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Impact of special COVID-19 social relief of distress grants in South Africa: A CGE analysis

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Abstract. This paper assesses the outcomes of the Special COVID-19 Social Relief of Distress Grants (SRDG) program. A gratuity of R350 ($26.5) per person and per month was granted to low-income households following a national lockdown on 26 March 2020, aimed at alleviating the spread of the COVID-19 pandemic. Although, children and elderly grants are excluded from this program, the study focuses on cash transfer programs in terms of their role in increasing current consumption of poor households and enabling them to gain capitals. We assess the general equilibrium effects of the cash transfer through the usage of a static computable general equilibrium (CGE) model calibrated to South Africa's social accounting matrix (SAM) for 2015. Our simulation results indicate that the SRDG program improved the real incomes and consumption for all households. This result is consistent with the findings of Londoño-Vélez & Querubín (2022) and Ashfaq & Bashir (2021), who studied the impact of emergency cash assistance during the pandemic in Colombia and Pakistan. The decline in GDP (-0.1021%) is cushioned by the fact that both exports and imports were negatively affected as the lockdown restrictions obstructed all international trade activities. Despite the welfare gains, South Africa's fiscal and macroeconomic indicators suggest that the program is likely better considered as an automatic stabilizer in fiscal and social policy planning rather than as another component of social protection. The shock applied to the economy is limited to the total amount of the cash transfer allocated by the government. A static CGE model seems suitable in this study as econometric analysis is unsuitable for the simple reason that there is lack of time series data. The originality of this study lies in the use of the CGE model for assessing the outcomes of such cash transfer to low-income households in South Africa.
Keywords. Social Relief of Distress Grants; Cash transfer; CGE model.
JEL. E16; D50; H50.

1. Introduction

Since the announcement of lockdown by the President of South Africa on 26th March 2020, the Special COVID-19 Social Relief of Distress Grants (SRDG) was proposed to provide R350 ($26.5) per person and per month to low-income households, subject to government approval. Although this program excluded children and elderly grants, to be eligible, applicants should be unemployed with no other financial support and hold valid papers granted by the South African government. The objective of this cash transfer was to enable these households to maintain consumption amid possible income loss resulting from the national lockdown decision (National Treasury, 2020).

Additionally, on 21st April 2020, the government introduced measures not only to support low-income households but also to aid small and medium enterprises. This included ratifying laws such as the Disaster Management Act, 2002, a Draft Disaster Management Tax Relief, and a COVID-19 Block Exemption for specific industries in the economy. The government implemented a fiscal stimulus of approximately R500 ($37.6) billion to mitigate the harmful socioeconomic effects of the lockdown, which represents around 10% of the country's GDP.

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According to National Treasury (2020), about 22.6 million households were qualified to receive a total package of R500 ($37.6) billion. Assuming an average of 5.2 persons per household, this suggests that more than 48 million individuals were likely to be considered under the program out of a total population of approximately 60 million (Stats SA, 2020). The amount disbursed was significant, allowing beneficiary households to purchase food and essential items. Consequently, when comparing with other countries, this amount surpasses the allocation made by Pakistan to its population during the same period. Nishtar (2021) reports that Pakistan allocated PKR 203 ($28.6) billion to about 16.9 million households, covering over 100 million individuals in a population of approximately 221 million.

Many countries have demonstrated that welfare gains from cash transfers govern restricted transfers (in-kind) in the presence of a well-defined individual social welfare function, which allows for interpersonal comparisons (Londoño-Vélez & Querubín, 2022). Nonetheless, if there is a direct relationship between specific goods and welfare, restricted transfers may be preferable, particularly when consumption baskets vary significantly between income groups.

From a longer-term policy perspective, Kaneda, Kubota & Tanaka (2021) argue that cash transfer should stimulate undeniable welfare gains on aggregate household groups as a part of social protection. Given the exceptional nature of the COVID-19 pandemic, it is crucial to consider whether an increase in consumption for a selected group may lead to a welfare decline for others. In such cases, transfers in-kind may be preferable.

In addition to cash transfers, businesses were encouraged to put their provisional corporate income tax disbursements on hold for six months without penalties. Individuals and businesses were also encouraged to donate to the COVID-19 disaster relief Solidarity Funds, with the possibility of receiving tax refunds after tax assessment. Donors could deduct 10% of their taxable income and be exempt from donations taxes. As a result, individuals who donate to the SRDG program may benefit significantly with at least a 20% reduction when claiming tax refunds from taxable income. Other benefits included a three-month break for submitting tax returns, expedited processing of Value Added Tax (VAT) refunds, and a four-month delay in the payment of companies' skills development levy (SARS, 2020).

Besides the efforts made by the government in implementing various relief strategies to support small businesses, private sectors, such as banks, large corporations, non-governmental organizations (NGOs), and wealthy families, also contributed to overcoming the harmful effects of COVID-19. The Industrial Development Corporation (IDC) and the Department of Trade provided a substantial R3 ($0.26) billion packages for industrial funding to assist vulnerable businesses. This amount of money rescued businesses in distress by supplying raw materials, debt payment and scheme-associated dispensation rating (National Treasury, 2020).

In this study, we aim to assess the impact of the SRDG on the South African economy. A Computable General Equilibrium (CGE) analysis of the impact of SRDG seems suitable in this study. The simple definition of a CGE will be the one given by Dixon, defining a CGE as nothing more than a general equilibrium model that can be used to perform quantitative analysis of economic policy problems. A CGE model therefore needs apart from the theoretical structure provided by a general equilibrium model, some data

concerning the economy of interest. Once the general equilibrium model and data have been integrated, an actual solution method needs to be determined in order to solve the equilibrium prices and decision variables in the equilibrium system (Dixon, *et al.*, 1980). This study will be limited to the application of the CGE model as econometric analysis is unsuitable for the simple reason that there is lack of time series data. Section 2 presents the literature review, followed by a brief portrayal of the methodology in Section 3. Section 4 examines the findings, while Section 5 assesses the policy implications of the simulation's results. The final section offers concluding observations.

2. Literature review

In theory, cash transfers can stimulate economic growth by alleviating demand constraints (Lewis & Thorbecke, 1992; Levy & Robinson, 2014). While this possibility can be demonstrated, for instance, in computable general equilibrium models, it is often challenging to isolate from other trends. Early indications suggest that the SRDG program has achieved its immediate objectives of alleviating poverty and economic hardship during the lockdown. Nishtar (2021) cites the findings of a telephone survey in which 97% of respondents reported fully expending the transfer amount during the lockdown, with 93% of the transfer being spent on food and sustenance needs. As a result of its importance, the SRDG program was recommended to continue for another year in 2021 for economic development purposes.

Prior empirical literature, predating COVID-19 demonstrates relative consensus on the welfare gains of cash transfers to low-income households vulnerable to adverse shocks. For instance, Haushofer & Shapiro (2016) found increased economic security and psychological well-being among households receiving unconditional cash transfers from an NGO in Kenya. This positive effect was consistent regardless of the transfer's size, frequency, or the household's recipient of the transfer.

Londoño-Vélez & Querubín (2022) indicate that, from the perspective of a local economy, cash transfers, especially public works programs can contribute to local economic growth by creating community assets. Additionally, the liquidity injected into a community from transfers can have further positive effects. Regular and predictable transfers facilitate planning, consumption smoothing, and investment (Abeysinghe, 2021). Households receiving lumpy and unpredictable transfers, as was the case during COVID-19, are likely to spend the money differently. Furthermore, the relative amount of the transfer matters. The World Bank's study (2021) shows that the size of the transfer as a share of per capita consumption of beneficiary households ranged from 7% in Ghana to nearly 30% in Zambia. The demographic profile of beneficiary households, particularly the availability of labor, also plays a role in shaping the economic activities a household can undertake.

The context matters for interpersonal comparisons as welfare gains from cash transfers may outweigh regulated transfers (in-kind) in the presence of a well-structured household social welfare function (Ashfaq & Bashir, 2021). Consumption baskets differ between income groups, and transfers of specific goods may yield greater welfare gains than a cash transfer (Lind, Roelen, & Sabates-Wheeler, 2021). Therefore, from a longer-term policy perspective, it is crucial to establish whether there are overall welfare gains or not. While the COVID-19 pandemic is an extremely rare event, it is necessary to consider if

an increase in consumption for only a selected group due to cash transfers—a minority—leads to a welfare decline in other groups, making transfers in-kind more preferable instead.

Ashfaq & Bashir (2021) studied the unconditional cash transfer for Pakistan, while Haushofer & Shapiro (2016) focused on Kenya and eight countries in Sub-Saharan Africa. They found little evidence that unconditional cash transfers were regularly misappropriated for other purposes. Nonetheless, there were community effects like raising inflation, reducing labor participation and fiscal unsustainability.

During the COVID-19 pandemic, early evidence suggests similar effects of cash transfers to low-income households. Kaneda, Kubota, & Tanaka (2021) studied the differences in bank deposit timings of an unconditional cash transfer by the Japanese government and find that low-income households displayed larger positive consumption effects following the transfer than higher-income groups.

Londoño-Vélez & Querubín (2022) pointed out that the effects of unconditional cash transfers in Colombia reported positive welfare effects from a regular unconditional cash transfer of about 8% of the monthly minimum wage to households already living in poverty. Households receiving the transfer reported improved financial health, increased human capital investment, better food access, and improved psychological well-being. Lawson-McDowell, McCormack & Thostrup (2021) also reported the considerable success of cash transfers and vouchers in providing immediate widespread relief in several countries following the COVID-19 outbreak.

3. Methodology

We assess the general equilibrium effects of the SRDG on the South African economy using a static CGE model adapted to South African's social accounting matrix (SAM) for year 2015. SAM is a popular format for presenting CGE databases (Horridge, 2000). A SAM must contain "social" information, such as a detailed mapping between different household types and different income sources, and detail of transfers between institutions. Each row or column of the SAM corresponds to a particular agent, activity, or account. Each cell A (i, j) shows the value of some transaction. Row totals show total income to each account – these should match the corresponding column totals showing total (expenditure + savings) of each account.

Our CGE model was initially constructed by Lofgren, Harris, and Robinson (2001). It follows the neoclassical-structuralist approach, and the set of equations are consistent with the SAM disaggregation of commodities, activities, factors and institutions as represented in the SAM. The set of equations illustrates the behaviour and interactions of economic agents using rules denoted by both fixed coefficients and non-linear first-order optimality conditions as well as a set of identity equations. It also captures the functioning of a market economy in which the interactions of producers, households, government and rest of the world are resolved using prices and markets. Macroeconomic and resource constraints are taken into consideration, which is crucial for large-scale policy changes. The model includes 49 commodities at industry level as well as 49 activities. There are four factors of production, capital, high-skilled, semiskilled and unskilled labor. Four labour groups are distinguished: primary education educated (Grades 1-7), middle educated (Grades 8-10), secondary educated (Grades 11-

12) and tertiary educated. The households are divided into the 14 income deciles. Besides, we pointed out explicit macroeconomic government closures for the purpose of allowing new taxes such as a carbon tax to be re-injected back into the economy, making government revenue unbiased.

For capturing the effects of cash transfer, the direct and indirect tax components are also disaggregated in the model based on the realities of the South African tax structure. In the case of direct taxes, the model makes the distinction between regular and dividend income earned by enterprises and households. Allowances are made for these incomes to be taxed differently as is currently the case. Regular income is subject to Company Income Tax (CIT) in the case of firms and Personal Income Tax (PIT) in the case of households, while dividend income to households is subject to dividend tax. Data from the South Africa Reserve Bank (SARB, 2020) were used to disaggregate enterprise income that flows to households in the form of regular and dividend income revenue streams and the associated tax revenue components.

A CGE analysis of the program's effects is useful here as the global resumption of activity has been the hardest hit by the pandemic and it is unlikely that household surveys at a similar level of disaggregation as the SAM may be conducted by the South African government. CGE model has showed no limitations yet as over the last decades. CGE models have become a wide-spread tool for the economic impact assessment of policy regulation (Horridge, 2000). Besides, any econometric technique to assess the impact of this pandemic should be inappropriate due to the lack of time series data (World Bank, 2021). A fixed share of disposable income, i.e. net of taxes and transfers abroad, is allocated to savings. Allocation of the remainder for consumption across commodities is based on utility maximization of Cobb-Douglas preferences.

3.1. Database presentation

The SAM used here as the database of the CGE model is based on the macro-SAM for year 2015. The model was initially constructed by Lofgren, Harris, & Robinson (2001). The initial SAM for 2015 contains information on 49 types of activities, 85 commodities, 4 factor inputs, 14 types of households and 3 other accounts in a 165 × 165 matrix. For a more tractable analysis, some aggregation of activities, commodities, factor inputs and other accounts was done with respect to the original without any significant loss of information. No further aggregation was undertaken with respect to households as a major focus of this paper is on the effects of the SRDG program on different households. The resulting SAM used for the analysis contains 49 activities, 49 commodities, 4 factor inputs – capital, labor and land, 14 household types, and 8 other institutional accounts in a 124 × 124 matrix. Table 1 is a stylized illustration of the SAM provided in this paper. Rows in the SAM report payments (income) while columns report expenditures.

Table 1. *A Stylized Illustration of South Africa's Social Accounting Matrix for year 2015*

Income	Expenditure					
	Commodities	Activities	Factors	Households	Other Institutions	Total
Commodities		Intermediate inputs		Household consumption	Taxes, subsidies, exports, firm stock and investment	Demand
Activities	Domestic production					Gross output/ production
Factors		Factor returns			Factor income from abroad	Factor income
Households			Factor income to households		Government and enterprise transfers	Household income
Other Institution	Net taxes on products and imports	Net taxes on production	Factor taxes, non-household factor income, depreciation	Household taxes, savings and transfers	Government savings, domestic and international capital transfers	Non-household income, savings and transfers
Total	Supply	Production costs (Total absorption)	Expenditure on factor inputs	Household expenditure	Non-household savings, expendtiture and investment	

Table 1 includes the activity and institution sets in the SAM. Of direct interest here, the 14 types of households are first disaggregated on the basis of income – poor or non-poor households. In this case, household consumption decisions are determined by the first order conditions from utility maximization subject to its budget constraint. Households own factor inputs such that the household's budget constraint comprises of a share of factor income and transfers from the government and other institutions. Nonetheless, households differ in their factor holdings and income. In fact, non-poor households receive income from the returns to land, labor and capital while poor households receive income from labor only. Activity, commodity and institution sets used in the SAM are described as follow:

$a \in A$: All the 49 activities in activity A.

$c \in C$: Commodities: these map correspondingly to A. Each activity produces one specific commodity.

$c \in CM \subset C$: Imported commodities denoted M.

$c \in CNM \subset C$: Non-imported commodities such as electricity "cElect" in the model.

$c \in CX \subset C$: Exported Commodities

$c \in CNX \subset C$: Non-exported commodities such as electricity "cElect" in the model.

$f \in F$: Factor inputs: κ – Capital; ℓ – Labor; n – Land.

hhd $\in HH$: Households: (i) Poor households (hhd-0, hhd-1, hhd-2, hhd-3 and hhd-4); (ii) Non-poor households (hhd-5, hhd-6, hhd-7, hhd-8, hhd-9-1, hhd-9-21, hhd-9-22, hhd-9-23 and hhd-9-24).

$j \in J$: Other institutions: (i) Transaction costs; (ii) Enterprises; (iii) Government; (iv) Subsidies; (v) Sales taxes; (vi) Import taxes; (vii) Export duty rebates; (viii) Direct taxes; (ix) Savings-Investment; (x) Rest of the World.

A fixed share of disposable income, i.e. net of taxes and transfers abroad, is allocated to savings. Allocation of the remainder for consumption across commodities is based on utility maximization of Cobb-Douglas preferences.

Enterprises maximize profits subject to a constant elasticity of substitution (CES) production technology using a linear combination of factor inputs and a composite intermediate to produce a commodity that is used both for final

consumption and as part of the intermediate composite. Factor demands are obtained by the first order conditions of firms' profit maximization and the price of each factor is determined by the value of its marginal product. Factors may be mobile or activity-specific with their prices differing accordingly. The composition of the intermediate for an activity, a, is obtained from the input requirement of each final commodity, c. This is obtained from the SAM.

The government's budget constraint comprises of tax receipts from individuals and firms, domestic factor income and receipts from abroad. Its outlays include the purchase of commodities for consumption, subsidies and transfers to other institutions. Government savings (the fiscal position) are the difference between its revenues and outlays. This is endogenous in the model.

Domestic demand consists of household demand, government purchases, investment, intermediate inputs demand from firms and exports. Demands are derived from a cost minimization function as per a CES aggregate function with imperfect substitutability. The economy is assumed to be a price taker in world markets, i.e. a small open economy, and export demand and the supply of imports for domestic demand are infinitely elastic. Where there are imports of a commodity, this is treated as a composite of imports and exports in the domestic market in the model. For exports, domestic suppliers allocate between domestic demand and exports by maximizing revenue subject to a constant elasticity of transformation (CET) function. Prices of all imports and exports are in domestic currency units and adjusted for taxes or subsidies.

For factor inputs, labor supply is fixed and assumed to be mobile between activities and a unique wage clears the labor market. Land is fully utilized and the price of land is determined by the value of its marginal product. Capital is activity-specific and the price of capital is fixed. This implies that some factor price distortion exists in the capital market and the returns to capital differ from the value of its marginal product. Of the various production activities, only agriculture (aAGRI) requires land as a factor input that its production function is of the general form: $AGRI = f(\kappa,\ell,n,M)$ where M denotes the intermediate composite. All other commodities have a production function of the type: $c = f(\kappa,\ell,M)$.

The model is closed using the following assumptions – closure rules. On the small open economy assumption, foreign savings are fixed and a flexible exchange rate clears the current account. Investment adjusts according to the level of domestic savings. As there is no monetary sector in the model, price normalization is done in terms of the consumer price index based on Cobb-Douglas preferences i.e. CPI = 1. This is the economy-wide CPI which is the weighted average of the price indices of the consumption bundles across all household types. Note that a structural limitation of the model is that the SAM imposes the restriction that an activity necessarily corresponds to the production of one commodity and vice versa. While it is possible for an activity to produce more than one commodity and/or that a commodity may be produced by more than one activity, the restriction imposed by the SAM means that these types of linkages cannot be considered or included in the model.

3.2. Treatment of Household

The SRDG program is targeted at low-income households. This includes households below the poverty line and also households in receipt of transfers under the various schemes implemented by the Government of South Africa.

Nonetheless, the SAM includes specific data on the type and number of households that are classified as poor and non-poor income households. The SAM includes information on the total number of households and individuals in each category and total pre-transfer incomes. From these, daily per capita incomes of the different reported household types may be derived. These are presented in Table 2.

According to the concept of Purchasing Power Parity (PPP), two currencies are in equilibrium—their currencies are at parity—when a basket of goods is priced the same in both countries, taking into account the exchange rates. PPP is a popular macroeconomic analysis metric used to compare economic productivity and standards of living between countries. Following the international poverty line of USD 1.90 a day (World Bank, 2021), 5 household types are selected to receive the cash transfer in our analysis. They are classified as the poor households (hhd-0, hhd-1, hhd-2, hhd-3, and hhd-4). Furthermore, the model includes 38 sets of equations depicting the behavior and dynamics of the various activities and institutions in the economy and includes 19 exogenous variables, 38 endogenous variables and 19 parameters. A number of parameters like output shares and commodity input weights may be derived from the SAM. For free parameters like the elasticity of substitution and elasticity of transformation, they were calculated and included in the SAM.

Table 2. *Household Incomes*

Variables	Total Household Income (billion Rand)	Per capita income	
		Daily (Rand)	Daily (USD)
POOR	273	386.75	20.68
hhd-0	27	38.25	2.05
hhd-1	47	66.58	3.56
hhd-2	57	80.75	4.32
hhd-3	65	92.08	4.92
hhd-4	77	109.08	5.83
NPOOR	1313	1860.08	99.47
hhd-5	89	126.08	6.74
hhd-6	108	153.00	8.18
hhd-7	151	213.92	11.44
hhd-8	287	406.58	21.74
HHD-9	677	959.08	51.29
hhd-9-1	84	119.00	6.36
hhd-9-21	98	138.83	7.42
hhd-9-22	118	167.17	8.94
hhd-9-23	144	204.00	10.91
hhd-9-24	234	331.50	17.73
ALLHHD	1586	2246.83	120.15

Source: Calculations from the SAM by Author

One aspect needs to be pointed out with respect to the interpretation of our results. Lofgren *et al.*, (2001) argue that despite the earlier base year of the data, the underlying mechanisms and relationships of the CGE model remain relevant as the rate of economic and structural changes in a developing economy like South Africa is not rapid, and the estimates from the CGE model are plausible for inference.

3.3. Concept of the CGE model

As indicated earlier, the static CGE model utilised for the simulations in this paper is predominantly founded on the adaptation from the static CGE model constructed by Lofgren *et al.,* (2001). It portrays the interactions and correlations between various economic representatives such as producers, investors and government in the economy in both the factor and product markets. The model includes foreign markets by means of trade and foreign savings. Nonetheless it makes provision for the inter-temporal adjustments in the economy and it considers the impacts of the policy interventions as they unfold over time.

The database for the static CGE model is composed of a SAM. The SAM itself merely depicts the structure of an economy at a particular time. In order to gain some insight about how the economy works and to predict how changes will affect it, there is a need for an active model to be employed (World Bank, 2010). In this case, the SAM for the year 2015 serves as database for the CGE model. The parameters of the CGE equations are calibrated to observed data from the SAM. The model portrays the performance of the market economy where the dealings between the economic agents are determined using prices and quantities. Some macroeconomic limitations are taken into consideration for policy purposes. For instance, there is only one fundamental law of economics: for every income there must be a corresponding expenditure. No economic theory can be considered complete unless all incomes and outlays are accounted for. CGE models are data demanding, they do not tolerate inconsistencies in data. Although by definition the number of decile groups is exactly 10, the household sector is disaggregated according to income into deciles with the top decile further split into 5 groups. The government, enterprises, 14 income groups based on their per capita expenditure, and interactions with the rest of the world are all captured. The behaviour of industries and households is governed by rational expectations (Horridge, 2000). Figure 1 below illustrates the conceptual framework of our CGE model and the relationships between all the economic agents.

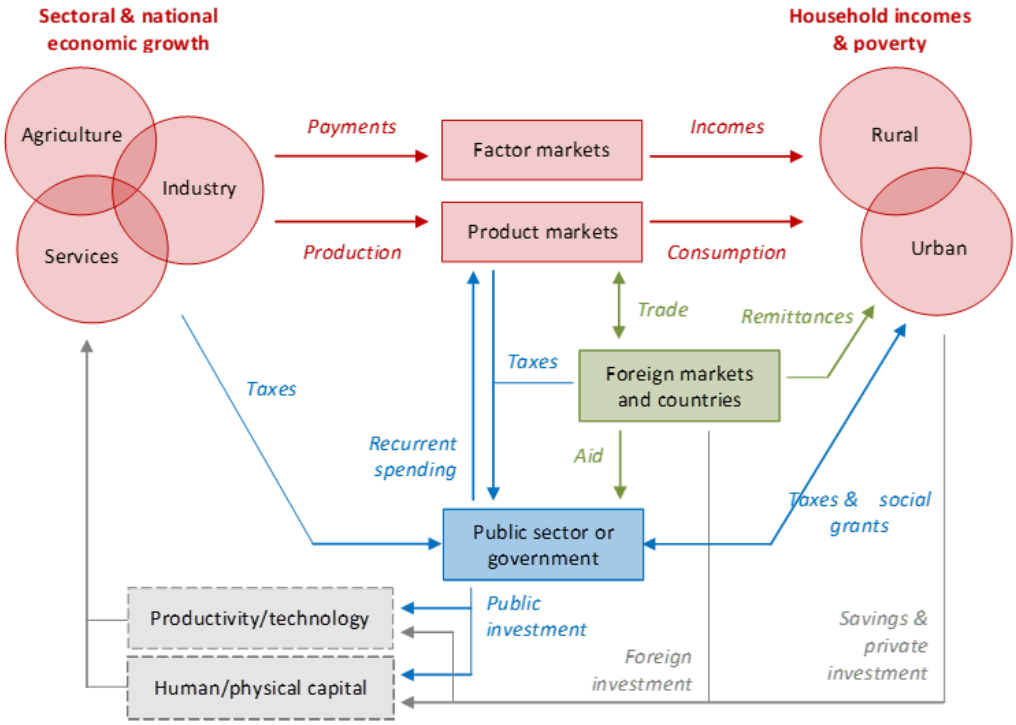

Figure 1. *Conceptual Framework of the CGE Model*
Source: Alton, et. al., (2012)

The primary data sources applied for the construction of the 2015 SAM are supplied by the Statistics South Africa (Stats SA) and South Africa Reserve Bank (SARB). The specific data used to analyse the sectoral linkages between economic agents and labour were taken from the supply and use tables. We will describe only a limited number of equations due to the huge number of variables and equations in the model. The trade equations are based on an external account that includes global commodity prices, foreign financial flows, payments for imports and revenues from exports, and trade elasticities. The main component of the CGE model is presented below.

3.4. Consumer and producer behaviour

This model captures the comportments of producers and consumers established from the activities and commodities data. Consumers are assumed to maximise their utility based on the Stone-Geary utility function, subject to their budget constraint. The household is subdivided into 14 income categories by assuming that each income category is free to expand its welfare based on the available income. The demand follows the Linear Expenditure System (LES) as illustrated in the Equation 3.1. The LES regulates the inconsistency of income elasticities between various household income categories.

$$P_j * H_{jh} = P_j * \gamma_{jh} + \beta_{jh} * ((1 - S_h - td_h) * Y_h - \Sigma_{jt} P_{j'} * \gamma_{j'h}) \quad (3.1)$$

while H_{jh} signifies the expenditure on product j by household h, β_{jh} signifies the slight budget portion, γ_{jh} signifies the smallest survival level, P_j signifies the market price of each product, Y_h signifies the gross household salary, S_h signifies minimum savings and td_h signifies the direct tax rates.

Similarly, the assumption is that the producers should make enough revenue despite the fluctuation in the input and output prices. Based on the neoclassical theory, a constant elasticity of substitution (CES) function defines output quantity A from sector j. In this case, the producer production function is illustrated by equation 3.2:

$$A_j = a_j * \left(\delta_{j* L_j}{}^{-\rho_j} + (1-\delta_j) * \overline{K}_j{}^{-\rho_j}\right)^{-1/\rho_j} \quad (3.2)$$

while α signifies the total factor productivity (TFP), δ_j signifies the share, ρ_j signifies the replacement parameter, L_j signifies the labour and K_j signifies the capital demand. It must be noted that the production function permits technologies to modify according to each economic activity. Maximizing profits subject to Equation 3.2 bring forth the subsequent factor demand as represented in equation 3.3:

$$L_j / K_j = [(r * Z_j / W) * (1 - \delta_j / \delta_j)]^{1/(1+\rho_j)} \quad (3.3)$$

where W signifies the labour wage and r signifies a fixed capital rental rate in the economy modified by a sector-specific element Z. The factor substitution elasticity is a transformation of ρ. Substitution can occur between labour L_j and capital K_j when relative prices change in the case of higher elasticities. δ_j signifies the share, ρ_j signifies the replacement parameter.

In this model, we assume that all factors are retained by households. Therefore, total household income Y_h including the grants is illustrated by equation 3.4:

$$Y_h = \sum_j(\omega * W * L_j + \theta * r * Z_j * \overline{K}_j) + st_h \quad (3.4)$$

where st_h signifies social transfers from the government. Coefficients ω and Θ control the dissemination of factor earnings to individual households of labour L_j and capital K_j respectively. W signifies the labour wage and r signifies a fixed capital rental rate in the economy modified by a sector-specific element Z. Provision is made in the model to incorporate enterprises that gain the returns to capital. The revenue received by the enterprises can be used to save, pay corporate taxes and dividends to households.

In the process of production, the intermediate demand in the model is based on the Leontief technology functions. Equation 3.5 captures the elements of intermediate demand.

$$PA_j * A_j = W * L_j + r * Z_j * \overline{K}_j + \sum_j P_j io_{jj} \quad (3.5)$$

where fixed input-output coefficients $io_{jj'}$ display the quantity of good j' utilised to generate one unit of good j. These technical coefficients are derived from Stats SA (2020). Finally, the producer price, PA, is the sum of factor and intermediate payments per unit of output. Function defines output quantity A from sector j, W signifies the labour wage and r signifies a fixed capital rental rate in the economy modified by a sector-specific element Z. While ρ_j signifies the replacement parameter with Labour L_j and capital K_j.

3.5. Model closure and policy shocks

The computable general equilibrium model used in this study is carefully designed to reflect the economic environment in South Africa during the COVID-19 crisis and the implementation of the Special COVID-19 Social Relief of Distress Grants (SRDG) program. The model includes a comprehensive set of equations characterizing the behavior and dynamics of various economic activities and institutions in the economy. It consists of 23 exogenous variables, 42 endogenous variables, and 23 parameters or elasticities.

Modeling Low-Income Households: To target the low-income households in the SRDG program, data on the category and number of households classified as low income were obtained from the SAM. Using this information, daily per capita incomes for different household categories were estimated. The SRDG program was then targeted to five household categories below the poverty line and those receiving transfers under various government schemes. This targeting approach ensures that the cash transfer reaches the most vulnerable households effectively.

Closure of Factor Markets: The model specifies closures for factor markets, ensuring that capital and skilled labor are fully employed, while semi-skilled and low-skilled labor are assumed to be unemployed. As a result, the nominal wages for semi- and low-skilled labour remain constant, reflecting the high levels of unemployment experienced by these factors during the crisis (Erero, 2021).

Macroeconomic Savings-Investment Balance: In the CGE model, saving and investment are considered crucial elements for maintaining macroeconomic stability. Savings are seen as "leakages" from the demand system, while investment is the pool where these savings are utilized. The model includes two important parameters, household savings shares (mps_h), and base-year sectoral investment quantities (qinv_c). By fixing the investment demand (QINV_c), the model can examine the demand impact of an exogenous increase in investment. The savings-investment balance is maintained through the introduction of a variable called WALRAS, ensuring that savings and investment are equal.

Labor Market Assumptions: The labour market assumption in the model is based on the condition that capital and skilled labor are fully employed, while semi-skilled and low-skilled labour experience high levels of unemployment in South Africa. This assumption helps in understanding the dynamics of the labor market during the crisis and how it impacts different types of labour.

Elasticities and Parameters: Various parameters and elasticities are estimated from the SAM, and some are obtained from previous studies like Lofgren *et al.,* (2001). These parameters play a crucial role in determining the responsiveness of different economic variables to policy shocks and changes in the economic environment.

Policy Shocks: The CGE model is well-suited to simulate and analyze policy shocks, such as the implementation of the SRDG program. We introduced exogenous changes specifically in variable social transfer " ⟦st⟧ _h" in the model. In this respect, we could assess the potential impacts of this policy interventions on the economy. This allows for a thorough evaluation of the effectiveness and consequences of the cash transfer program on household consumption, welfare, and overall economic growth.

Overall, the CGE model used in this study provides a comprehensive framework for understanding the economic impact of the SRDG program and

other policy interventions during the COVID-19 crisis. It allows policymakers to make informed decisions and design targeted and effective relief measures to support vulnerable households and promote economic recovery.

4. Findings

When interpreting the simulation results, it is essential to consider that there is no predetermined logic to adhere to. However, we should focus on variables of interest due to the shock's impact. The results obtained from the simulation align with the expectations from the CGE model. The magnitude of percentage change between the business-as-usual scenario and the impact of the shock provides valuable insights. Adams (2003) describes how suitable interpretations can be derived from this difference.

Two aspects deserve attention regarding the interpretation of our results. Firstly, despite using an earlier base year of data, the underlying mechanisms and relationships of the CGE model remain relevant, as the rate of economic and structural changes in a developing economy like South Africa is constant. Thus, the estimates from the CGE model are plausible for inference (Horridge, 2000; World Bank, 2021). Secondly, it is essential to note that the income quartiles of low-income households (poor) originated from the low-income households, which are only disaggregated within the lowest income quartile, while the other quartiles are amalgamated.

The simulation in this study focused on the effects of special COVID-19 Social Relief of Distress Grants (SRDG) on the South African economy. The substantial amount of money injected into the economy during the pandemic played a crucial role. Our expectation was that the policy shock related to the increase in cash transfers would lead to expansion in all economic activities utilizing factors of production such as labor, capital, and land more efficiently. Furthermore, the productivity gain should result in a reduction in output prices across sectors. We specifically emphasized the impact of SRDG on the production function, employment, and GDP improvement, as presented in Table 1.

Table 1. *Impact on the Macroeconomic variables (base values and percentage change)*

Variables	Description	Base (2015 R billion)	Sim (% change)
ABSORP	Absorption (Cost of production)	2687	0.2018
PRVCON	Private consumption	1586	0.1782
FIXINV	Investment	501	-0.4181
DSTOCK	Stock	-3	0
GOVCON	Government consumption	604	0
EXPORTS	Exports	642	-0.1738
IMPORTS	Imports	-666	-0.1641
GDPMP	GDP	2663	-0.1021
NETITAX	Net indirect tax	287	-0.1136
EXRXY	Exchange rates	1	0.0005
YGX	Government income	679	-0.1142

Source: Shock results

The simulation results validate the continued operation of the SRDG program, particularly the potential welfare gains from cash transfers to low-income households as part of social security. However, the increased domestic demand for certain commodities resulting from the cash transfer led to the

reallocation of factor inputs between sectors, reducing national income and increasing the government's budget deficit.

In Table 1, most macroeconomic variables declined, except for private consumption, absorption (unit cost of output produced or service rendered), and exchange rates. Private consumption and absorption showed significant increases of 0.1782% and 0.2018%, respectively, due to the cash transfer from the government. The decline in GDP (-0.1021%) can be attributed to reduced exports and imports resulting from lockdown restrictions that obstructed international trade activities. The reduction in imports indicates that a greater share of domestic production was consumed domestically, leading to an appreciation of the exchange rate. If we assume that consumption expenditure serves as a proxy for welfare, it is evident that cash transfers would have positive impacts on welfare and welfare distribution across all households in South Africa in the short run. Given South Africa's welfare problems, such a policy would likely be well-received by policy makers. The results suggest that the government could effectively address these issues in the short run by using tax revenue to transfer cash to low-income households. The high level of unemployment in South Africa could be the main reason for that. Our findings align with the broader literature (Bulow *et al.*, 2020; Ashfaq & Bashir, 2021; Londoño-Vélez & Querubín, 2022). Income and consumption expenditure increased for all beneficiary households. Importantly, numerical calculations indicate that welfare is unambiguously higher among beneficiary households who received cash transfers. Table 2 includes the government's income from the shock.

Table 2. *Impact on the government revenue*

Description	Base (2015 R billion)	Sim (% change)
Direct revenue excluding dividend tax	396	-0.0464
Activity tax revenues	38	-0.0004
Import duty revenues	23	-0.0008
Sales tax revenues	226	0.0021
Transfers received from factors	52	-0.0031
Transfers received from ROW	-30	0.0032

Source: Shock results

Table 2 illustrates that most of the government's tax revenues declined, except for sales tax and transfers received from the rest of the world (ROW), which improved by 0.0021% and 0.0032%, respectively. However, the revenue losses due to the lockdown were not fully offset by the marginal rise in sales tax revenues, although sales tax played a significant role in total government revenue. Table 3 presents the employment categorized by income groups.

Table 3. *Employment*

Variables	Description	Base (2015 R billion)	sim (% change)
flab-p	Primary education	77	-0.1326
flab-m	Middle education	208	-0.0812
flab-s	Secondary education	387	-0.0754
flab-t	Tertiary education	541	0.0625

Source: Shock results

Table 3 shows a decline in employment across all categories, except for individuals with tertiary education levels. The COVID-19-induced job losses have effectively erased the last decade of employment growth. The pandemic

has also exacerbated pre-existing inequalities relating to gender, income distribution, and geographic spread. The simulation results indicate that, on average, household factor income from labor and capital fell for all employment categories with primary, middle, and secondary education level. Most of the job losses were in elementary occupations, both in the informal and formal economy. Studies conducted by the National Treasury (2021) have shown that Black South Africans living in rural areas and informal settlements were the hardest hit by the COVID-19 pandemic. Most of this category lost their jobs with little hope of finding new employment due to a lack of skills. Table 4 includes the effect of cash transfer on real household consumption by category.

Table 4. *Household consumption*

Variables	Base (2015 R billion)	sim (% change)
POOR	273	0.0217
hhd-0	27	0.0143
hhd-1	47	0.0162
hhd-2	57	0.0211
hhd-3	65	0.0242
hhd-4	77	0.0262
NPOOR	1313	0.0412
hhd-5	89	0.0315
hhd-6	108	0.0325
hhd-7	151	0.0374
hhd-8	287	0.0382
HHD-9	677	0.0425
hhd-9-1	84	0.0422
hhd-9-21	98	0.0425
hhd-9-22	118	0.0413
hhd-9-23	144	0.0471
hhd-9-24	234	0.0513
ALLHHD	1586	0.0373

Source: Shock results

Table 4 presents the 14 different household categories classified by two income deciles (poor and non-poor). Households possess factor inputs with specific budget constraints based on the share of factor income, transfers from the government, and other organizations. However, households vary considerably in their factor holdings and income. Poor households receive income from labor only, while non-poor households receive income from the returns to land, labor, and capital.

The simulation results from Table 4 indicate that the cash transfer increased the household incomes of all beneficiary households. This significant improvement in consumption expenditure and welfare was observed for both poor and non-poor households. Our findings align with the program's preliminary results and the broader literature (Bulow et al., 2020; Londoño-Vélez & Querubín, 2022). Income and consumption expenditure increased for all beneficiary households. Consequently, the SRDG program played an essential role in alleviating immediate economic adversity caused by income loss during the lockdown by enabling low-income households to continue buying basic groceries. The cash transfer has proven to be effective in reducing poverty and could be adopted as a suitable policy because it improved income and consumption expenditure for beneficiary households.

The SRDG program primarily targeted low-income households, including those below the poverty line and households receiving transfers under various schemes implemented by the Government of South Africa. Table 5 includes the impact of the SRDG program on various industries.

Table 5. *Industrial output*

Sector	Base (2015 R billion)	sim (% change)
Agriculture	2	0.1352
Mining	10	-0.0428
Manufacturing	14	-0.1011
Other industries	6	-0.0362
Private services	48	-0.0564
Public services	19	0.1035

Source: Shock results

As expected, the cash transfer should stimulate a rise in demand for almost all commodities. Table 5 shows that the agriculture sector experienced the highest output increase (0.1352%), followed by public services (0.1035%). Notably, mining, manufacturing, other industries, and private services accounted for significant output reduction. The tourism industry, among others, was severely impacted worldwide and in South Africa, primarily due to the lockdown and travel restrictions. The number of tourists visiting South Africa decreased considerably, and other industries, such as finance, insurance, real estate, business services, trade, catering, and accommodation, also experienced notable liquidations. The pandemic caused distress to all businesses, regardless of their size (National Treasury, 2021).

5. Policy implication

The primary intention behind the SRDG program was to alleviate immediate economic hardship caused by income loss during the lockdown by enabling low-income households to continue purchasing essential goods and food staples. As a result, the extent to which the cash transfer raised income (alleviated poverty) and increased consumption expenditure for beneficiary households are of immediate policy interest.

The SRDG package was implemented in 2020 and extended in 2021 with the financial assistance of the South African government. Our findings provide evidence for the continuation of cash transfers to low-income households. However, it is crucial to acknowledge that the resultant decline in GDP combined with the rise in the fiscal deficit implies that extending the SRDG package beyond the pandemic will stimulate economic growth. This package has played a vital role in raising household consumption during a time when household demand was at risk of collapsing due to income losses from the lockdown enforced by the government in response to the COVID-19 pandemic. Therefore, any policy that supports managing the effects of income shocks by maintaining aggregate demand stability should be recommended.

The evidence from recent rigorous impact evaluations of cash transfer programs in South Africa, triggered by the COVID-19 pandemic, clearly addresses fears of "dependency." In policy circles, concerns are often raised that providing cash to the poor might lead them to work less and rely solely on the transfers. However, the results show that not only is this not the case but transfers also enable households to be productive. While cash transfers may not be designed to lift people out of poverty in the short term, the findings

demonstrate that they do not induce laziness and, in fact, promote productivity and have a positive income multiplying effect at both the household and local economy levels (Londoño-Vélez & Querubín, 2022)

6. Conclusion

The unexpected COVID-19 pandemic led to a significant rise in fiscal expenditures worldwide aimed at mitigating its adverse socioeconomic effects. This paper assessed the effects of the Special COVID-19 Social Relief of Distress Grants (SRDG) program, providing R350 ($26.5) per person to low-income households following a national lockdown imposed in March 2020 to combat the spread of the COVID-19 pandemic in South Africa. The cash transfer aimed to enable these households to maintain consumption despite possible income losses during the lockdown. We applied a general equilibrium analysis of the cash transfer using a CGE model calibrated to South Africa's social accounting matrix for 2015. Our simulation results indicate that the SRDG program improved the real incomes and consumption for all households. These findings are consistent with those of Londoño-Vélez & Querubín (2022), suggesting that the program is Pareto-improving, benefiting both beneficiary and non-beneficiary households through increased real income and consumption. Our findings align with the program's preliminary results and the broader literature (Bulow et al., 2020; Ashfaq & Bashir, 2021). Income and consumption expenditure increased for all beneficiary households. While most macroeconomic variables declined, private consumption, absorption (unit cost of output produced or service rendered), and exchange rates showed significant increases of 0.1782%, 0.2018%, and 0.0005%, respectively. This is due to the government's cash transfer. However, the decline in GDP (-0.1021%) resulted from reduced exports and imports as the lockdown restrictions hampered international trade activities. The reduction in imports indicated that a greater share of domestic production was consumed domestically, leading to an appreciation of the exchange rate. Furthermore, the shock applied to the economy was limited to the total amount of the cash transfer allocated by the government. The usage of the CGE model to assess the effects of the cash transfer to low-income households is a notable contribution of this study.

In summary, this article makes three fundamental contributions:

1. It provides a realistic policy shock analysis of the effects of the Special COVID-19 Social Relief of Distress Grants on the South African economy. The simulation results demonstrate that the SRDG program improved the real incomes and consumption for all households, as facilitated by the CGE analysis.
2. It contributes to the existing discourse on the role of cash transfers during unexpected events such as the COVID-19 pandemic. The research shows that cash transfers have significant value for economic development, independent of their societal consequences.
3. This study offers an analytical instrument for policymaking. The findings underscore the importance of policies that manage the effects of income shocks by ensuring stability in aggregate demand.

The empirical outcomes of this research suggest that the government should consider extending the SRDG program beyond the COVID-19 pandemic. Based on these findings, we propose that the extended continuation of the SRDG program should serve as an automatic stabilizer in

future fiscal and macroeconomic planning, holding promise for economic growth. The techniques employed in this research are well-documented and can serve as a foundation for developing other models for various purposes.

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