

## **EFFECTS OF REDUCING TARIFFS IN THE DEMOCRATIC REPUBLIC OF CONGO (DRC): A CGE ANALYSIS**

*Jean Luc Erero*

University of Johannesburg and South African Revenue Services, South Africa

*Lumengo Bonga-Bonga*

University of Johannesburg, South Africa

### **ABSTRACT**

Over the past two and a half decades, the Democratic Republic of Congo (DRC), along with several other developing countries, implemented the Structural Adjustment Program (SAP) proposed by the International Monetary Fund (IMF) and World Bank. Since the 1990s when war broke out in the DRC triggered by the control of natural resources, unemployment and poverty have been on the rise in the country. Despite this, ever since the Government Action Plan for Natural Resource Law Enforcement, Governance and Trade was implemented in 1992, the population blamed the SAP for causing the heightened poverty of the 1990s. However, during the reform period it was difficult to point out which policies had an adverse effect on unemployment, poverty and productivity growth. It is in that context that this paper analyses the effects of reducing tariffs through a Computable General Equilibrium (CGE) model of the DRC. The specific DRC Formal-Informal Model (DRCFIM) is a multi-sectoral computable general equilibrium model that captures the observed structure of the DRC's formal and informal economies, as well as the numerous linkages or transmission channels connecting their various economic agents, such as investors, firms, traders, and the government. The parameters of the CGE equations are calibrated to observed data from a social accounting matrix (SAM). The paper finds that tariff reduction increases formal employment and output but hurts informal producers. It considerably increases the output and employment of the formal sector by raising import competition without providing further opportunities for the informal sector to access foreign export markets. Nonetheless, it induces productivity improvements when local producers survive import competition by seeking importing input-saving technologies and production practices. These findings highlight the importance of differentiating between the formal and informal sector impacts of the DRC's socioeconomic policies. In particular, this study draws the attention of policy makers to a different employment outcome when tariff reduction is taken into consideration. We suggest that the DRC government considers subsidising low income household to avoid widening inequality in the country.

**JEL Classifications:** C68, D58, E26, F16

**Keywords:** Informal sector, CGE model, Democratic Republic of Congo

**Corresponding Authors' Email Addresses:** lbonga@uj.ac.za

### **INTRODUCTION AND COUNTRY BACKGROUND**

Over the past two and a half decades, the Democratic Republic of Congo (DRC), along with several other developing countries, implemented the Structural Adjustment Program (SAP) proposed by the International Monetary Fund (IMF) and World Bank. Since the 1990s when war broke out in the DRC triggered by the control of natural resources, unemployment and poverty have been on the rise in the country. Despite this, ever since the Government Action Plan for Natural Resource Law Enforcement,

Governance and Trade was implemented in 1992, the population blamed the SAP for causing the heightened poverty of the 1990s. However, during the reform period it was difficult to point out which policies had an adverse effect on unemployment, poverty and productivity growth. This is because a comprehensive range of policies were implemented, ranging from trade to countercyclical fiscal and monetary policies, exchange rate regulations, demand-side interventions, public employment programmes, employment guarantee schemes, labour-intensive infrastructure programmes, wage and training subsidies, and other specific socio-economic policies, frequently at the same time.

The DRC underwent significant trade liberalisation policy during the 1990s which affected the terms of trade between agriculture and industry, business opportunities, wages, prices and structure of commodities, economic development, and employment within the economic system. However, to the best of our knowledge no study has ever been conducted to assess the general equilibrium effects of trade liberalisation policy in the DRC. Thus, this paper investigates the effects of trade liberalisation in the DRC using our constructed DRC Formal Informal Sector Model (DRCFIM) based on ORANI model of the Australian economy (Horridge, 2005). Trade liberalisation is simulated by tariff reduction on all imported goods and services

Previous studies indicate that various techniques are used to analyse the effects of trade liberalisation on the economy. For instance, Santo-Paulino (2002) estimated the impact of trade liberalisation on export growth in developing countries using dynamic panel data, where he considered the removal of export duties. This econometric analysis also entailed the use of dummy variables to measure before and after trade liberalisation. His findings indicate that export duties as an indicator of trade distortions only negatively affects export growth marginally. On the one hand, trade openness has a strong positive impact on export performance and on the other hand trade liberalisation makes little difference to the sensitivity of exports to real exchange rate changes. Moreover, external demand has a strong positive effect on export growth, and that there is evidence that trade openness increases the sensitivity of exports to income changes.

Studies that do consider formal–informal sector linkages typically focus on tax policies, such as expanding the tax base, or on labor market interactions, such as trade unions’ protection of formal employment (Schultz and Mwabu, 1998; Lucas and Hofmeyer, 2001). Such studies do not address formal–informal sector competition in product markets, which may also influence the size and composition of the informal sector, and hence indirectly the high level of unemployment. Using micro simulations, Ianchovichina *et al.* (2002) measured the extent to which CGE models map factor income to different types of households with view to analyze different policy changes in several developing countries such as DRC and Angola. Starting all tariffs at zero, the results show a decline in most prices of various goods. The return to labour capital stimulated the land to expand and natural resources to contract. This is in line with the huge reserve of land in the DRC. In addition demand increased in sectors where price level fell. Although average income increased, skilled labour wages improved compared to the unskilled. Fall in price benefits the poor who in turn increase their consumption level. The simulation results also show that the incidence of poverty improved marginally.

Litchfield *et al.* (2003) used a conceptual framework which linked trade liberalisation to poverty, and exploits detailed household survey data for more than one period to examine the impact of agriculture and other trade liberalisation in Vietnam, China and Zambia. He employed two key mechanisms from trade to household living standards identified as price changes, and wage distribution between

skilled and unskilled labour and employment level. Their findings indicate that in Vietnam the incidence of poverty declined. As export levels increased in certain sectors, export prices also increased and fell in others such as fertilizers. In this case trade liberalisation was effective.

It is important to note that the DRC gained independence from the Belgian colonial power in 1960. According to the IMF (2011), the DRC was one of the most highly developed countries in Africa in the 1960s, coming second after South Africa. Nonetheless, its economy was progressively ruined due to two disastrous wars, which caused the deaths of approximately five million people. In 2011 the country was still ranked among the poorest performers in Africa and ranked number twenty in terms of Gross Domestic Product (GDP). During the 1970s, the government of the DRC adopted a system of tight import regulations because of foreign currency scarcities (World Bank, 2000). In the 1980s, the pressure to open up trade was intensifying as the tight system of regulations had become gradually difficult to manage. Furthermore, low domestic production of commodities and heightening unemployment led to a resolution by the government to adopt a World Bank assisted SAP in 1990. Besides macroeconomic policy reform, the main constituent of the SAP was trade liberalisation, which required tariff reductions. Ever since, trade liberalisation in the DRC has heightened poverty as a result of the uneven distribution of resources and power. According to Mosley (2009), the DRC does not gain from international trade of its own natural resources because much of them are illegally exported.

This limits the DRC's participation in the global economy while allowing for neighbouring countries and rebel groups to profit from these resources. High unemployment in the DRC is further attributed to an underperforming formal sector and to the inability of the unemployed to enter informal labour markets; formal sector job creation has failed to keep pace with growing labour force involvement. As expected, the unemployed have turned to the informal sector, with informal employment accounting for 80% of the job creation over the last decade (World Bank, 2010). A summary of the performance of macroeconomic indicators for the period between 1980 and 2013 is reported in Table 1. As seen in the table, the DRC's growth performance has been deteriorating over time, and the country has not progressed much in the last three decades. From 1990 to 2001, the DRC experienced a considerable period of economic recession, with an average GDP growth rate of -5.4%. Indeed the economy collapsed, reaching a growth rate of -13.5% in 1993. In the meantime, current GDP per capita dropped 37.9% from US\$204.9 in 1990 to US\$127.32 in 2001, and unemployment contracted to approximately 70% (World Bank, 2014). In 2002, economic growth resumed for the first time in thirteen years.

**TABLE 1: DRC SELECTED MACROECONOMIC INDICATORS, 1980-2013**

	1980	1999	2000	2001	2002	2010	2011	2012	2013
Real GDP growth	2.4	-4	-7	-2	3	7.2	6.5	5.1	6
Real GDP per capita growth	6.8	-4.7	10,0	-4,7	0,7	4.5	3.8	2.5	3.4
CPI inflation	40	270	550	357	26	23.5	14.8	15.1	12.2
Budget balance % GDP	-	-	-	-7.1	-1.6	2.4	-6.3	-7.8	-1.1
Current account %GDP	-1.6	-2.6	-4.6	-4.7	0.1	11.7	10.3	-3	-3
Real exchange rate	71.1	47.8	-18	-6	-58	-	-	-	-
Trade balance	-	4	-	-	-	2.1	2.3	0.6	-1.1

Exports of goods (f.o.b)	-	7.6	9.6	9.6	11.1	41.3	39.7	31.1	29.4
Imports of goods (f.o.b)	-	3.6	9.2	10.6	14.1	39.2	37.4	30.4	30.4

Source: World Bank (2014)

During the period of trade liberalisation in the DRC, tariffs were mostly used as a revenue raising instrument, while specific industries were protected by exchange controls and the reduction of import demand. The tariff structure adopted in 1982 was in use until 2011, although the DRC liberalised its import and exchange controls from the beginning of the 1990s.

**TABLE 2: STRUCTURE OF TARIFF RATES**

Goods	Tariff rates %
Equipment goods	5
Raw materials	5
Agricultural	5
Veterinary supplies	5
Unassembled equipment	5
Consumable food items	10
Industrial inputs	10
Spare parts	10
Hospital items	10
Clothing	20
Furniture	20
Cigarettes	20
Other finished products	20

Source: DRC customs (2012)

The main purpose of the new tariff structure was to lower rates and rationalise the band structures, which are summarised in Table 2. The three bands are 5%, 10% and 20%. With the new tariff structure, the DRC government intended to reduce duties on raw materials and other inputs with a view to stimulating economic growth.

Vos and Jong (2003) pointed out that one of the reasons for the failure of major global trade negotiations is that they do not lead to free trade agreements. For a vast country such as the DRC, with an inadequate and inefficient infrastructure, there has been pressure to open up new markets in neighbouring countries. For this reason, the DRC has entered into various bi-lateral trade agreements and is a member of the Southern African Development Community (SADC), the Common Market for Eastern and Southern Africa (COMESA), the Central African Economic Community (CEEAC) and the World Trade Organisation (WTO). However the DRC does not get involved in the COMESA or the SADC free trade region because its government depends heavily on tariff revenues. According to the WTO (2013), the country's average applied tariff rate was 12% in 2008. All its tariffs are *ad valorem* and charged on a cost, insurance and freight (CIF) basis. A new value-added tax (VAT) ratio of

16% came into effect in 2012, replacing the previous consumption tax. VAT ratio was implemented in that year in order to meet the increased need for revenue by the government. The introduction of VAT should generate more revenues and appears to be more transparent than the previous consumption tax system. Nonetheless, enterprises fear that it could lead to price inflation. Despite the tariff structure and implementation of VAT, several taxes are collected on imported goods by different government agencies. These additional taxes paid by importers on goods and services average between 10% and 40%. Moreover, the DRC Customs Authority evaluates and collects tariffs and duties based on determined rates under the country's tariff band. On the other hand, the Import-Export Control Agency imposes a 2% tax on the CIF value of all imported goods with an excess of US\$2,500, plus an extra charge of US\$5 per ton of goods, and applies a sliding scale for imports valued less than US\$2,500. Consequently, importers of duty-free goods must also pay an *ad valorem* administrative fee of 5% (WTO, 2013).

As stated earlier, this paper investigates the effects of trade liberalisation in the DRC using our constructed DRC Formal Informal Sector Model (DRCFIM) based on ORANI CGE model of the Australian economy (Horridge, 2005). Trade liberalization is simulated by tariff reduction on all imported goods and services. The remainder of the paper is organised as follows: section 2 discusses the model applied in the paper, section 3 presents the results of the simulations and section 4 concludes the paper.

## MODEL DESCRIPTION

Previous CGE models (Pagan and Shannon, 1987; Wigle, 1991; Harrison and Vinod, 1992; Harrison, Jones, Kimbell and Wigle, 1992; DeVuyst and Preckel, 1997; Horridge, 2005; Logfrem, 2001) required a database, a description of the solution procedure, a brief description of the data, and software such as the General Equilibrium Model Package (GEMPACK) or the General Algebraic Modelling System (GAMS). Most of these models focussed on the values of exogenously assigned elasticity parameters, while the calibrated parameters – those that are obtained from combining elasticity information with flow or stock data – have been essentially problematic to assess. We followed the technique used by Horridge (2005) and we used GEMPACK to construct a DRC Formal-Informal Model (DRCFIM) because of the changes on income distribution due to trade liberalisation. To overcome this limitation we replace the assumption of a representative household by incorporating all the households from both formal and informal sector. In this way, we endogenize intra-group variations. The particularity of the DRCFIM is that it is a multi-sectoral CGE model that depicts the reflected structure of the DRC's formal and informal sectors, along with a diversity of linkages between various economic agents such as government, investors, traders and enterprises. This model is a system of equations that depicts the performance of the DRC economy, encompassing all major industry groups, markets and institutions. As indicated earlier, it is a comparative-static model by all accounts. Besides using its own core database, the DRCFIM is based on the 2007-SAM, which reconciles a wide variety of data sources such as national accounts, household surveys, and labour force surveys. The SAM consists of comprehensive data on demand and supply for 15 activities or commodities in both the formal and informal sectors. The labour component was divided between the formal and informal sector. Four labour groups were specifically identified in each of the formal and informal sectors, namely: (1) subsistence factor (survivalist), (2) child labour, (3) female adult labour, and (4) male adult labour. The household sector of

SAM was disaggregated according to income into rural and urban areas with four groups in both the formal and informal sectors, i.e. (1) rural poor households, (2) rural non poor households, (3) urban poor households, and (4) urban non poor households. The land component was also divided between the formal and informal sectors.

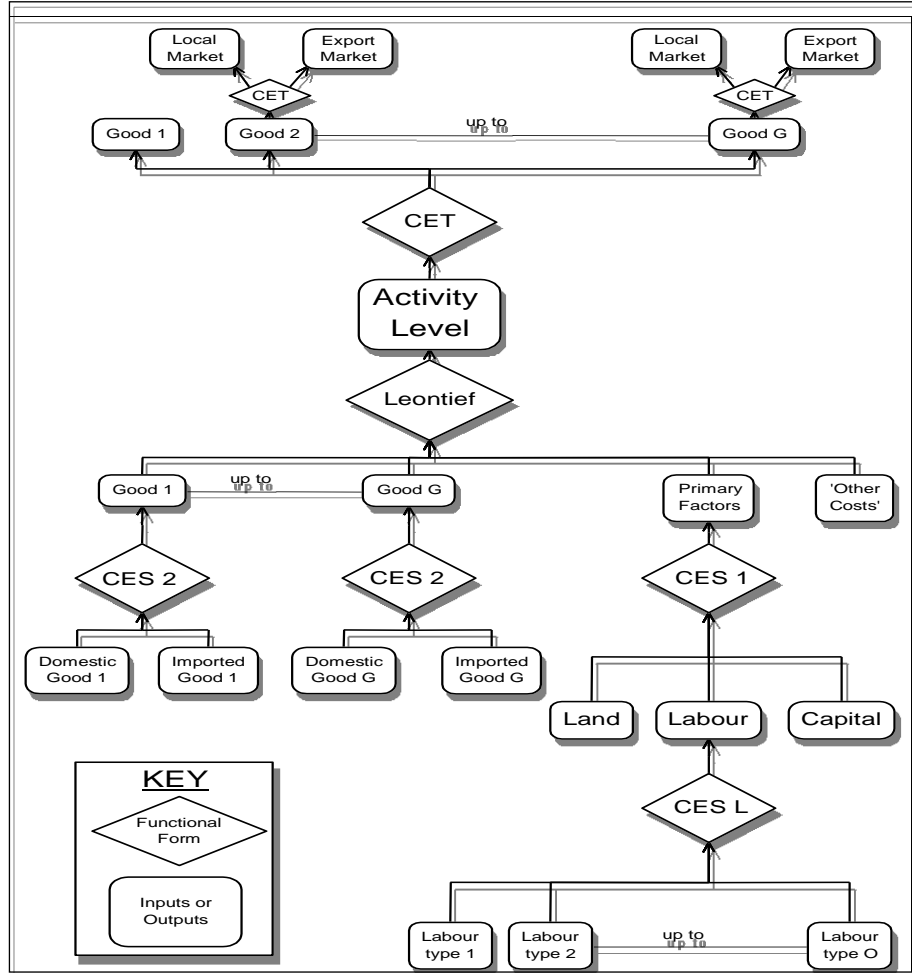
Further information provided by this particular economy-wide database relates to the differentiation between formal and informal economies in the areas of production, trade and incomes. Household consumption demand was divided into demand for formal and informal goods, using specified informal market consumption shares from the Household Survey (BCC, 2008). The model has a theoretical composition which is typical of a static model, and is comprised of equations portraying periodical equations such as producers' demands for produced inputs and primary factors, producers' supplies of commodities, demands for inputs to capital formation, household demands, export demands, government demands, the relationship of basic values to production costs and to purchasers' prices, market-clearing conditions for commodities and primary factors, and numerous macroeconomic variables and price indices. The database absorption matrix distinguishes the following economic agents:

- (1) Local producers composed of various industries;
- (2) Investors from various industries;
- (3) One typical agent household;
- (4) A comprehensive foreign purchaser of exports; and
- (5) An 'other' demand type, generally equivalent to government.

As far as the modelling of different economic agents is concerned, one must take into account the relationship between commodities and activities. The database makes provision for two kinds of transactions on a sectoral level, namely the purchase of intermediate and primary inputs on the one side, and the supply of intermediate and final outputs on the other.

As described by Horridge (2005), the production structure of the model allows each industry to produce a number of commodities and make use of local and imported commodities, labour of different kinds, capital, and land as inputs. There is a distinction between the commodities selected for exports and those for local consumption. The production function is constrained to a system of nests based on particular assumptions. Figure 1 illustrates that the Leontief production function is used to combine commodity composites, primary factor composites and 'other costs'. In this respect, the commodity composite is basically an intermediate input represented as a constant elasticity of substitution (CES) function of a domestic good and the corresponding imported good. The primary-factor composite is a CES aggregation of land, capital and composite labour. In fact, formal and informal sectors consider this to be a general production system, but input shares and behavioural factors can differ between industries.

FIGURE 1: STRUCTURE OF PRODUCTION



Source: Horridge (2005)

As mentioned above, the production function includes commodity composites, primary-factor composites and 'other costs', which are linked using a Leontief production function. Thus a proportional input is demanded for every single category of the intermediate, primary and other costs (Horridge, 2005). As for the household, the structure of its demand indicates that commodity composites can be combined according to the Klein-Rubin utility function instead of the Leontief function, which leads to the linear expenditure system (LES). The outflow on every single product is a linear function of prices and expenditure.

The modeling of export demands is done through the subdivision of commodities into two categories. The first category consists of *conventional* exports composed of primary products, while the second category consists of *non-conventional* exports. The largest share of total output for most commodities goes to conventional exports, while the smallest share is total output for *non-conventional* export commodities. In this model, we exogenise the commodity composition of

aggregate *non-conventional* exports by considering *non-conventional* exports as a Leontief aggregate.

The model contains numerous variables associated with every flow of goods and services between industries and final users. These variables are endogenous and exogenous. DRCFIM's detail related to both endogenous and exogenous variables is used to address the considerable number of questions of relevance with the formal and informal sectors.

Previous studies show that trade liberalisation has been analysed through tariff reduction (Davies and Thurlow, 2011; Chitiga et al., 2007). In this respect, we assess the effects of tariff reduction in the DRC by reducing import prices by 5% across all industries. Although Mai (2003) used the same percentage to analyse the tariff reduction in China, we could not find any previous study related to tariff reduction in the DRC. For this reason we applied a uniform reduction in import tariffs. A 5% reduction in import prices can be used as a basis for developing 'what if' scenarios for the economy as part of designing and implementing trade liberalisation policies. We allowed the import price to decline by shocking the variable "pImp" (import price) in the model. This variable is declared exogenous in our command file because in ordinary simulations the price variable is endogenous, and cannot therefore be shocked when the specific hypothesis that needs to be tested within a simulation is not appropriately specified in the closure. We solve the problem by imposing the import price on all imports from the rest of world uniformly across all industries. Moreover, it should be noted that the equations are in percentage changes form. The equations calculating the tariff reduction in the DRCFIM model are presented below:

$$xImp(e,i) = xIMP\_e(i) - CESM(i) * [pImp(e,i) - pImp\_e(i)] \quad (1)$$

$$ID01[VIMP(i)] * wImp\_e(i) = sum\{e, IMP, SAM(e,i) * [pImp(e,i) + xImp(e,i)]\} \quad (2)$$

$$E\_pImp\_e(all,i,IND)wIMmp\_e(i) = pImp\_e(i) + xImp\_e(i) \quad (3)$$

Where

$xImp(e,i)$  is the firm demand for imports

$pImp(e,i)$  is the import prices

$CESM(i)$  is the constant elasticity of substitution between ROW and ROD imports

$pImp\_e(i)$  is the price import composite

$xImp\_e(i)$  is the quantity import composite

$wImp\_e(i)$  is the expenditure on imports

- Equation (1) represents the trade liberalisation for industry  $i$ . It is determined by the quantity import composite less the multiplication of the constant elasticity of substitution between Rest of the World (ROW) and imports, with the differential obtained from subtracting the price import composite from the real import prices.
- Equation (2) represents the expenditure on imports. It includes the sum of import prices with the firm demand for imports multiplied by the firm import cost.
- Equation (3) represents the impact of the import prices. It considers the sum of the price import composite with the quantity import composite.



In our model, commodities destined for export are distinguished from those for local use. The multi-input and output production specification is kept manageable by a separability assumption. The assumption of *input-output separability* implies that the generalised production function for some industry represents an index of industry activity. According to the World Bank (2010), the DRC-applied simple and import weighted tariff averages are classified in the same category as the low-income country group means. Therefore, tariffs remain a dominant tool through which government can considerably influence global trade and product market incorporation, although they are not essentially the primary obstacle to economic incorporation. In addition, tariffs constrain imports and create a wedge between local and foreign prices.

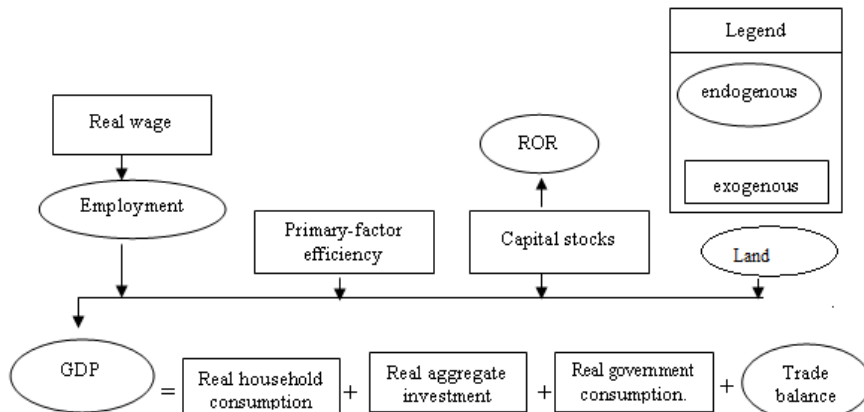
### Closure and shock

Within modelling methodology, the assumptions about exogenous and endogenous variables are known as ‘model closure’. We established a suitable closure with a view to testing the effect of tariff reduction in the DRC economy. Many closures can be used for different purposes, and there is no unique natural or correct closure. Nonetheless, the hypothesis of testing the impact of a tariff reduction in the DRC economy was performed within a short and long run setting. In the short run with no free mobility of capital we would expect sector such as agricultural to benefit from its scarce capital, thereby leading to increased inequality in the rural areas while in the long run trade liberalisation does not harm income distribution and could even improve it (Bhorat, 1999; Edwards, 2001).

### Short run closure

Figure 2 below illustrates the main assumptions highlighting the relations between endogenous (oval) and exogenous (rectangular) macroeconomic variables in the model’s short run closure. With the closure denoted in Figure 2, it was assumed that there were more variables than equations. Thus, to close the model, we chose which variables must be exogenous or endogenous. The exogenous variables were set while the endogenous variables are explained by the model. The number of endogenous variables must equal the number of equations.

**FIGURE 2: ASSUMPTION HIGHLIGHTING SHORT RUN CLOSURE**

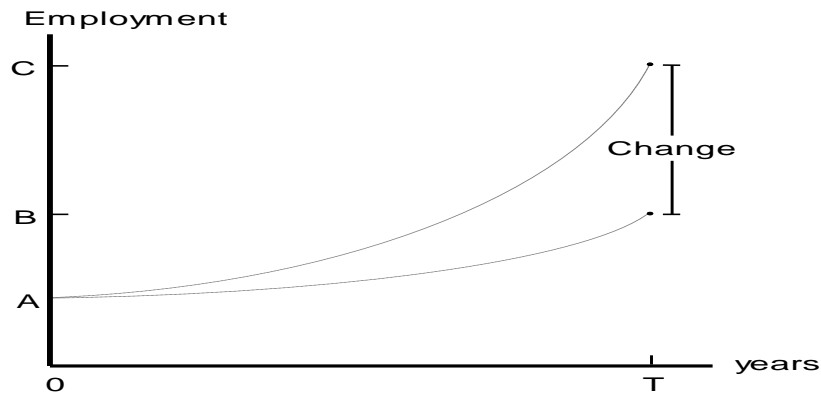


On the national expenditure side, real household consumption, real aggregate investment, and real government consumption are exogenous. The trade balance is endogenous. Technological change variables and all tax rates are exogenous to the model. Furthermore, land, capital and imports are in elastic supply at fixed prices.

On the income side, GDP is obtained from labour, primary-factor efficiency, capital stocks and land. In a short run simulation we hold capital stocks fixed. The idea is that capital stocks take some time to install - too long for them to be affected, in the short run, by the shocks. Short run closures often also allow for rigidities in the labour market: in this case by holding real wages fixed. The length of the 'short' run is not explicit, but is usually thought to be between one and three years. Constant real wages in the short run closure determine employment (Horridge, 2005). The model allows the land to adjust and also allocates fixed investment following endogenously determined rates of return (ROR).

Horridge (2005) described the role of variables in the short run closure. The equations and variables in the model refer implicitly to the economy at some future time period. For instance Figure 3 illustrates the values of employment variable against time. A is the level of employment in the initial period and B is the level which it would reach in T years' time if a policy related to tariff shock is not implemented. With the tariff shock employment would reach C, all other factors being equal. In a comparative-static simulation, our model might generate the percentage change in employment  $100(C-B)/B$ , showing how employment in period T would be affected by the tariff shock only.

**FIGURE 3: RELATIONSHIP BETWEEN VARIABLES (SHORT RUN)**



The effect of tariff reduction is better assessed through shocking the appropriate variable in the model. Usually there are no definite formulas for establishing the level of the shock and interpreting macroeconomic results, although one explanation can be provided to justify the choice of the shock (5%). It is essentially important to set the boundary within the scenario context and to identify the kind of variables, especially those which are affected by the shock, to provide realistic results from the simulation. Thus the government can provide a policy on trade liberalisation based on the effects of tariff reduction. In the command file, we perform the shock by setting “pImp (“ImpROW”, IND)” = uniform -5”. As indicated earlier, the ‘pImp’ represents the import price variable for industry, “ind”. The “ImpROW” is the import from the rest of the world and “-5” means that import price from the rest of the world is reduced uniformly for all industries.

### Long run closure

In the long run closure, capital stocks are free to adjust in such a way that fixed rates of return are sustained. An open capital market is implicitly assumed, since there is no link between capital formation and domestic saving. Standard modelling assumptions indicate that real wage rates adjust to keep employment fixed in the long run. This means that the tariff reduction has no long run effect in aggregate employment. Any long run changes in the labour market are revealed as changes in real wage rates rather than as changes in employment. This would be consistent with the idea that both the labour force and the rate of unemployment are, in the long run, determined by mechanisms outside of the model.

Household and government expenditure move together to accommodate a balance of trade as a fraction of GDP which is fixed. This means that in the long run, the rest of the world might be hesitant to sponsor a bigger trade deficit. Aggregate investment follows the aggregate capital stock (Horridge, 2005). Other exogenous variables include price and quantity shift variables, rates of production tax and technological coefficients.

## SIMULATION RESULTS

### Macroeconomic results

The simulation conducted is a tariff reduction in which import prices are reduced by 5% in the model. The results of short run (SR) and long run (LR) policy simulation on various macro-economic variables are reported in Table 3. As we would expect, gross domestic product, exports and employment rise. The policy simulation results show that the GDP increases by 0.57% and 0.61% in the SR and LR respectively from the baseline economy. This means that output increases and domestic prices drop in most sectors, reflecting more efficiency and lower costs per unit of output.

Furthermore, import volume increases by 5.63% and 5.15% in the SR and LR respectively, which in turn improve the productivity capacity by showing an increase in GDP. The main reason for this is that the consumption boom caused by the relative cheapening of imports led to a substantial increase in imports and a growing trade surplus. Imports grew steadily but less than exports. This result is in line with the findings of the previous studies which show that the DRC economy is very import intensive (World Bank, 2007). The rise in income creates demand for imported goods, however the balance of trade is on the positive side with a slight increase of 1.47% and 0.82% respectively. Overall, tariff reduction has a considerable impact on GDP and employment. Households in the formal sector can consume more as employment increases in the SR and consumer price levels decline. Results of tariff reduction show output having a significant positive impact on employment in the SR. The expansionary economy, coupled with rising export demand, raises the demand for factors of production. The increase in employment (0.56%) represents an increase of labour in the production process, especially in the formal sector.

**TABLE 3: MAIN MACRO VARIABLES UNDER TARIFF REDUCTION POLICY SIMULATIONS**

Main Macro Variables	Description	Simulation %	
		SR	LR
Real GDP	Real GDP	0.57	0.61
AggEmploy	Employment	0.56	0
AveRealWage	Average Real Wage	0	1.52
ExpVol	Export Volume	12.11	5.73
ImpVol	Import Volume	5.63	5.15
RealHou	Real Household Consumption	0	1.09
RealInv	Investment	0	0
Real Gov	Government Consumption	0	0
AggCapStock	Capital Stock	0.69	1.38
AggLand	Land	-0.02	0.9
GDPPI	GDP Price Index	-0.47	1.24
CPI	Consumer Price Effect	-0.99	0.53
ExportPI	Export Price Index	-2.26	-1.11
ImportPI	Import Price Index	-5	-5
BOT_GDP	Contribution of BOT to real GDP	1.47	0.82

*Source: own calculation*

### **Sectoral output**

The results reported in Table 4 show that the tariff reduction policy leads to the changes in sectoral output. The overall economic impact of the tariff reduction has positive results on all formal sectors and negative results on a large number of informal sectors. The policy simulation results demonstrate that all formal sectors benefit from the tariff reduction. The formal sectors which benefit the most from the shock are transport and communications, TRANS\_F (17.4% in SR and 13.27% in LR), private services, PRIVS\_F (12.4% in SR and 5.86% in LR), mining sector, MINIM\_F (3.2% in SR and 3.0% in LR) and manufacturing, MANUF\_F (2.5% in SR and 3.78% in LR) (see the first column in Table 4). The rise in output in the formal sector was especially driven by intensifying exports. This creates more opportunities for jobs in the formal sector, where male and female adult workers could be absorbed in those sectors which improved their output. It is further noticed that the demand for informally employed workers expanded in the formal sector, even though this profits mostly child labour.

The simulation results show that tariff reduction increases demand for imported goods. For example this shock significantly affects the textile and clothing sector. This sector is exposed to the biggest rise in import competition when tariffs are reduced. In the SR, the output of textiles and clothing increases by 1.37% for the formal sector and declines by 0.39% for the informal sector (see the first column in Table 4). The main reason could be that the producers from the textile and clothing sector in both the formal and informal sectors are negatively impacted by inexpensive imported goods. In fact, the general rise in imports has macroeconomic connotations,

because it creates a burden to the current account balance which is supposed to be constant in foreign currency. Nonetheless, foreign import demand and foreign exports increased as the real exchange rate is fixed in the SR. Consequently production increased in non-textile sectors, which are equipment and machinery, livestock, food processing and manufacturing. In view of this, the formal sector producers of food processing (0.38% in SR and 0.99% in LR), equipment and machinery (0.92% in SR and 0.89% in LR), livestock (0.99% in SR and 0.23% in LR) and manufacturing (2.48% in SR and 3.78% in LR) products benefit the most as the informal sector producers are not directly involved in the foreign exports. Thus the considerable import competition without any enhanced penetration to foreign export markets jeopardises the output of the informal sector producers.

**TABLE 4: SECTORAL PRODUCTION UNDER TARIFF REDUCTION POLICY SHOCK**

Sector	xTot		xExp		Xfac_f		xHou	
	SR	LR	SR	LR	SR	LR	SR	LR
AGRIC_F	0.62	0.37	5.22	-4.24	0.55	0.17	0.02	0.75
AGRIC_I	0.06	0.31	3.15	-3.73	0.06	0.27	-0.38	0.85
LIVES_F	1.00	0.24	3.56	-1.96	0.98	0.17	-0.30	1.22
LIVES_I	-0.33	0.42	3.23	-6.32	-0.33	0.38	-0.36	0.30
MININ_F	3.19	3.00	6.75	5.89	2.72	2.57	0.31	2.79
MININ_I	0.08	0.59	0.43	-0.18	0.06	0.60	-0.91	1.59
FOOD_F	0.38	1.00	6.64	-1.73	0.14	0.56	0.28	1.27
FOOD_I	-0.38	0.57	3.10	-5.18	-0.38	0.47	-0.39	0.55
CLOTH_F	1.37	1.93	10.14	2.56	0.81	0.91	0.94	2.14
CLOTH_I	-0.39	0.67	2.84	-4.79	-0.40	0.57	-0.44	0.63
MANUF_F	2.49	3.78	21.29	19.02	1.20	1.92	2.90	5.22
MANUF_I	0.17	0.93	2.55	-1.80	0.10	0.82	-0.50	1.25
EQUIP_F	0.92	0.89	26.40	26.29	-0.64	-0.65	3.75	6.48
EQUIP_I	0.81	1.46	3.35	0.74	0.62	1.32	-0.34	1.77
UTILI_F	1.74	2.30	5.34	-0.18	1.46	1.97	0.04	1.59
UTILI_I	0.30	0.21	0.00	0.00	0.44	0.31	-1.00	1.62
CONST_F	0.19	0.12	7.75	5.34	-0.07	-0.09	0.49	2.69
CONST_I	-0.06	0.32	3.80	-1.45	-0.08	0.17	-0.25	1.33
TRADE_F	0.62	0.60	0.85	-0.19	0.58	0.59	-0.83	1.58
TRADE_I	-0.03	0.58	1.31	-1.35	-0.07	0.61	-0.74	1.35
HOTEL_F	1.85	0.99	4.33	-0.70	1.64	0.85	-0.15	1.48
HOTEL_I	32846.00	0.90	2.42	-2.97	-0.41	0.91	-0.52	1.01
TRANS_F	17.37	13.28	21.08	16.12	15.94	10.95	2.86	4.71
TRANS_I	0.17	0.45	1.55	-1.18	0.11	0.48	-0.69	1.38
ESTAT_F	0.88	0.82	5.80	10.30	0.80	0.26	0.13	0.56
ESTAT_I	-0.12	0.40	4.05	-6.99	-0.09	0.15	-0.21	0.16

ADMIN_F	1.45	0.43	7.64	-3.04	1.28	0.04	0.47	1.00
ADMIN_I	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	1.62
PRIVS_F	12.41	5.86	16.21	7.39	11.42	4.01	2.02	3.08
PRIVS_I	-0.12	0.78	2.32	-2.85	-0.16	0.74	-0.54	1.04

Source: own calculation

Table 5 below reports changes in employment under tariff reduction policy simulations in the SR, and reflects a diverse distributional effect for both the formal and informal sectors. Increase in employment among formal producers is due to the growth in the formal sector's production. The main beneficiaries of this growth are the male and female adult labour from the formal sector operating extensively in the transport and communications (17.4%), private services (12.4%), mining (3.2%) and manufacturing sectors (2.48%). The main losers include all the workers from the informal sector, and both subsistence factor and child labour from the formal sector. Although employment decreases in the informal sector due to tariff reduction, more jobs opportunities are created in the formal sector. The formal sector will demand more employment, with a possibility of absorbing unemployed workers from the labour market. The policy simulation results demonstrate that policy makers should consider policies which promote employment creation, both in the formal and informal sectors. The decline in the informal sector's output and foreign import prices stimulates consumers from the informal sector to depend on foreign imported products, therefore the change in consumer preferences stimulates the intensity of commerce between the informal and formal sectors. The traders from the informal sector will benefit the most through the collection of fixed transaction margins from the trade's volume. Another reason is that the informal sector has more unemployed people when compared with the formal sector. While the male and female adult workers from the formal sector receive an increase in their incomes, all the informal sectors suffer decreasing incomes.

**TABLE 5: CHANGES IN EMPLOYMENT UNDER TARIFF REDUCTION POLICY SIMULATIONS**

Formal sector	Description		Base employment (1000s)	Change from base (%)
		factor		
FSUB	Subsistence (Survivalist)		324	-0.31
LCHILD	Child Labour		231	-0.25
FEMLAB	Female adult labour		867	0.01
MALELAB	Male adult labour		974	0.52
<b>Informal sector</b>				
FSUB	Subsistence factor		5998.2	-0.94
LCHILD	Child Labour		1532	-1.05
FEMLAB	Female adult labour		122	-0.96
MALELAB	Male adult labour		23	-0.89

Source: own calculation

Table 6 below reports the results of the policy shock on the household incomes in the SR. It reports a general fall across informal sectors in real household disposable incomes because of the declining employment. Nonetheless, impacts across household groups differ considerably. For instance, urban non poor household income composed of male labour rose by 0.52% in the formal sector while it shrank by 0.89% in the informal sector. The same trend is observed in the category of urban poor household income which is composed mostly of the female adult labour. Their income rose by 0.01% in the formal sector and shrank by 0.96% in the informal sector. Rural poor and rural non poor household groups experienced a general fall in income across both formal and informal sectors. Previous studies from countries such as South Africa established that trade liberalisation profited households from the middle income category (Thurlow, 2007; Pauw *et al.*, 2006). Our findings are consistent with this as incomes rise for the urban poor and non-poor household groups in the formal sector, but fall for the rural poor and non-poor income groups. The simulation result shows that efficient trade liberalisation must be promoted in the DRC economy in view of narrowing the income gap between urban and rural income households, as well as between formal and informal sectors.

**TABLE 6: CHANGES IN INCOMES UNDER TARIFF REDUCTION POLICY SIMULATIONS**

Income by occupation	Description	Formal sector	Informal sector
URBNPOOR	Urban non poor household	0.52	-0.89
URBPOOR	Urban poor household	0.01	-0.96
RURNPOOR	Rural non poor household	-0.25	-1.05
RURPOOR	Rural poor household	-0.31	-0.94

In brief, tariff reduction has diverse effects on the formal and informal sectors in the DRC. It considerably increases the output of, and employment in, the formal sector by increasing import competition, without offering further opportunities for the informal sector to penetrate foreign export markets. The formal sector is stimulated and can therefore act accordingly based on the current foreign market opportunities as its output increases. In addition, tariff reduction adjusts the structure of the informal sector by tightening product market freedom for informal sectors, expanding opportunities for informal traders and motivating workers from the informal sector to seek descent jobs in the formal sector. Despite the negative impact that tariff reduction may have on the informal sector, there are still new job opportunities in the formal sector. This emphasises the need for policies to stimulate further job creation and improve incomes among low income households.

## CONCLUSIONS AND POLICY IMPLICATIONS

This paper evaluates the effects of tariff reduction on employment, export performance, welfare and productivity growth in the DRC. An empirical DRCFIM was used to perform a policy simulation. In particular, this study draws the attention of policy makers to a different employment outcome when tariff reduction policy is taken into consideration. Tariff reduction increases formal employment and output but hurts informal producers, as output decreased in informal sectors such as livestock and clothing. It significantly increases the output of, and employment in, the formal

sector, by raising import competition without proposing further opportunities for the informal sector to access foreign export markets. Furthermore, it induces productivity improvements when local producers survive import competition by seeking importing input-saving technologies and production practices. The formal sector is stimulated to boost exports based on the new foreign market opportunities as its output increases. In addition, tariff reduction adjusts the structure of the informal sector by tightening product market freedom for informal sectors and motivating informal workers to seek decent jobs in the formal sector. The adverse effect that trade liberalization has on the informal sector is that it reduces total employment in spite of new employment opportunities in the formal sector. This highlights the need for policies to support further employment creation and raise incomes among poor households.

Regarding the welfare issues related to the tariff reduction policy, as consumption increases across all households in the DRC, it means that tariff reduction has a positive effect on welfare distribution. Considering the DRC's welfare issues, such a policy seems appropriate to policy makers. Our policy simulation results show that the DRC government can deal with the welfare issues by adopting a tariff reduction policy. Household demand shows mixed results however; only the high income households from the formal sector benefited as a result of the tariff reduction. We suggest that the DRC government considers subsidizing low income household to avoid widening inequality in the country.

Finally, the DRC's government in the past may have failed to consider the success of the tariff reduction in generating a dynamic export industry, however it is not too late to do so now and it would be highly pertinent to take into account the benefits of further reducing tariff in the future. Committing openly to reducing tariffs would make a significant contribution to increasing the global competitiveness of the DRC economy, as well as remind the DRC that there are still considerable distances to travel before the economic health of the country produces the level of prosperity expected by the community. Without exception, there is still substantial scope to lower prices and raise household welfare through stronger unilateral tariff liberalization.

## REFERENCES

- Bhorat, H. (1999) Decomposing sectoral employment trends in South Africa. Paper presented at the Trade and Industrial Policy Strategies Annual Forum, 19-22 September, Muldersdrift, South Africa.
- Chitiga, M., Mabugu, R. and Kandiero, T. (2007) "Trade Policy and poverty: Results from a CGE Micro-Simulation Analysis" *Journal of Development Studies*. Vol. 43, :1105-1125, No. 6
- Davies, R. and Thurlow, J. (2011) Formal-Informal Economy Linkages and Unemployment in South Africa. *South African Journal of Economics*. Vol. 78(4):437-459.
- DeVuyst, E. A., and Preckel, P. V. (1997). "Sensitivity Analysis Revisited: A Quadrature-Based Approach." *Journal of Policy Modeling* 19, 175-185.
- Edwards, L. (2001) Globalisation and the occupational structure of employment in South Africa. *South African Journal of Economics* 69 (1): 40-71.
- Harrison, G. W., Jones, R. C., Kimbell, L. J., and Wigle, R. M. (1992). "How Robust is Applied General Equilibrium Analysis?" *Journal of Policy Modeling* 15, 99-115.



Harrison, G. W., and Vinod, H. D. (1992). "The Sensitivity Analysis of Applied General Equilibrium Models: Completely Randomized Factorial Sample Designs." *The Review of Economics and Statistics* 74, 357-362.

Horridge, M. (2005) ORANI-G: A generic single-country computable general equilibrium model. Paper prepared for the practical GE Modelling Course, February 7-11.

Ianchovichina, E. and Walmslev, T. (2002) Impact of China's WTO Accession on East Asia <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.3.5774> Date of access: 21 January 2014.

International Monetary Fund (IMF). (2011) "Democratic Republic of the Congo: Poverty Reduction Strategy Paper." Country Report No. 07/330, September. IMF, Washington, D.C.

Litchfield, J., McCulloch, N. and Alan Winters, L. (2003). Agriculture trade liberalisation and poverty dynamics in Three Developing Countries, World Bank.

Lucas, R. E. B., and J. F. Hofmeyr. 2001. The rise in union wage premiums in South Africa. *Labour* 15 (4): 685-719.

Mai, Y. (2003) Effects of reducing tariffs and endogenous productivity growth, Centre of Policy Studies, General Working Paper No, G-139: Monash University.

Mosley, P. (2009). Liberalisation and poverty in Africa since 1990: Why is the operation of the 'invisible hand' uneven? DESA Working Paper No.84.

Pagan, A., and Shannon, J. (1987). "How Reliable are ORANI Conclusions?" *Economic Record* 63, 33-45.

Pauw, K., and L. Edwards. (2006) Evaluating the general equilibrium effects of a wage subsidy for South Africa. *South African Journal of Economics* 74 (3): 442-462.

Santo-Paulino, A. (2002) The effects of trade liberalization on imports in selected developing countries, *World Development* 30 (6), 959-974.

Schultz, T. P., and G. Mwabu. 1998. Labor unions and the distribution of wages and employment in South Africa. *Industrial and Labor Relations Review* 41 (4): 680-703.

Thurlow, J. (2007) Trade liberalization and pro-poor growth in South Africa. *Journal for Studies in Economics and Econometrics* 3 (2): 161-179.

Vos, R.P. and Jong, N. de (2003) Trade Liberalization and Poverty in Ecuador: A CGE Macro-Microsimulation Approach. *Economic Systems Research*, 15(2), 211-232.

Wigle, R. M. 1991. The Pagan-Shannon Approximation: Unconditional Systematic Sensitivity in Minutes. In Piggott, J., Whalley, J. (eds.), *Applied General Equilibrium*. Physica-Verlag: Heidelberg; 35-49.

World Bank (1997) *World Development Report*. Washington DC.

World Bank. (1999) *The Macroeconomic Foundation*, World Development Report. Oxford University Press.

World Bank (2000) *World Bank Development Indicators*.

World Bank (2001) "Congo: Poverty Reduction Strategy Paper." Report No. 39615-ZR, April. World Bank, Washington D.C.

World Bank (2007) "Democratic Republic of Congo—Country Assistance Strategy: For the Period FY08–FY11." Report No. 41474-ZR, November. World Bank, Washington D.C.

World Bank (2010) *World Bank Development Indicators*. Washington DC

World Bank. <http://www.worldbank.org/publications>. Date of access: 05 April 2012

World Bank (2011) World Economic Outlook. An update of the key WEO projections. World Bank, Washington, D.C. Available at: <http://www.worldbank.org/weo2011>.

World Bank (2013) World Development Indicators, Washington, D.C. Available at: <http://data.worldbank.org/country/congo-dem-rep> Date of access: 23 January 2014.

WTO (2013) Trade Monitoring Reports <http://www.canberratimes.com.au/world/tariff-cuts-on-green-goods-get-thumbs-up>. Date of access: 01 June 2014

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.