp/payments / C_NOFER / I_NOFER / GOS / Firms	0.0076	4.0452	0.0306	2.2371
			Imp/payments / C_FINAN / I_FINAN / GOS / Firms	0.0055	4.4595	0.0247	1.8052
			Imp/payments / C_OTHIN / I_OTHIN / GOS / Firms	0.0074	3.2878	0.0245	1.7909
			Imp/payments / C_TRANS / I_TRANS / GOS / Firms	0.0068	3.4188	0.0231	1.6929
			Imp/payments / C_IRON / I_IRON / GOS / Firms	0.0052	3.488	0.0182	1.3304
			Imp/payments / C_HOTEL / I_HOTEL / GOS / Firms	0.0056	3.2669	0.0182	1.3293
			Imp/payments / C_OTHMN / I_OTHMN / C_TRANS / I_TRANS / GOS / Firms	0.0044	3.4747	0.0154	1.126
			Imp/payments / C_CHEM / I_CHEM / GOS / Firms	0.0039	3.8854	0.015	1.096
			Imp/payments / C_FOOD / I_FOOD / C_AGRI / I_AGRI / GOS / Firms	0.0034	4.106	0.0138	1.0064
Imp/payments	d0	0.0201	Imp/payments / C_GOLD / I_GOLD / lo / d0	0.0009	2.699	0.0025	12.398
			Imp/payments / C_OTHMN / I_OTHMN / lo / d0	0.0003	2.7779	0.0009	4.6372
			Imp/payments / C_AGRI / I_AGRI / lo / d0	0.0001	3.0126	0.0003	1.6735
			Imp/payments / C_COAL / I_COAL / lo / d0	0.0001	2.7332	0.0003	1.5928
			Imp/payments / C_IRON / I_IRON / lo / d0	0.0001	2.9513	0.0003	1.5616
			Imp/payments / d0	0	2.3271	0.0001	0.3009
Imp/payments	d1	0.0244	Imp/payments / C_GOLD / I_GOLD / lo / d1	0.0012	2.6999	0.0032	12.9065
			Imp/payments / C_OTHMN / I_OTHMN / lo / d1	0.0004	2.7788	0.0012	4.8274
			Imp/payments / C_AGRI / I_AGRI / lo / d1	0.0001	3.0134	0.0004	1.742
			Imp/payments / C_COAL / I_COAL / lo / d1	0.0001	2.734	0.0004	1.6581
			Imp/payments / C_IRON / I_IRON / lo / d1	0.0001	2.9522	0.0004	1.6256
			Imp/payments / GOS / Firms / d1	0.0001	3.2373	0.0003	1.0239
			Imp/payments / d1	0.0001	2.3308	0.0001	0.5143
Imp/payments	d2	0.0406	Imp/payments / C_GOLD / I_GOLD / lo / d2	0.0018	2.7078	0.0047	11.7058
			Imp/payments / C_OTHMN / I_OTHMN / lo / d2	0.0006	2.7867	0.0018	4.3779
			Imp/payments / C_AGRI / I_AGRI / lo / d2	0.0002	3.0207	0.0006	1.5791
			Imp/payments / C_COAL / I_COAL / lo / d2	0.0002	2.7419	0.0006	1.5038
			Imp/payments / C_IRON / I_IRON / lo / d2	0.0002	2.9606	0.0006	1.4743
			Imp/payments / GOS / Firms / d2	0.0001	3.25	0.0004	1.0124
			Imp/payments / d2	0.0001	2.3455	0.0002	0.4027
Imp/payments	d3	0.0528	Imp/payments / C_GOLD / I_GOLD / lo / d3	0.0022	2.7128	0.0061	11.4716

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_OTHMN / I_OTHMN / lo / d3	0.0008	2.7917	0.0023	4.2901
			Imp/payments / C_AGRI / I_AGRI / lo / d3	0.0003	3.0251	0.0008	1.547
			Imp/payments / C_COAL / I_COAL / lo / d3	0.0003	2.7469	0.0008	1.4736
			Imp/payments / C_IRON / I_IRON / lo / d3	0.0003	2.9659	0.0008	1.4447
			Imp/payments / GOS / Firms / d3	0.0002	3.2554	0.0008	1.4416
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d3	0.0002	3.3307	0.0006	1.1482
			Imp/payments / d3	0.0001	2.3552	0.0003	0.4806
Imp/payments	d4	0.0807	Imp/payments / C_GOLD / I_GOLD / lo / d4	0.0029	2.7304	0.0079	9.8511
			Imp/payments / C_OTHMN / I_OTHMN / lo / d4	0.0011	2.8092	0.003	3.6834
			Imp/payments / GOS / Firms / d4	0.0004	3.2743	0.0012	1.4933
			Imp/payments / C_AGRI / I_AGRI / lo / d4	0.0004	3.0418	0.0011	1.3272
			Imp/payments / C_COAL / I_COAL / lo / d4	0.0004	2.7643	0.001	1.2653
			Imp/payments / C_IRON / I_IRON / lo / d4	0.0003	2.9845	0.001	1.2403
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d4	0.0003	3.3494	0.001	1.1892
			Imp/payments / d4	0.0001	2.3793	0.0003	0.4097
Imp/payments	d5	0.1084	Imp/payments / C_GOLD / I_GOLD / lo / d5	0.0036	2.7472	0.0099	9.1646
			Imp/payments / C_OTHMN / I_OTHMN / lo / d5	0.0013	2.826	0.0037	3.4261
			Imp/payments / GOS / Firms / d5	0.0005	3.2916	0.0017	1.6064
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d5	0.0004	3.3665	0.0014	1.2791
			Imp/payments / C_AGRI / I_AGRI / lo / d5	0.0004	3.0581	0.0013	1.2337
			Imp/payments / C_COAL / I_COAL / lo / d5	0.0005	2.7811	0.0013	1.177
			Imp/payments / C_IRON / I_IRON / lo / d5	0.0004	3.0022	0.0013	1.1537
			Imp/payments / C_GOLD / I_GOLD / med / d5	0.0004	2.8733	0.0011	1.0046
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / d5	0.0003	3.3002	0.0011	1.0026
			Imp/payments / d5	0.0001	2.4029	0.0003	0.2923
Imp/payments	d6	0.1604	Imp/payments / C_GOLD / I_GOLD / lo / d6	0.0047	2.7819	0.013	8.1287
			Imp/payments / C_OTHMN / I_OTHMN / lo / d6	0.0017	2.8606	0.0049	3.0376
			Imp/payments / GOS / Firms / d6	0.0009	3.3219	0.003	1.8406
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d6	0.0007	3.3965	0.0023	1.4651
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / d6	0.0006	3.3304	0.0018	1.1488
			Imp/payments / C_AGRI / I_AGRI / lo / d6	0.0006	3.092	0.0018	1.0926
			Imp/payments / C_COAL / I_COAL / lo / d6	0.0006	2.8156	0.0017	1.0437
			Imp/payments / C_GOLD / I_GOLD / med / d6	0.0006	2.9022	0.0017	1.0425
			Imp/payments / C_IRON / I_IRON / lo / d6	0.0005	3.0389	0.0016	1.0228
			Imp/payments / d6	0.0001	2.4469	0.0002	0.1451
Imp/payments	d7	0.2378	Imp/payments / C_GOLD / I_GOLD / lo / d7	0.0057	2.8381	0.0162	6.8217
			Imp/payments / C_OTHMN / I_OTHMN / lo / d7	0.0021	2.9165	0.0061	2.5475
			Imp/payments / GOS / Firms / d7	0.0015	3.3624	0.0051	2.1373
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d7	0.0012	3.4366	0.004	1.7006
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / d7	0.0009	3.3709	0.0032	1.3338
			Imp/payments / C_GOLD / I_GOLD / med / d7	0.0009	2.9424	0.0026	1.1064
			Imp/payments / d7	0.0001	2.5101	0.0002	0.0827
Imp/payments	d8	0.3712	Imp/payments / C_GOLD / I_GOLD / lo / d8	0.0062	2.9505	0.0184	4.9571
			Imp/payments / GOS / Firms / d8	0.0022	3.4498	0.0074	2.0033
			Imp/payments / C_OTHMN / I_OTHMN / lo / d8	0.0023	3.0283	0.0069	1.849
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d8	0.0017	3.5234	0.0059	1.5928
			Imp/payments / C_GOLD / I_GOLD / med / d8	0.0016	3.0039	0.0048	1.2904
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / d8	0.0013	3.4583	0.0046	1.2501
			Imp/payments / d8	0.0001	2.6201	0.0003	0.0798
Imp/payments	d91	0.2998	Imp/payments / C_GOLD / I_GOLD / lo / d91	0.004	2.9138	0.0116	3.8733
			Imp/payments / GOS / Firms / d91	0.0018	3.4022	0.0063	2.0856

Origin	Destination	Global Influence	Elementary Paths	Direct Influence	Path Multiplier	Total Influence	Total/Global (in %)
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d91	0.0014	3.4765	0.005	1.6591
			Imp/payments / C_OTHMN / I_OTHMN / lo / d91	0.0014	2.9918	0.0043	1.4453
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / d91	0.0011	3.411	0.0039	1.3016
			Imp/payments / C_GOLD / I_GOLD / med / d91	0.0012	2.9747	0.0035	1.1671
			Imp/payments / d91	0	2.56	0.0001	0.0406
Imp/payments	d921	0.0998	Imp/payments / C_GOLD / I_GOLD / lo / d921	0.0015	2.7671	0.0041	4.095
			Imp/payments / C_OTHMN / I_OTHMN / lo / d921	0.0005	2.8456	0.0015	1.5304
			Imp/payments / GOS / Firms / d921	0.0004	3.2885	0.0013	1.2887
			Imp/payments / C_GOLD / I_GOLD / med / d921	0.0004	2.8635	0.0012	1.1616
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d921	0.0003	3.3635	0.001	1.0261
			Imp/payments / d921	0	2.3942	0	0.0185
Imp/payments	d922	0.1207	Imp/payments / C_GOLD / I_GOLD / lo / d922	0.0013	2.7886	0.0036	2.9779
			Imp/payments / GOS / Firms / d922	0.001	3.2862	0.0032	2.6818
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d922	0.0008	3.3613	0.0026	2.1354
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / d922	0.0006	3.2952	0.002	1.674
			Imp/payments / C_OTHMN / I_OTHMN / lo / d922	0.0005	2.867	0.0013	1.1126
			Imp/payments / C_AGRI / I_AGRI / GOS / Firms / d922	0.0003	3.6446	0.0012	1.0249
			Imp/payments / d922	0	2.4139	0	0.0266
Imp/payments	d923	0.1419	Imp/payments / GOS / Firms / d923	0.0014	3.2862	0.0046	3.2567
			Imp/payments / C_GOLD / I_GOLD / lo / d923	0.0014	2.8012	0.0041	2.859
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d923	0.0011	3.3613	0.0037	2.5932
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / d923	0.0009	3.2953	0.0029	2.0328
			Imp/payments / C_AGRI / I_AGRI / GOS / Firms / d923	0.0005	3.6446	0.0018	1.2446
			Imp/payments / C_COAL / I_COAL / GOS / Firms / d923	0.0005	3.3263	0.0017	1.2122
			Imp/payments / C_OTHMN / I_OTHMN / lo / d923	0.0005	2.8794	0.0015	1.068
			Imp/payments / d923	0	2.4271	0	0.0212
Imp/payments	d924	0.2975	Imp/payments / GOS / Firms / d924	0.0055	3.2695	0.0181	6.0716
			Imp/payments / C_OTHMN / I_OTHMN / GOS / Firms / d924	0.0043	3.3448	0.0144	4.8354
			Imp/payments / C_GOLD / I_GOLD / GOS / Firms / d924	0.0034	3.2786	0.0113	3.79
			Imp/payments / C_AGRI / I_AGRI / GOS / Firms / d924	0.0019	3.6273	0.0069	2.3212
			Imp/payments / C_COAL / I_COAL / GOS / Firms / d924	0.002	3.3097	0.0067	2.2602
			Imp/payments / C_NOFER / I_NOFER / GOS / Firms / d924	0.0013	4.1086	0.0054	1.8122
			Imp/payments / C_FINAN / I_FINAN / GOS / Firms / d924	0.001	4.5146	0.0043	1.4576
			Imp/payments / C_OTHIN / I_OTHIN / GOS / Firms / d924	0.0013	3.3385	0.0043	1.4504
			Imp/payments / C_TRANS / I_TRANS / GOS / Firms / d924	0.0012	3.4673	0.0041	1.3694
			Imp/payments / C_GOLD / I_GOLD / lo / d924	0.0012	2.9499	0.0036	1.1988
			Imp/payments / C_IRON / I_IRON / GOS / Firms / d924	0.0009	3.5415	0.0032	1.0774
			Imp/payments / C_HOTEL / I_HOTEL / GOS / Firms / d924	0.001	3.3162	0.0032	1.0762
			Imp/payments / d924	0	2.5697	0	0.0059

Source: Author's calculations structural path analysis results

Appendix B: Turn-it-in Report



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Diversifying the transmission of financial shocks to household income distribution in South Africa

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Document submitted by: Muzumbezi, M. on behalf of the Department for the Degree of Bachelor of Arts, Department of Economics at the University of the Western Cape

Supervisor: Prof. C. Erasmus
Co-supervisor: Dr. C. van der Merwe

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Appendix C: Proof of language editing

4 November 2015

To whom it may concern

Dear Sir/Madam

This is to certify that I have language edited the dissertation entitled “Dissecting the transmission of financial shocks to household income distribution in South Africa” of M Murambadoro (2172569). The text was checked for clarity and ease of reading, grammar, spelling and punctuation. The editor makes no pretension to have improved the intellectual content of the dissertation and did not rewrite any text. The editor’s suggestions are to be accepted or rejected by the author.

Kind regards

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