Impact of interest rate changes on South African GDP and households: a combined macroeconomic and social accounting matrix modelling approach

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A B S T R A C T

In this article, research findings are provided that estimate the impact of interest rate changes from a macroeconomic perspective on South African households. The study addresses the impact on the economy as a result of a 100 basis point increase in the interest rate, with the focus on households, by combining a macroeconomic model and a social accounting matrix.

The results from the macroeconomic model show a reduction of 0.54% in nominal GDP as a result of a 100 basis point increase in the nominal interest rate, given a three quarter lag. This equates to a decrease of R13 billion in the GDP (in 2009 prices). The real GDP impact is estimated at -0.22%, or a decrease of R5.3 billion. Employment opportunities are estimated to decrease by more than 26 000.

The results from the impact analysis per household and per expenditure decile show that, as expected, the biggest percentage impact as a result of the 100 basis point increase in interest rates is on higher income households. Households in the highest decile have a 0.6% decrease in expenditure compared to a -0.23% impact for the poorest households. This is as a result of households in higher income groups having relatively more access to credit, giving rise to higher average debt to household income ratios. Highly skilled individuals also have the highest percentage drop in employment at 0.28% (compared to -0.22% on average). However, the biggest employment impact (in terms of the number employed) is on the skilled, semi-skilled and unskilled and

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informal sectors of the economy, where an estimated 21 736 individuals may lose their jobs (using 2009 as the base).

The sectors that show the biggest Rand value and employment impacts, as a result of the 100 basis point increase in interest rates, are the wholesale and retail trade sector. This is to be expected given the size of the retail sector in South Africa. The biggest impact, in percentage terms, is on the beverages and tobacco sector.

Looking at the results from this model, employment accommodative economic policies would encourage lower interest rates (although the impact of lower interest rates on inflation and the impact of inflation on lower income groups should also be considered).

Key words: interest rates impact, macroeconomic modelling, economic impact modelling, South African households, social accounting matrix

Introduction

Households have always been the cornerstone of any economy, with consumption contributing the largest share to GDP in most economies. The international financial crisis of 2008 emphasised the importance of consumers and their financial wellbeing.

In South Africa (SA), household debt to disposable income of households remained between 54% and 62% during the period 1993 to 2003, whereafter it increased dramatically to reach 80.6% in 2008 (SA Reserve Bank). This resulted in debt service costs of households as a percentage of disposable income (household financial gearing ratio) increasing from less than 12% in 2003 to almost 18% in 2008 (of which 11.6% was interest only) (Mokoena 2008). Given that household disposable income was R1.512 trillion in 2008, debt service costs amounted to almost R270 billion, of which R175.4 billion consisted of interest payments. The South African Reserve Bank reduced its repo rate from a high of 12% in 2008 (Q2) to 5% in 2012 to stimulate economic growth, but given economic, inflation and interest rate cycles, these rates will have to be increased in future. The monetary policy committee considers a wide range of economic factors, including inflation targeting, unemployment and output and inflation gaps, before adjustments are made to the repo rate. Any changes in these rates have important impacts on the economy and on the financial position of households.

J.C. Jordaan

Objective, problem statement and outline of study

The objective of this paper is to combine a macroeconomic model (which includes an economic sector component) with an economic impact model. The aim is to improve our understanding of the impact of interest rate changes on households, but also to break the macro-economic results down to a more detailed product and household level.

The detailed level of analysis estimated in this paper is not easily achievable by using only a traditional macroeconomic model. This is due to the level of detail of time-series data needed to perform such an analysis, as well as the theoretical foundations and time that are required to construct such a model. Furthermore, a monetary shock, such as a change in the interest rate, is not simple to estimate by applying only an economic impact model based on a social accounting matrix (SAM).

Therefore, the aim of this paper is to combine the result from a macroeconomic model with a SAM-based model in a way that makes it possible to have a 'top down' macro analysis (with a time component), as well as detailed impact results from an economic impact modelling exercise. As a result, the impact of macroeconomic changes can be reviewed on a household level, by means of the said models. The research question to be answered in this article is whether a 100 basis point hike in the repo rate will impact the real GDP, and if so, how this will impact SA households (and by how much)?[1]

The paper is organised as follows. The next section provides a brief overview of international and domestic literature on the impact of interest rate changes on economic growth. This is followed by a short overview of the theoretical basis of the research by firstly focusing on macroeconomic models and economic sector impact models, and lastly social accounting matrices (SAMs) and the Leontief inverse framework, which is a method for producing an economic impact model. Thereafter the results and household impact analysis are presented for the combination of the macroeconomic and economic sector model with a SAM to estimate the impact on the economy of a 100 basis point increase in the repo rate. The conclusion provides sound guidelines for policy implications and identifies potential future research opportunities that could build on this pioneering research project.

Literature review of the impact of interest rate change on economic growth

According to Di Giovanni, McCrary and Wachter (2009), a recurring question in economics is the extent to which monetary policy interventions affect the real

economy. This is a central research theme of numerous studies – see for example Christiano, Eichenbaum and Evans (1999), Romer and Romer (1989) and Sims (1972, 1980), including work done by the 2011 Economic Nobel Prize winners, Sargent and Sims, who researched the impact and causal relationships of unexpected shocks in the economy. These include, for example, the impact of an interest rate or tax cut on GDP or inflation, or the impact of a change in the price of oil, or lower growth in the US (Sargent and Sims 2011).

An increase in interest rates makes the cost of money more expensive and may crowd out private demand, particularly when investments show a significant sensitivity to changes in interest rates. This could lead to a decrease in aggregate demand, both directly through investment and indirectly through a lower wealth effect in the private sector and subsequent lower consumption. However, higher interest rates could also lead to an increase in savings and could attract foreign inflows that could lead to a currency appreciation. This is especially true in a fairly small open economy, with a flexible exchange rate regime and relatively mobile capital such as SA (Briotti 2005).

Di Giovanni et al. (2009) found that interest rates lower quarterly real growth only moderately. Their results, using an ordinary least squares (OLS) methodology, show that a 1 percentage point increase in the interest rate in the Netherlands resulted in a 0.094 percentage point decrease in the real growth rate. A similar increase in the interest rate in France gave rise to only a 0.015 percentage point decrease in the real growth rate. Their research shows an average interest rate effect of -0.043 on real growth across 12 European countries.

Research by the Organisation for Economic Co-operation and Development (OECD) (2008) shows that the impact on the US GDP (four to six quarters later) as a result of a 100 basis point increase in the real short-term interest rate is -0.09% (using a reduced form estimation) and -0.06% (using a vector autoregression model). This research was done using quarterly data spanning the period 1990 (Q4) to 2007 (Q3).

According to research by the European Central Bank (ECB) (2002), the impact on real GDP as a result of a 100 basis point increase in the ECB repo rate is -0.34% after the first year and -0.71% after the second year, while the impact on consumer prices is -0.15% after the first year and -0.30% after the second year (see Table 1). The impact shown by the NCB (the ECB's macroeconometric model) is slightly lower, with a real GDP impact of -0.38% after year two and a reduction of -0.21% in the consumer prices. The NiGEM model shows a decrease of 0.47% in real GDP during year two.

Table 1: Responses to a one percentage point increase in the policy-controlled interest rate of the Euro area

	Real GDP (%)			Consumer prices (%)		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
AWM	-0.34	-0.71	-0.71	-0.15	-0.30	-0.38
NCB	-0.22	-0.38	-0.31	-0.09	-0.21	-0.31
NiGEM	-0.34	-0.47	-0.37	-0.06	-0.10	-0.19

Note: Simulations are performed using ECB's area-wide model (AWM), the ECB's macroeconometric models (NCB) and the multi-country model (NiGEM) of the National Institute of Economic and Social Research (NIESR) (ECB 2002).

Aron and Muellbauer (2002) researched the interest rate effect on output in South Africa over different policy periods using multistep forecasting techniques in estimating stochastic trends to predict output growth in SA one year ahead. Their models offer important insights on monetary policy transmission. According to their research, levels of real rates influence output, and the effects persist for up to three years, even without feedback effects via other explanatory variables. However, the impact of nominal interest rates on the economy is decreasing: "a one percentage point rise in the prime rate now has a smaller direct effect on output than before the shift in monetary policy in the early 1980s…" According to Aron and Muellbauer (2002), nominal rises in interest rates and the level of the real rate both have strong negative effects on subsequent growth. They show an impact of a real prime rate change on GDP that varies between -0.13% for the period between 1979 and 2000 (using different control variables in the equation) and -0.325% for the period between 1970 and 2000 (without control variables in the equations).

Table 2: Impact on real output in South Africa (%)

	Dependent variable $\Delta_4$log (y) (+4)	1963–2000	1970–2000	1963–1994	1979–2000
1	RPRIME (-4)	-0.318	-0.325	-0.322	-0.286
2	RPRIME (-4)	NA	-0.233 to -0.152	NA	-0.162 to -0.134

Note: This table shows only a selection of the results: 1) indicates estimation with a stochastic trend, 2) indicates estimation outputs for the different periods after the inclusion of additional variables. RPRIME is the real prime interest rate (four quarter moving average), $\Delta_4$log (y) (+4) is the annualised real GDP growth rate (seasonally adjusted).

Saymeh and Abu Orabi (2013) used regression analysis to estimate the impact of interest rates (among other variables) on real GDP for Jordan from 2000 to 2010. They found that a one period lagged interest rate had a significant impact on GDP, with a coefficient of -0.152. With a generalised autoregressive conditional heteroskedasticity

(GARCH) regression, they estimated a lagged interest rate impact of -0.34 on real GDP (using log variables).

The next section gives a brief overview of modelling in general and the models that have been used in estimating the impact of interest rate changes in this article.

Economic impact modelling methodology

Economic impact analysis, such as the impact of a sharp change in exchange rates, a slowdown in world economic growth, increases in interest rates, or the introduction of a new policy or investment, forms a central part of applied macroeconomics. There is considerable literature that promotes the understanding of these impacts and quantifies them. These include various theories, methodologies and 'tools', which can range from intuitive understanding of impacts and causal relationships – such as in *Freakonomics* by Levitt & Dubner (2005) – to theoretical explanation (Keynesian, New Classical, Monetarists, etc.) and expert opinion obtained by means of focus groups. Other methods include a comparison of events with similar historic events using historic data (time-series data) and historic outcomes and, lastly, with the advent of computers, more advanced calculations and techniques have become possible, combining historical data with theories and statistical 'tools' to provide econometric outcomes – these include, for example, structural macroeconomic models, vector autoregressive models (VARs), vector error correction models (VECMs) and computable general equilibrium models (CGEs).

In this article, the results from a South African macroeconomic model, with a separate economic sector model and a SAM-based economic impact model, are combined to estimate the impact of an interest rate increase on households in the South African economy. The interest rate 'shock' is introduced in the macroeconomic model from Q1 2008, where the repo rate is increased by 100 basis points. The results of this 'shock' for 2009 are shown in a later section. Figure 1 shows how the suite of economic models is linked to obtain the results from where the repo rate is increased by 100 basis points, to the point where the results from the economic sector model are used to shock the economic impact model.

Macroeconomic model

One method used to perform economic impact modelling is structural macroeconomic modelling. These types of models are constructed to represent the economy (from a macro point of view) by combining historic data, economic theory and statistical principles. The macroeconomic model can be seen as a high-level representation of
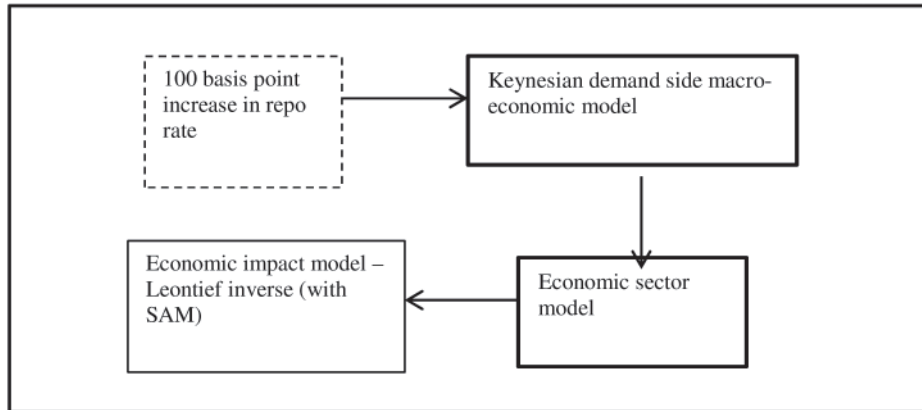
J.C. Jordaan

Figure 1: Suite of economic models used

economic behaviour, and when unexpected shocks are introduced into the model, the impact of these events (or exogenous shocks) can be calculated by taking into account divergence from a base case simulation.

Macroeconomic models are basically used for three reasons: firstly, to test economic theories, secondly to perform economic forecasts and finally, to understand how both unexpected shocks and policy shifts affect macroeconomic variables in the short and long term (Sargent and Sims 2011).

The macroeconomic model used in this research is a Keynesian demand-side model built using quarterly data from 1995 (Q1) to 2010 (Q4) and is expressed (where applicable) using un-annualised and not seasonally adjusted data. It is built in real (constant) prices. The emphasis of this article is not to show the detailed estimation and regression and statistical results of the macroeconomic model, but rather the results of this model. Future research will focus on the detailed specifications and equations of the said model.

The basic transmission mechanism captured in the macroeconomic model, as a result of the increase in the repo rate, is as follows: consumption and investment will decrease, *ceteris paribus*, as a result of the higher cost of borrowing. The lower levels of demand together with higher interest rates will lead to lower levels of the Johannesburg Stock Exchange (JSE) all share index, fewer imports and a lower GDP and higher unemployment. Furthermore, an increase in interest rates will, *ceteris paribus*, lead to a decrease in inflation that will result in an appreciating currency. The appreciating currency will lead to lower exports and higher imports.

Economic sector model

The macroeconomic model is linked to an economic sector model with the following sectors: agriculture; coal mining; gold mining; other mining; manufacturing; electricity, gas and water; construction; trade (wholesale and retail); transport and storage; communication; financials; general government; and other producers (community and personal services excluding government). This model is linked with the macroeconomic model in such a way that variables such as GDP, unemployment, inflation, exchange rates, consumption expenditure, etc. from the macroeconomic model, together with the same set of exogenous variables such as oil prices, interest rates and the gold price, drive the economic sector model.[2]

SAM-based economic impact model

Economic impact models based on a SAM can vary from more simplistic fixed structure Leontief inverse models to CGE or dynamic CGE models. A SAM, which forms the basis of these models, is a set of accounts written in matrix format and elaborates the linkages between supply and use tables, as well as institutional sector accounts in an economy for a specific period – usually a year. SAMs map the flows in the economy between different role players, such as consumers, producers, factor markets, product markets, imports and exports. Households and the government form an integral part of the matrix and also show the distributional elements in the economy. SAMs are generally used in monitoring the impact of government policies and/or external influences on non-monetary variables. These include the impacts of investment projects, changes in employment levels and skills development.

SAMs map the flows in an economy between different role players, such as consumers and producers, factor markets and product markets, imports and exports. These institutional agents are both buyers and sellers in the economy.

Institutional agents (firms, households, government and the 'rest of economy' sector) are both buyers and sellers. In a SAM, the columns represent buyers (expenditures, demand, use) and the rows represent sellers (receipts, supply). SAMs were created to identify and present monetary flows from sources to recipients, within a disaggregated national account. A SAM is read from column to row, so each entry in the matrix comes from its column heading, going to the row heading. SAMs are squared matrices, and the sum of columns and rows are added to equal each corresponding equal up to ensure accounting consistency, and each column is added up to equal each corresponding row.

Table 3 shows a SAM for a basic open economy, the items being (Mitra-Kahn 2008):

C = Consumption from households and paid to firms; T = Taxes; W = Wages; M = Imports;

X = Exports; S = Savings; I = Investment; G = Government transfers; $_F$ = Firms; $_H$ = Households; $_G$ = Government; $_C$ = Consumption goods; $_K$ = Capital goods.

Table 3: A typical SAM for an open economy

	Firm	Household	Government	Rest of economy	Net investment	Total (received)
Firm		C	G_F	$(X-M)_K$	I	$C+G_F+(X-M)_K+I$
Household	W		G_H	$(X-M)_C$		$W+G_H+(X-M)_C$
Government	T_F	T_H				T_F+T_H
Rest of economy	$(X-M)_K$	$(X-M)_C$				$(X-M)_K+(X-M)_C$
Net investment		S_H	S_G			S_H+S_G
Total (expended)	$W+T_F+(X-M)_K$	$C+T_H+(X-M)_C+S_H$	$G_F+G_H+S_G$	$(X-M)_C+(X-M)_K$	I	

Source: Mitra-Kahn (2008)

A SAM is generally used in monitoring the impact of government policies and/or external influences on non-monetary variables such as employment levels, skills development training and demographic changes (Stats SA 2004).

The next section provides an overview and discussion of the results obtained from the suite of models.

Economic impact results obtained by combining a suite of models

The 100 basis point increase in the repo rate was introduced in 2008 (Q1), and the impact is estimated for 2009. The output from the impulse response shock from the macroeconomic model is used as an input shock for the economic impact model that is based on the 2009 SAM. The results from the macroeconomic model are shown in Table 4.

The nominal GDP impact, as a result of the 100 basis point increase in the repo rate, is a reduction of 0.54% (or 0.21 percentage points, or a decrease of R13 billion in 2009 prices). The real GDP impact is estimated at -0.22% or a decrease of R5.3 billion.

Table 4: Results from the SA macroeconomic model as a result of a 100 basis point increase in the SA repo rate

Variables	Impact (2009) (%)	Value impact (2009 prices)	2009 nominal base value
GDP Nominal (2009)	-0.54 (-0.21 percentage points)	-R13 billion	R2 407.9 billion
GDP Real (2009)*	-0.22 (-0.116 percentage points)	-R5.3 billion	R2 407.9 billion
GDP deflator	-0.32 (-0.63 percentage points lower)	-R7.7 billion	
Real consumption expenditure by households (2009)	-0.24	-R3.54 billion	R1 473.49 billion
Exports	-0.02	-R0.13 billion	R657.11 billion
Imports	-0.11	-R0.746 billion	R677.74 billion
Rand/dollar	-0.31		
Consumer price inflation (CPI)	-0.38 (-0.6 percentage points lower)		
Long-run interest rate	(0.49 percentage points higher)		

*Both the real and nominal GDP are expressed in 2009 prices for ease of comparison. The 2009 real GDP in 2005 constant prices is R1 782.26 million. The GDP, import, export and consumption expenditure figures may have been updated in later Reserve Bank publications.

The magnitude of this impact is in line with the 0.15% to 0.34% decrease mentioned in the literature review. This real impact,[3] together with the impact results from the economic sector model (shown in Table 5), are used to estimate the detailed impact through the SAM-based economic impact model.

Real household consumption expenditure is expected to decrease by 0.24% (R3.54 billion), exports by 0.02% and imports by 0.11%. The exchange rate is expected to appreciate slightly by 0.31%, CPI to decrease by 0.38% (or 0.6 percentage points) and long-term interest rates to increase by 0.49 percentage points.

Table 5 shows the sector impact, using the sector economic model that is linked to the macroeconomic model.[4] The results from this model show a negative impact on the compensation of employees (COE) (in nominal terms) across all sectors as a result of the 100 basis point increase in the interest rate. The COE for the electricity, gas and water sector is the largest. This result comes from the wage function and is the combination of a higher than inflationary wage adjustment and a very low growth in productivity when measured as the sector gross value added (GVA) output per employee.[5] The gross operating surplus (GOS) is also negative in all sectors except government. The GOS impact is the largest in the transport and storage sector at -2.01%, followed by -0.874% in the communication sector. The -2.01% GOS in the transport and storage sector is the result of a relatively large additional direct impact that interest rates have on this sector (given the sector-specific equation).

The government sector has a positive GOS impact of 0.007% and the gold mining sector shows a small negative impact of 0.009%. The positive estimated GOS for government results from the negative values in the net operating surplus (NOS) for government between 1992 and 2002. The small negative GOS for gold mining also results from the NOS equation where the NOS shows numerous negative periods for the gold mining sector in its historic data.

The employment impact is negative across all sectors. The sectors with the highest percentage employment impact, given the results from the model, are the general government, agriculture and manufacturing sectors. The sectors with the largest number of employment opportunities lost, according to the results, are the trade sector (wholesale and retail), general government, manufacturing and communication. The model shows an employment loss of more than 25 000 opportunities. The results from the sector model show a change in the GVA of between -0.195% for the gold mining sector and -1.086% for the transport and storage sector.

Table 5: Estimated impact results as a result of a 100 basis point increase in the repo rate (nominal impact)

Macroeconomic model results: September 2011 (for 2009)	COE (%)	GOS (%)	Employment (formal and informal) (%)	Employment (formal and informal) (number)	GVA (%)
Agriculture	-0.297	-0.202	-0.246	-1 856	-0.232
Coal mining	-0.478	-0.240	-0.083	-47	-0.333
Gold mining	-0.281	-0.009	-0.042	-59	-0.195
Other mining	-0.432	-0.194	-0.061	-151	-0.257
Manufacturing	-0.951	-0.563	-0.207	-3 057	-0.974
Electricity, gas and water	-1.129	-0.462	-0.026	-16	-0.845
Construction	-0.254	-0.240	-0.019	-142	-0.248
Trade (wholesale and retail)	-0.824	-0.402	-0.176	-7 114	-0.701
Transport and storage	-0.511	-2.012	-0.059	-240	-1.086
Communication	-0.473	-0.874	-0.148	-3 474	-0.843
Financials	-0.326	-0.353	-0.156	-3 038	-0.352
General government	-0.646	0.007	-0.266	-6 122	-0.639
Other producers (community and personal services excluding government)	-0.655	-0.637	-0.04	-85	-0.653
Total				-25 420	

Note: COE is compensation of employees, GOS is gross operating surplus and GVA is gross value added. Trade also includes wholesale, retail, motor trade, hotels and restaurants; financials also include business services.

The GVA impact estimated in the sector model is used to create an impact for the economic impact model (the impact is created by multiplying the GVA per sector in the SAM by the percentage GVA estimated as shown in Table 5). These input values were adjusted by a factor so that the total GVA from the economic impact model is equal to the GDP estimated in the macroeconomic model. These values in the economic impact model had to be adjusted downwards, given the multiplier impact in the economic impact model and the risk of overestimating the GDP impact if no adjustment is made.[6]

The results reflect several negative employment impacts, with the largest percentage change in the general government, agriculture and manufacturing sectors and the smallest impacts in construction, other producers and personal services, and gold mining. The largest negative GVA impact is on the transport and storage sector followed by manufacturing. Gold mining, other mining, construction and financials have the smallest negative impact.

Results from the SAM economic impact model

Table 6 shows the summary results from the economic impact model.[7] The SA GDP in 2009 was R2.395 trillion, and the total employment (formal and informal) is estimated at 12.2 million, of which 9.9 million are formal employees, using combined data from the quarterly employment statistics (QES) and the quarterly labour force survey (QLFS), both from Stats SA.

Table 6: Summary output from the economic impact model

	Impact	% impact
GDP 2009 (R mil)	2 395 967	
Total implied employment (number)	12 166 418	
Total implied formal employment (number)	9 953 642	
Direct injection (R mil)	-3 269	
GVA (R mil)	-5 347	-0.22
Exports (R mil)	-211.87	-0.03
Imports (R mil)	-992.37	-0.17
Taxes on production (R mil)	-75.17	-0.24
Taxes on products (R mil)	-373.09	-0.2
Import duties (R mil)	-47.72	-0.16
Direct corporate and personal income taxes (R mil)	-819.74	-0.22
Total savings and investments (R mil)	-795.25	-0.23
Household savings and investments (R mil)	-41	-0.17

Table 6 continued

	Impact	% impact
Household expenditure (R mil)	-3 919	-0.27
Employment (number)	-26 536	-0.22
Formal (number)	-21 710	-0.22
Highly skilled (number)	-4 800	-0.28
Skilled (number)	-10 874	-0.26
Semi-skilled and unskilled (number)	-6 036	-0.15
Informal (number)	-4 826	-0.22

Note: Percentage impacts show the results as a percentage of SA 2009 GDP and the total estimated employment in the case of the employment impact figures.

A direct negative impact of R3.269 billion is used in the economic impact model to simulate a real GDP impact of 0.22% (or R5.34 billion, which was estimated with the macroeconomic model, see Table 4). The difference between -R3.269 billion and -R5.34 billion is as a result of the multiplier effect in the economic impact model. This translates, using the economic impact model, into a reduction of R211.8 million (0.03%) in exports, R992.3 billion (0.17%) in imports; a drop of R75.1 million in taxes on production (0.24%), R373.09 million in taxes on products (0.2%) and R47.7 million less in import duties (0.16%). Direct corporate taxes are reduced by R819.7 million, and savings and investment are reduced by R795 million. Household expenditure is R3.9 billion lower, and the total employment opportunities decrease by 26 500 (of which 21 700 are in the formal sector). This employment impact is calculated using a ratio of the number of employment opportunities per sector for a R1 million output of a sector.

Values for variables such as exports, taxes and savings and investments are not a direct result from the model, but are calculated using the structure of the SAM and are derived from the results.

Table 7 presents results from the economic impact model (based on the SAM), and shows the change in combined labour income for different skills levels as a result of the estimated 100 basis point increase in the repo rate. Although the greatest impact in Rand terms (R978.86 million) is for workers with a tertiary education, the greatest percentage impact (-0.22%) is for workers with only a primary education (this compares to a slightly lower -0.20% for workers with tertiary education). This implies that interest rate increases have a slightly greater negative impact on poor uneducated households compared to better educated and more affluent households (the correlation between poorer uneducated individuals versus richer educated individuals is also clearly visible from the SAM). The large number of unskilled

and semi-skilled employment opportunities that are lost (shown in Tables 5 and 6) further drive the loss in labour income.

Table 7: Labour income (values in percentage changes)

Labour per skills level	Impact R million (2009 prices)	Impact % change
Labour with primary school education (grades 1–7)	-148.94	-0.22
Labour with middle school education (grades 8–11)	-404.05	-0.22
Labour completed secondary school education (grade 12)	-706.88	-0.21
Labour with tertiary education (certificates, diplomas or degrees)	-978.86	-0.20
Total	-2 230.73	

Figure 2 shows the percentage impact per sector. The beverages and tobacco sector, at -0.4%, shows the greatest impact, followed by glass products (-0.37%), electricity and gas distribution (-0.34%) and petroleum products (-0.33%). The least affected sectors are the construction sector (-0.07%), public administration (-0.09%) and other mining (-0.15%).

Figure 3 shows the formal employment impact per sector. The wholesale and retail trade sector shows the greatest impact at -3 799 of formal sector employment opportunities, followed by real estate activities (-2 192), public administration (-1 971) and other business activities (-1 677).

Figure 4 shows the formal and informal employment impact per sector, using disaggregated employment data from Quantec (2012). The figure shows that the greatest impact with respect to job losses is on the wholesale and retail trade sector, with more than 6 270 estimated job losses. Informal job losses are estimated at more than 2 470 (or 39%), while highly skilled job losses amount to 8% (or 500). Job losses in real estate activities are estimated at 2 400, with more than 58% being skilled employees. Other mining and agriculture show a large percentage of job losses among semi-skilled and unskilled workers, with losses amounting to an estimated 840 each (or 79% and 78% for the two sectors respectively).
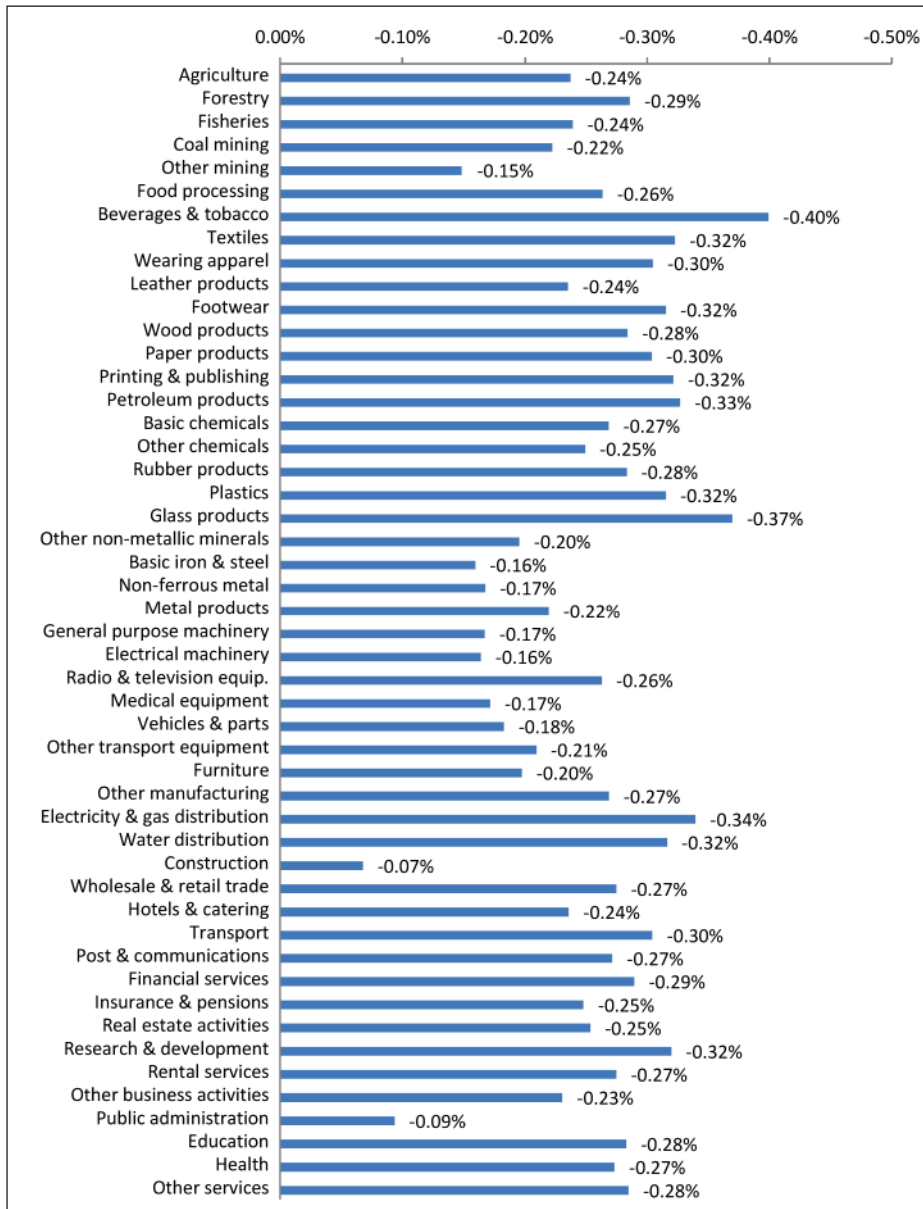
Figure 2: Total percentage change in the output per sector for activities

Impact of interest rate changes on South African GDP and households
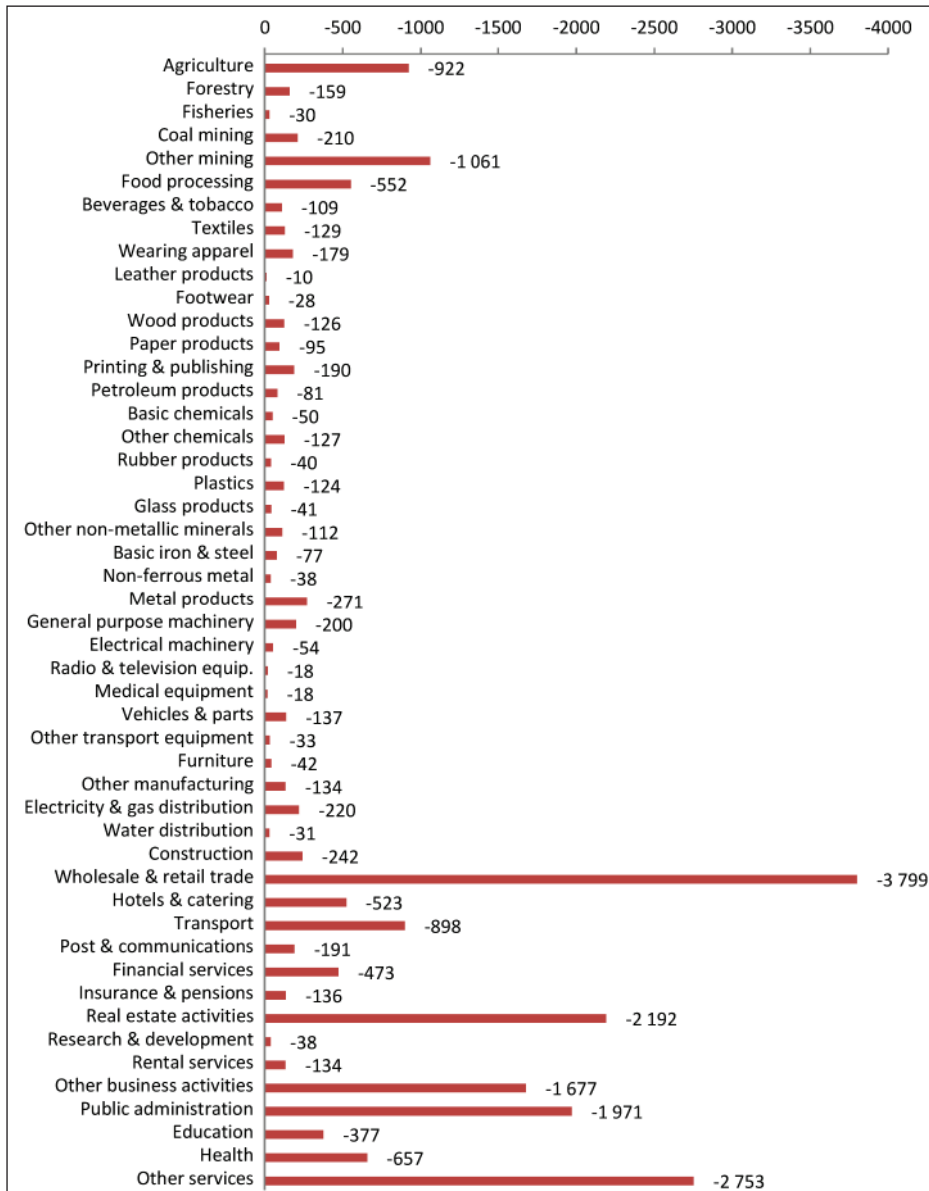
Figure 3: Formal employment impact per sector
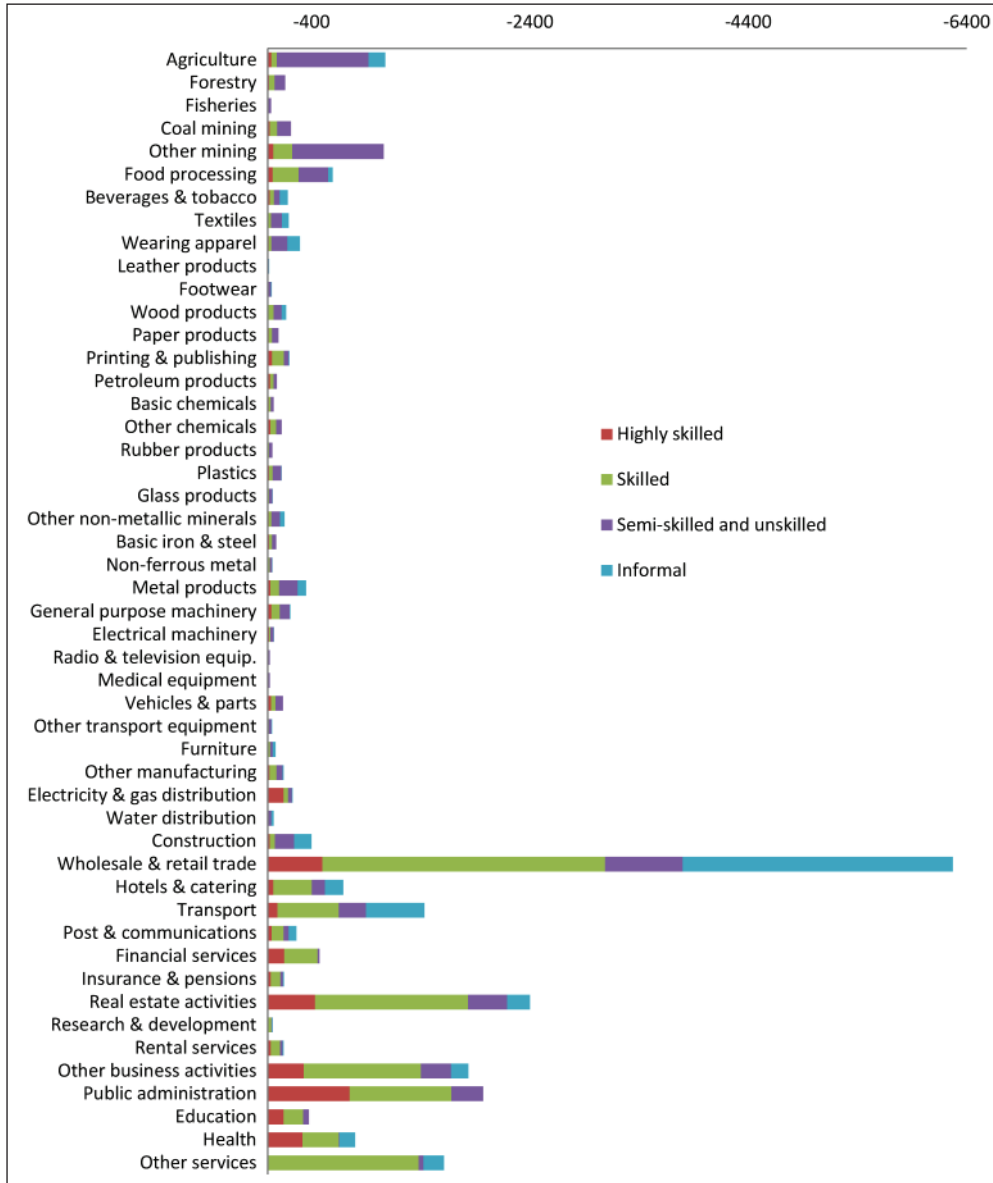
Figure 4: Formal and informal employment impact per sector

Table 8 shows the impact, as a result of a 100 basis point increase in the repo rate, on household expenditure for the different income deciles (or percentiles[8] for the upper income group). Lower income groups are not only less impacted on in Rand terms, but also in percentage terms. The average percentage impact is -0.56%, with a -0.23%

impact on decile 1 households and a -0.6% reduction in household expenditure, or an average reduction of R1 503.9 per household for decile 10 households.

Table 8: Impact per household per expenditure decile (in real terms)

Household expenditure per decile		Number of households per decile or percentile ('1000)	Total impact (R million, 2009 prices)	Impact per household decile per year (in Rand terms, 2009 prices)	Percentage impact
Decile 1		1 245.8	-32.60	-26.2	-0.23
Decile 2		1 245.8	-62.65	-50.3	-0.36
Decile 3		1 245.8	-87.59	-70.3	-0.42
Decile 4		1 245.8	-113.72	-91.3	-0.44
Decile 5		1 245.8	-149.53	-120.0	-0.53
Decile 6		1 245.8	-190.03	-152.5	-0.54
Decile 7		1 245.8	-253.57	-203.5	-0.57
Decile 8		1 245.8	-387.12	-310.7	-0.56
Decile 9		1 245.8	-769.68	-617.8	-0.57
Percentile 90–92		249.2	-228.61	-917.5	
Percentile 92–94		249.2	-261.79	-1 050.7	
Percentile 94–96	Decile 10	249.2	-324.97	-1 304.3	-0.60
Percentile 96–98		249.2	-406.59	-1 631.8	
Percentile 98–100		249.2	-650.41	-2 610.4	
Total		12 458	-3 918.87	-314.6	-0.56

The results from Table 8 were used together with expenditure data from the 2005/06 Statistics SA Income and Expenditure Survey (Stats SA 2008) to estimate what the impact would be on expenditure as a result of a 100 basis point increase in the repo rate.

Table 9 shows the total estimated Rand impact (in millions), using the data from Table 8. The sectors experiencing the largest impact are the housing, water, electricity, gas and other fuels sectors (in real terms, R924 million less is spent in these categories). About R780 million less is spent on transport, and R565.6 million less on food and non-alcoholic beverages. These sectors are also the sectors with the highest average household expenditure impact, as shown in Table 10. The average household spend will be R314.6 less per year (at 2009 prices) as a result of a 100 basis point increase. The upper decile (highest income – on average R248 823 per year) will spend, on average, R1 503.90 less per year, and the lower decile (lowest income – on average earning R11 381 per year) on average -R26.20 less per year.

Although the higher income households pay the burden of the higher interest rate (in Rand and percentage terms), the uneducated or lower educated and lower income (i.e. poorer) households suffer the most through job losses. This is expected, given the structure of the economy and the large number of lower income individuals. However, when poorer households also have significant levels of outstanding debt, this potential impact on them can be much larger. The International Monetary Fund (IMF) mentions that households are most vulnerable to rising interest rates, particularly with respect to mortgages. The share of vulnerable households and debt-at-risk increases fairly sharply under rising interest rate scenarios, with a strong impact on lower-income households (IMF 2012). This is also supported by Kida (2009), who mentions that although most households in New Zealand remain mortgage-free, and the most debt is held by high income households; the debt-service ratio indicator suggests that lower-income indebted households are more vulnerable to interest rate increases.

Tables 9 and 10 summarise household expenditure, and a more detailed breakdown is provided in Table 11. Total expenditure on food and non-alcoholic beverages, for example, is estimated to decrease by R565.6 million (see Table 9), or, on average, R45.4 per household (with expenditure on bread and cereals expected to decrease the most). Average expenditure on transport is estimated to decrease by R360 per annum for affluent households (decile 10) (or R489.9 million in total for affluent households). Motor cars account for R253 of the R360 average expenditure per annum.

The biggest estimated decreases will be in housing, water, electricity, gas and other fuels expenditure, and in the transport expenditure group, decreasing by R924.4 million and R780.3 million respectively. Miscellaneous goods and services are shown to decrease by R563.98 million; with insurance connected with health, and insurance connected with dwellings showing the largest decreases in this expenditure group.

Impact of interest rate changes on South African GDP and households

Table 9: Total household expenditure impact per income decile (in Rand millions)[9]

					Income deciles						Total
	Lower	2	3	4	5	6	7	8	9	Upper	
Average household size	2.8	3.3	3.8	4.4	4.7	4.9	4.6	4.4	3.8	3.6	3.8
					Rand impact (millions) (2009 prices)						
Food and non-alcoholic beverages	-10.7	-20.7	-27.0	-33.8	-43.2	-49.51	-56.21	-64.87	-85.43	-137.46	-565.65
Alcoholic beverages and tobacco	-0.69	-1.34	-1.51	-2.07	-2.73	-3.90	-4.90	-5.44	-7.96	-12.71	-45.15
Clothing and footwear	-2.66	-5.03	-7.26	-9.32	-12.2	-14.47	-19.23	-24.04	-34.15	-58.13	-194.09
Housing, water, electricity, gas and other fuels	-6.18	-11.05	-16.6	-20.7	-27.3	-34.82	-50.57	-86.63	-189.77	-492.33	-924.37
Furnishings, household equipment and routine maintenance of the dwelling	-2.02	-4.52	-7.18	-9.41	-11.6	-15.89	-19.87	-28.18	-45.59	-124.41	-269.95
Health	-0.43	-1.04	-1.41	-1.78	-2.68	-3.23	-3.56	-6.07	-12.23	-32.94	-65.11
Transport	-3.42	-7.73	-9.58	-12	-17	-25.12	-36.16	-63.39	-175.92	-448.92	-780.26
Communication	-0.98	-1.82	-2.88	-3.61	-5.25	-6.36	-9.94	-14.40	-27.61	-65.25	-137.42
Recreation and culture	-0.72	-1.39	-2.69	-3.49	-5.33	-7.46	-10.58	-14.86	-32.80	-105.18	-180.20
Education	-0.71	-1.19	-1.58	-2.29	-2.91	-3.17	-5.98	-15.06	-20.91	-41.36	-94.64
Restaurants and hotels	-1.37	-1.44	-1.94	-2.34	-3.36	-5.18	-6.63	-7.75	-16.42	-38.40	-85.98
Miscellaneous goods and services	-2.66	-5.19	-7.65	-12.2	-15.3	-20.35	-29.17	-55.20	-118.70	-308.90	-563.98
Other unclassified expenses	-0.07	-0.12	-0.19	-0.27	-0.37	-0.58	-0.78	-1.22	-2.21	-6.40	-12.00
Total	-32.6	-62.65	-87.5	-113	-149	-190	-253.5	-387.1	-769.6	-1 872.3	-3 918.87

Table 10: Average household expenditure impact per income decile in Rand terms

	Income deciles										Average
	Lower	2	3	4	5	6	7	8	9	Upper	
Average household size	2.8	3.3	3.8	4.4	4.7	4.9	4.6	4.4	3.8	3.6	3.8
	Average household impact per year (2009 Rand values)										
Food and non-alcoholic beverages	-8.59	-16.69	-21.72	-27.13	-34.71	-39.73	-45.11	-52.10	-68.51	-110.41	-45.40
Alcoholic beverages and tobacco	-0.55	-1.08	-1.21	-1.66	-2.19	-3.13	-3.93	-4.37	-6.38	-10.21	-3.62
Clothing and footwear	-2.14	-4.04	-5.83	-7.48	-9.86	-11.62	-15.43	-19.31	-27.39	-46.69	-15.58
Housing, water, electricity, gas and other fuels	-4.96	-8.88	-13.35	-16.67	-21.96	-27.95	-40.58	-69.59	-152.18	-395.45	-74.20
Furnishings, household equipment and routine maintenance of the dwelling	-1.62	-3.63	-5.75	-7.56	-9.35	-12.75	-15.95	-22.64	-36.56	-99.93	-21.67
Health	-0.35	-0.84	-1.13	-1.43	-2.15	-2.59	-2.85	-4.87	-9.81	-26.46	-5.23
Transport	-2.75	-6.21	-7.68	-9.91	-13.66	-20.16	-29.02	-50.91	-141.07	-360.58	-62.63
Communication	-0.78	-1.46	-2.31	-2.90	-4.21	-5.10	-7.97	-11.57	-22.14	-52.41	-11.03
Recreation and culture	-0.58	-1.12	-2.16	-2.80	-4.28	-5.99	-8.49	-11.94	-26.30	-84.48	-14.46
Education	-0.57	-0.95	-1.26	-1.84	-2.33	-2.54	-4.80	-12.10	-16.77	-33.22	-7.60
Restaurants and hotels	-1.10	-1.16	-1.56	-1.88	-2.70	-4.16	-5.32	-6.22	-13.16	-30.84	-6.90
Miscellaneous goods and services	-2.14	-4.17	-6.14	-9.80	-12.31	-16.33	-23.41	-44.34	-95.19	-248.11	-45.27
Other unclassified expenses	-0.05	-0.10	-0.15	-0.22	-0.29	-0.47	-0.62	-0.98	-1.77	-5.14	-0.96
Total	-26.19	-50.32	-70.24	-91.27	-120.00	-152.51	-203.50	-310.94	-617.22	-1 503.92	-314.57

Table 11: Detailed expenditure breakdown for the different income deciles (average 2009 Rand values per product per household income decile)

Expenditure group	Income deciles										Average
	Lower	2	3	4	5	6	7	8	9	Upper	
Average household size	2.8	3.3	3.8	4.4	4.7	4.9	4.6	4.4	3.8	3.6	3.8
	Average household impact per year (2009 Rand values)										
Food and non-alcoholic beverages	-8.59	-16.6	-21.7	-27.1	-34.7	-39.7	-45.1	-52.1	-68.5	-110	-45.4
Bread and cereals	-2.54	-5.03	-6.49	-7.67	-9.13	-9.70	-10.2	-10.4	-10.7	-12.3	-9.46
Meat	-1.80	-3.57	-4.92	-6.43	-9.04	-10.7	-12.6	-14.6	-18.7	-25.3	-11.4
Fish	-0.30	-0.46	-0.60	-0.94	-1.07	-1.31	-1.36	-1.62	-2.84	-4.53	-1.59
Milk, cheese and eggs	-0.74	-1.37	-1.75	-2.26	-2.94	-3.48	-4.29	-5.28	-7.76	-11.4	-4.35
Oils and fats	-0.36	-0.69	-0.85	-1.11	-1.29	-1.37	-1.57	-1.69	-1.82	-2.64	-1.47
Fruits	-0.13	-0.28	-0.41	-0.48	-0.65	-0.74	-0.95	-1.22	-2.01	-4.40	-1.16
Vegetables	-1.06	-2.10	-2.43	-2.88	-3.44	-3.82	-3.97	-4.56	-5.73	-9.45	-4.32
Sugar, jam, honey, chocolate and confectionery	-0.51	-0.99	-1.31	-1.60	-1.85	-2.07	-2.20	-2.26	-3.02	-5.08	-2.27
Food products nec	-0.48	-0.89	-1.08	-1.30	-1.89	-1.92	-2.09	-2.51	-3.02	-4.82	-2.16
Coffee, tea and cocoa	-0.15	-0.31	-0.41	-0.48	-0.69	-0.71	-0.83	-0.81	-1.22	-2.15	-0.83
Mineral waters, soft drinks, fruit and vegetable juices	-0.32	-0.62	-0.85	-1.12	-1.52	-2.04	-2.45	-3.17	-4.49	-7.72	-2.52
Unspecified food	-0.21	-0.40	-0.62	-0.86	-1.18	-1.86	-2.48	-3.93	-7.09	-20.5	-3.85
Alcoholic beverages and tobacco	-0.55	-1.08	-1.21	-1.66	-2.19	-3.13	-3.93	-4.37	-6.38	-10.2	-3.62
Spirits	-0.03	-0.09	-0.10	-0.11	-0.10	-0.52	-0.31	-0.34	-0.58	-1.83	-0.40
Wine	-0.02	-0.04	-0.04	-0.09	-0.09	-0.11	-0.16	-0.19	-0.62	-1.69	-0.30
Beer	-0.17	-0.24	-0.27	-0.52	-0.71	-0.84	-1.02	-0.95	-1.45	-1.39	-0.81
Tobacco	-0.32	-0.72	-0.81	-0.94	-1.29	-1.66	-2.44	-2.88	-3.74	-5.31	-2.11
Clothing and footwear	-2.14	-4.04	-5.83	-7.48	-9.86	-11.6	-15.4	-19.3	-27.3	-46.6	-15.5
Clothing materials	-0.01	-0.01	-0.05	-0.08	-0.05	-0.06	-0.10	-0.15	-0.29	-0.27	-0.11

Table 11 continued

177

Table 11 continued

	Income deciles										Average
	Lower	2	3	4	5	6	7	8	9	Upper	
Average household size	2.8	3.3	3.8	4.4	4.7	4.9	4.6	4.4	3.8	3.6	3.8
Garments	-1.39	-2.70	-3.90	-4.97	-6.57	-7.70	-10.4	-13.2	-19.0	-31.8	-10.5
Other articles of clothing and clothing accessories	-0.03	-0.06	-0.08	-0.09	-0.14	-0.20	-0.22	-0.29	-0.47	-0.94	-0.26
Cleaning, repair and hire of clothing	-0.01	-0.01	-0.01	-0.02	-0.03	-0.04	-0.09	-0.06	-0.08	-0.20	-0.06
Shoes and other footwear	-0.68	-1.24	-1.78	-2.30	-3.04	-3.56	-4.51	-5.50	-7.41	-13.3	-4.53
Repair and hire of footwear	-0.01	-0.01	-0.01	-0.02	-0.03	-0.03	-0.05	-0.04	-0.05	-0.05	-0.03
Housing, water, electricity, gas and other fuels	-4.96	-8.88	-13.3	-16.6	-21.9	-27.9	-40.5	-69.5	-152	-395	-74.2
Actual rentals paid by tenants	-1.59	-1.83	-2.61	-2.82	-5.14	-6.07	-11.3	-16.2	-36.7	-26.0	-11.3
Imputed rentals of owner-occupiers	-1.25	-2.82	-4.78	-6.34	-7.68	-10.4	-15	-30	-73.6	-258	-39.6
Materials for maintenance and repair of the dwelling	-0.04	-0.14	-0.18	-0.43	-0.34	-0.55	-0.58	-1.22	-2.53	-16	-2.07
Service for maintenance and repair of the dwelling	-0.06	-0.20	-0.27	-0.39	-0.37	-0.60	-1.33	-1.51	-4.81	-26.1	-3.41
Water and electricity	-0.16	-0.17	-0.23	-0.37	-0.77	-1.59	-1.24	-3.68	-5.84	-16.39	-2.97
Water supply	-0.15	-0.30	-0.54	-0.76	-0.84	-1.03	-1.25	-2.62	-5.09	-7.16	-1.99
Refuse collection	-0.09	-0.15	-0.21	-0.22	-0.32	-0.42	-0.60	-0.92	-1.11	-1.96	-0.62
Sewerage collection	-0.07	-0.12	-0.17	-0.19	-0.25	-0.36	-0.51	-0.94	-2.04	-2.34	-0.71
Other services relating to the dwelling	-0.17	-0.23	-0.48	-0.66	-0.67	-1.03	-1.84	-3.68	-7.15	-23.0	-3.78
Electricity	-0.64	-1.28	-1.97	-2.27	-3.43	-3.62	-5.01	-7.47	-12.0	-18.0	-5.74
Gas	-0.02	-0.04	-0.08	-0.10	-0.13	-0.20	-0.14	-0.22	-0.47	-0.54	-0.20
Liquid fuels	-0.43	-0.77	-0.86	-1.06	-1.09	-1.06	-0.92	-0.69	-0.45	-0.20	-0.92
Solid fuels	-0.30	-0.82	-0.96	-1.06	-0.93	-0.94	-0.69	-0.34	-0.23	-0.41	-0.82
Furnishings, household equipment and routine maintenance of the dwelling	-1.62	-3.63	-5.75	-7.56	-9.35	-12.7	-15.9	-22.6	-36.5	-99.9	-21.6

Table 11 continued

Impact of interest rate changes on South African GDP and households

| Average household size | Income deciles | | | | | | | | | | Average |
| | Lower | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Upper | |
	2.8	3.3	3.8	4.4	4.7	4.9	4.6	4.4	3.8	3.6	3.8
Furniture and furnishings	-0.20	-0.58	-1.13	-1.65	-1.79	-2.77	-4.05	-5.04	-7.00	-15.1	-3.97
Carpets and other floor covering	-0.01	-0.03	-0.06	-0.10	-0.09	-0.20	-0.27	-0.46	-0.81	-2.79	-0.47
Repair of furniture, furnishings and floor covering	-0.00	-0.01	-0.01	-0.04	-0.02	-0.05	-0.04	-0.09	-0.46	-0.51	-0.12
Household textiles	-0.44	-1.04	-1.71	-2.06	-2.68	-3.38	-4.01	-5.60	-6.74	-10.6	-3.99
Major household appliances	-0.22	-0.51	-0.92	-1.26	-1.53	-2.48	-2.59	-3.72	-4.33	-7.18	-2.55
Small electrical household appliances	-0.06	-0.12	-0.13	-0.18	-0.25	-0.29	-0.39	-0.57	-0.66	-1.49	-0.43
Repair of household appliances	-0.00	-0.02	-0.02	-0.03	-0.06	-0.06	-0.07	-0.09	-0.22	-0.50	-0.11
Glassware, tableware and household utensils	-0.06	-0.15	-0.23	-0.28	-0.34	-0.44	-0.52	-0.66	-1.01	-2.18	-0.61
Major tools and equipment	-0.00	-	-0.00	-0.00	-0.01	-0.02	-0.02	-0.10	-0.23	-0.87	-0.12
Small tools and miscellaneous accessories	-0.03	-0.07	-0.10	-0.11	-0.10	-0.16	-0.14	-0.25	-0.35	-1.18	-0.26
Nondurable household goods	-0.51	-0.96	-1.26	-1.49	-1.84	-2.17	-2.44	-2.82	-3.75	-7.05	-2.59
Domestic services and household articles	-0.07	-0.14	-0.18	-0.36	-0.63	-0.75	-1.41	-3.25	-10.9	-50.4	-6.46
Health	-0.35	-0.84	-1.13	-1.43	-2.15	-2.59	-2.85	-4.87	-9.81	-26.4	-5.23
Pharmaceutical products	-0.13	-0.29	-0.37	-0.44	-0.69	-0.75	-0.99	-1.65	-3.49	-8.84	-1.76
Other medical products	-0.01	-0.01	-0.01	-0.02	-0.02	-0.04	-0.05	-0.07	-0.06	-0.31	-0.06
Therapeutic appliances and equipment	-0.00	-0.01	-0.00	-0.05	-0.01	-0.02	-0.03	-0.12	-0.40	-0.86	-0.15
Medical services	-0.18	-0.48	-0.67	-0.80	-1.08	-1.28	-1.42	-1.95	-3.14	-8.92	-2.03
Dental services	-0.00	-0.01	-0.01	-0.02	-0.06	-0.04	-0.07	-0.20	-0.59	-2.15	-0.30
Paramedic services	-0.01	-0.02	-0.05	-0.04	-0.05	-0.33	-0.14	-0.19	-0.43	-2.31	-0.35
Hospital services	-0.02	-0.02	-0.02	-0.04	-0.24	-0.14	-0.15	-0.68	-1.70	-3.06	-0.59
Transport	-2.75	-6.21	-7.68	-9.91	-13.6	-20.1	-29.0	-50.9	-141	-360	-62.6

Table 11 continued

| Average household size | Income deciles | | | | | | | | | | Average |
| | Lower | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Upper | |
	2.8	3.3	3.8	4.4	4.7	4.9	4.6	4.4	3.8	3.6	3.8
Motor cars	-0.65	-2.08	-2.15	-1.94	-2.45	-5.19	-6.00	-19.4	-80.6	-253	-35.7
Motorcycles	–	–	–	–	-0.02	-0.01	–	-0.04	-1.13	-0.99	-0.21
Bicycles	-0.00	-0.00	-0.01	-0.10	-0.01	-0.01	-0.01	-0.02	-0.17	-0.34	-0.07
Animal-drawn vehicles	-0.00	-0.01	-0.01	-0.00	-0.02	-0.01	-0.01	-0.01	–	-0.29	-0.03
Spare parts and accessories	-0.03	-0.06	-0.08	-0.19	-0.27	-0.62	-0.94	-1.97	-5.84	-9.64	-1.90
Fuels and lubricants	-0.22	-0.22	-0.33	-0.58	-0.82	-2.55	-4.96	-10.4	-30.7	-62.2	-10.8
Maintenance and repair of personal transport equipment	-0.03	-0.02	-0.02	-0.05	-0.12	-0.30	-0.53	-1.25	-3.77	-9.18	-1.46
Other services in respect of personal transport equipment	-0.05	-0.12	-0.15	-0.23	-0.63	-0.60	-0.93	-1.73	-4.08	-8.20	-1.63
Passenger transport by rail	-0.12	-0.24	-0.21	-0.24	-0.65	-0.61	-0.93	-0.60	-0.34	-0.28	-0.47
Passenger transport by road	-1.64	-3.40	-4.68	-6.50	-8.59	-10.1	-14.5	-14.9	-12.6	-7.80	-9.22
Passenger transport by air	–	-0.01	-0.01	-0.03	-0.05	-0.03	-0.04	-0.42	-1.59	-7.28	-0.89
Passenger transport by sea and inland waterway	–	–	–	–	–	–	–	-0.01	–	-0.07	-0.01
Other purchased transport services	-0.01	-0.04	-0.03	-0.03	-0.04	-0.09	-0.12	-0.09	-0.17	-0.42	-0.11
Cost for other modes of transport	–	-0.01	-0.01	-0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.18	-0.02
Communication	-0.78	-1.46	-2.31	-2.90	-4.21	-5.10	-7.97	-11.5	-22.1	-52.4	-11
Postal services	-0.01	-0.01	-0.02	-0.04	-0.05	-0.05	-0.10	-0.22	-0.41	-0.95	-0.18
Telephone and telefax equipment	-0.20	-0.34	-0.50	-0.65	-0.96	-1.09	-1.41	-1.82	-2.67	-2.90	-1.32
Telephone and telefax services	-0.58	-1.11	-1.79	-2.21	-3.20	-3.96	-6.46	-9.53	-19.0	-48.5	-9.53
Recreation and culture	-0.58	-1.12	-2.16	-2.80	-4.28	-5.99	-8.49	-11.9	-26.3	-84.4	-14.4
Equipment for the reception, recording and reproduction of sound and pictures	-0.19	-0.42	-0.93	-1.27	-1.44	-2.07	-3.24	-3.27	-3.87	-6.13	-2.35

Table 11 continued

Table 11 continued

Impact of interest rate changes on South African GDP and households

Average household size	Lower	2	3	4	5	6	7	8	9	Upper	Average
	2.8	3.3	3.8	4.4	4.7	4.9	4.6	4.4	3.8	3.6	3.8
Photographic and cinematographic equipment and optical instruments	-0.00	-0.02	–	-0.00	-0.02	-0.12	-0.10	-0.18	-0.53	-2.61	-0.34
Information processing equipment	-0.06	-0.02	-0.05	-0.04	-0.16	-0.31	-0.39	-0.82	-3.01	-9.02	-1.33
Recording media	-0.02	-0.04	-0.07	-0.09	-0.17	-0.25	-0.46	-0.61	-1.40	-3.33	-0.63
Major durables for outdoor recreation	–	–	–	–	–	–	-0.01	-0.03	-0.03	-1.06	-0.11
Musical instruments and major durables for outdoor recreation	–	–	-0.14	-0.01	-0.01	-0.04	-0.03	-0.17	-0.14	-0.37	-0.10
Maintenance and repair of other major durables for recreation and culture	–	-0.01	-0.02	-0.02	-0.04	-0.04	-0.06	-0.06	-0.11	-0.19	-0.06
Games, toys and hobbies	-0.00	-0.01	-0.01	-0.02	-0.03	-0.05	-0.06	-0.17	-1.03	-2.62	-0.38
Equipment for sport, camping and open-air recreation	-0.01	-0.01	-0.01	-0.04	-0.02	-0.06	-0.08	-0.08	-0.57	-3.98	-0.46
Gardens, plants and flowers	-0.00	-0.01	-0.02	-0.03	-0.06	-0.06	-0.07	-0.25	-0.75	-4.06	-0.50
Pets and related products	-0.02	-0.04	-0.08	-0.11	-0.14	-0.22	-0.38	-0.66	-2.23	-6.26	-0.97
Veterinary and other services	–	–	–	–	-0.01	-0.01	-0.01	-0.06	-0.32	-2.15	-0.24
Recreational and sporting services	-0.02	-0.04	-0.04	-0.06	-0.18	-0.26	-0.29	-0.42	-1.22	-6.75	-0.89
Cultural services	-0.05	-0.08	-0.10	-0.17	-0.26	-0.36	-0.60	-1.26	-3.50	-13.69	-1.92
Games of chance	-0.05	-0.14	-0.26	-0.29	-0.44	-0.67	-0.86	-1.06	-1.92	-6.20	-1.17
Books	-0.03	-0.06	-0.08	-0.10	-0.18	-0.23	-0.31	-0.61	-1.36	-3.21	-0.61
Newspaper and periodicals	-0.06	-0.09	-0.19	-0.23	-0.60	-0.80	-1.03	-1.38	-2.49	-6.18	-1.28
Miscellaneous printed matter	–	–	–	-0.01	-0.01	-0.01	-0.02	-0.04	-0.09	-0.31	-0.04
Stationery and drawing materials	-0.06	-0.12	-0.15	-0.24	-0.33	-0.37	-0.34	-0.51	-0.95	-1.55	-0.48
Package holidays	–	–	-0.00	-0.07	-0.19	-0.05	-0.15	-0.30	-0.78	-4.81	-0.60
Education	-0.57	-0.95	-1.26	-1.84	-2.33	-2.54	-4.80	-12.1	-16.7	-33.2	-7.60
Pre-primary and primary education	-0.13	-0.23	-0.31	-0.56	-0.56	-0.66	-1.11	-2.28	-4.06	-9.35	-1.91

Income deciles

Table 11 continued

Table 11 continued

| Average household size | Income deciles | | | | | | | | | | Average |
| | Lower | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Upper | |
	2.8	3.3	3.8	4.4	4.7	4.9	4.6	4.4	3.8	3.6	3.8
Secondary education	-0.12	-0.24	-0.32	-0.42	-0.57	-0.71	-1.07	-1.51	-3.49	-12.0	-2.01
Tertiary education	-0.31	-0.45	-0.58	-0.81	-1.12	-1.10	-2.05	-2.91	-8.74	-10.8	-2.91
Education not definable by level	-0.01	-0.03	-0.05	-0.05	-0.08	-0.07	-0.57	-5.39	-0.48	-0.96	-0.76
Restaurants and hotels	-1.10	-1.16	-1.56	-1.88	-2.70	-4.16	-5.32	-6.22	-13.1	-30.8	-6.90
Beverages in restaurants, cafes, canteens and the like	-0.30	-0.43	-0.59	-0.69	-0.87	-1.35	-1.64	-1.47	-1.28	-1.75	-1.14
Meals in restaurants, cafes, canteens and the like	-0.69	-0.56	-0.83	-0.87	-1.51	-2.17	-2.59	-3.30	-6.29	-12.2	-3.20
Accommodation services	-0.11	-0.17	-0.14	-0.32	-0.31	-0.64	-1.10	-1.45	-5.59	-16.84	-2.57
Miscellaneous goods and services	-2.14	-4.17	-6.14	-9.80	-12.3	-16.3	-23.4	-44.3	-95.1	-248	-45.2
Hairdressing salons and personal grooming establishment	-0.01	-0.01	-0.03	-0.04	-0.04	-0.09	-0.09	-0.19	-0.53	-1.43	-0.24
Electrical appliances for personal care	-	-0.00	-0.00	-0.01	-0.02	-0.03	-0.02	-0.03	-0.05	-0.16	-0.03
Other appliances, articles and products for personal care	-0.51	-0.98	-1.20	-1.62	-2.01	-2.57	-3.33	-4.16	-6.16	-12.5	-3.63
Jewellery, clocks and watches	-0.04	-0.05	-0.10	-0.11	-0.29	-0.26	-0.49	-0.66	-1.47	-4.50	-0.78
Other personal effects	-0.06	-0.12	-0.17	-0.23	-0.31	-0.35	-0.46	-0.69	-1.33	-2.70	-0.65
Social protection services	-0.03	-0.05	-0.10	-0.21	-0.29	-0.35	-0.31	-0.89	-1.42	-3.23	-0.68
Insurance connected with the dwelling	-0.01	-0.04	-0.09	-0.18	-0.15	-0.42	-1.11	-4.83	-13.6	-71.5	-8.67
Insurance connected with health	-0.09	-0.14	-0.08	-0.11	-0.29	-0.70	-2.63	-10.1	-28.1	-70.3	-10.7
Insurance connected with transport	-0.00	-	-0.00	-0.04	-0.03	-0.13	-0.29	-1.33	-6.54	-19.4	-2.63
Other insurance	-0.29	-0.79	-1.24	-1.68	-2.24	-2.88	-3.60	-5.59	-7.40	-7.28	-3.42
Financial services nec	-0.20	-0.27	-0.58	-1.34	-1.23	-1.91	-2.83	-4.37	-10.3	-21.8	-4.43
Other services	-0.89	-1.71	-2.54	-4.25	-5.42	-6.63	-8.25	-11.4	-18.0	-33.0	-9.41
Other unclassified expenses	-0.05	-0.10	-0.15	-0.22	-0.29	-0.47	-0.62	-0.98	-1.77	-5.14	-0.96
Total	-26.19	-50.32	-70.24	-91.3	-120.0	-152.5	-203.5	-310.9	-617.2	-1 503.9	-314.57

Conclusion and policy implications

The results from the models used for this article (i.e. sign and size of impacts) make intuitive sense. The signs as well as the size of the impact on GDP as a result of the 100 basis point increase comply with theory as well as international empirical studies. The results from the models can also, in some cases, be compared for consistency and robustness. For example, the results from the sector model show a decrease of over 25 000 employment opportunities. This is roughly in line with the 26 500 employment opportunities lost as calculated in the economic impact model. Results from the macroeconomic model show a decrease of R3.54 billion in household expenditure compared to R3.9 billion in the economic impact model, while imports in the macroeconomic model show a decrease of R746 million compared to the R992 million from the economic impact model. However, these results will differ given that the composition and structure of the economy change over time. The economic impact model shows the exact structure of the economy as published by Stats SA and the Reserve Bank in more detail for 2009, while the results from the macroeconomic model use the same data, but estimate average coefficients using decades of data. As a result of this, impact results will never be exactly the same.

Looking at the sectors, the biggest Rand value impact as well as employment impact, as a result of the 100 basis point increase in interest rates, is on the wholesale and retail trade sector. This is to be expected given the size of the retail sector in SA. The biggest impact in percentage terms is on the beverages and tobacco sector.

The results from the impact analysis per household and per expenditure decile show that, as expected, the biggest percentage impact as a result of the interest rate increase is on higher income households. Households in the highest decile have a -0.6% impact compared to a -0.23% impact for the poorest households. Households in higher income groups have more access to credit, and highly skilled individuals also have the highest percentage drop in employment at -0.28% (compared to -0.22% on average). However, the biggest (number) employment impact is on the skilled, semi-skilled and unskilled and informal sectors in the economy, where an estimated 21 736 individuals may lose their jobs. Looking at the results from this model, however, employment accommodative policy would encourage lower interest rates (the impact of lower interest rates on inflation and the impact of inflation on lower income groups do not form part of this study and must be calculated before conclusive policy analysis can be given).

This research shows that a methodology that combines different models can be used to determine the impact on household income and expenditure as a result of policy changes or exogenous shocks. Future research is suggested where the impact

on household wealth, as a result of various policy changes or exogenous shocks, is included in the estimation.

Endnotes

1. A percentage increase in the repo rate could also be used, but, for example a 50 or 100 basis point increase is consistent with the methods used by the Reserve Bank to increase or decrease the repo rate and not percentage changes.
2. These models are discussed in more detail in Jordaan (2012).
3. The nominal impact includes an inflationary impact of -0.32%. If this nominal impact is used in the economic impact model, wage increases need to be included to compensate for the inflation impact. The inflation can also 'inflate' results artificially.
4. These impacts are fairly small and no problems are anticipated with the model results. However, far greater impacts can result in 'non-logical' results. This is due to the fixed Leontief structure of the model that does not take into account supply constraints.
5. Comparing data from 1990 to 2009 shows only an increase of 3.3% in productivity in nominal terms, compared, for example, to 22% in coal mining, 9% in communication and 8.5% for transport and storage.
6. This calibration was necessary to ensure that the results are not artificially inflated and to take care of any double counting, given the multiplier impact in the macroeconomic model.
7. Every economic impact study that utilises a SAM or economic impact model is based on a specific corresponding SAM or the estimated equations in the macroeconomic model. This implies that the results of the economic impact model, or the reliability of the policy implementation conducted using such models, depends upon the reliability of the SAM and the specification and coefficient sizes and variables included in the macroeconomic model.
8. Each decile represents a tenth of the households, grouped by expenditure. The 10th decile is disaggregated further into percentiles where each represents 20% of the upper decile (2% of the total).
9. In Tables 9–11, the colours show the relative size of the values; more negative values edge towards orange and red, while less negative values are indicated in green.

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