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STUDY ON MULTIPLIER EFFECTS OF SOCIAL PROTECTION EXPENDITURE IN RWANDA

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1. Background

The Social Security (Minimum Standards) Convention No. 102 adopted in 1952 established a worldwide-agreed minimum standards for social security relating to medical care, sickness, unemployment, old-age, employment injury, family, maternity, invalidity and survivors' benefits. The Convention stipulates guidelines for countries to achieve the tripartite objective of raising the percentage of the population covered by social protection schemes, level of minimum benefits to be secured to protect persons and streamlining conditions and period of entitlement to benefits (ILO, 1952). Although Rwanda has not yet ratified the Convention, the country has put in place commendable policy measures and instruments for social protection as a tool for poverty alleviation.

The Vision 2020 Umurenge Program (VUP) established in 2008 had three main components meant to uplift the wellbeing of poor households. These included conditional and unconditional cash transfers for the most vulnerable and poor households; cash for work for poor households with some members physically capable of engaging in public works; and a credit facility to households capable of repayment. Through its Social Transformation Pillar, the National Strategy for Transformation (NST1, 2017-2024) elaborates several interventions including promoting resilience to shocks and enhancing graduation from poverty and extreme poverty through improving and scaling up core and complementary social protection programs (Government of Rwanda, 2017). This is supplemented by the National Social Protection Policy (2020-2024) which is based on four pillars meant to mainstream different vulnerabilities. The pillars are; social security, social care services, short-term social assistance, and livelihood enhancement (MINALOC, 2020). Indeed, Rwanda is one of the African countries with a history of home-grown social protection initiatives including the one-cow-per-poor-family (girinka) program. Rwanda

Social Security Board (RSSB) was also established in 2010 with five schemes for pension, occupational hazards, maternity leave, medical, community-based health insurance (CBHI) and a long-term saving scheme commonly known as EjoHeza. These social protection programs Government efforts to promote social protection are complemented by development partners, including ILO's Building Social Protection for All program. The program aims at contributing to three outcomes revolving around promotion of social protection for formal and informal workers as well as strengthening the institutional capacity of RSSB for the effective implementation of social protection programs.

Available evidence reveals that social protection programs in Rwanda are so far delivering poverty alleviation benefits and building safety nets for poor households in Rwanda. In an empirical study on the Direct Support component of VUP, Habinama et al. (2021) found that unconditional cash transfers reduce both poverty headcount and poverty gap. Other scholars have documented increased investment in education as cash transfers ease the income constraints of households (Sebates et al., 2019). Although Nirere (2022) found no evidence that VUP lifts households above the national poverty line, the study acknowledges the role played by the program in reducing household vulnerability to shocks. Despite the growing body of literature estimating the effect of social protection programs in Rwanda, little evidence exists on multidimensional and multi-sectoral multiplier effects, which this study intends to address.

2. Study objectives

The main objective of the study is to produce a country case study on the multiplier effects of social protection expenditures using the Structural VAR methodology. The specific objectives are:

- To estimate the multiplier effects of social protection expenditure on economic growth.

- ❖ To estimate the multiplier effects of other government expenditures such as education expenditure
- ❖ To compute multiplier effects between social protection and other government expenditures.
- ❖ To estimate the multiplier effect of tax revenue on economic growth.

3. Methodology

To estimate the multiplier effect of social protection expenditure in Rwanda, we utilise the structural vector autoregressive (SVAR) model similar to Blanchard and Perotti (2002). the SVAR model provides the link between data and theory by imposing contemporaneous structural restrictions based on the economy's underlying structure. The functional form of the SVAR model that we intend to use for this exercise considers Rwanda a developing economy for which social protection is crucial for economic growth and poverty reduction. Thus, consider the two policy variables (social protection expenditure (soc_exp_t) and tax revenue (tr_t) and two non-policy variables (GDP growth (y_t) , and education expenditure (ed_t)) as follow:

X_t=$\varphi(L)X_{t-1}$+U_t..... (1)

Where $X_t = [soc\_exp_t, tr_t, y_t , ed_t]$ and all the variables are log-transformed, except GDP growth. $\varphi(L)$ denotes an autoregressive lag polynomial and U_t =[$u_t^{soc\_exp}$, u_t^{tr}, u_t^{y}, u_t^{ed}] is the vector of reduced form errors.

3.1: Identification Procedure of Fiscal Policy Shocks

From the empirical literature, the structural VAR identification procedure follows four approaches. These approaches include: first, the recursive approach introduced by Sims (1980) and applied to study the effects of fiscal shocks by Fatas and Mihov (2001); second, the structural VAR approach proposed by Blanchard and Perotti (2002) and extended in Perotti (2005, 2008); third, the sign-restrictions approach developed by Uhlig (2005) and applied to fiscal policy analysis by Mountford

and Uhlig (2005); and, fourth, the event-study approach introduced by Ramey and Shapiro (1998) to study the defence spending of large unexpected increases in government defence spending and also used by Edelberg et al. (1999), Eichenbaum and Fisher (2005), Perotti (2008) and Ramey (2007). This paper adopts the identification approach proposed by Blanchard and Perotti (2002). This choice is premised on the idea that this method relies on institutional information about the fiscal policy variables, and the associated impulse response is more realistic compared to other approaches (Cayen & Desgagnes, 2009). In addition, the sign restrictions on impulse responses by Canova and Pappa (2002), as well as Mountford and Uhlig (2002), fail to pin down when the shock occurs, and its identification conditions might be too strong. For example, revenue shocks can be identified through the condition that tax revenues and government spending do not co-vary positively in response to the shock. This sign restriction approach rules out by the assumption a whole set of "non-Keynesian" output responses to fiscal shocks. Finally, the approach represented by Fatas and Mihov (2001) and Favero (2002) essentially relies on Choleski ordering to identify fiscal shocks. Thus, ordering the fiscal policy variables is equivalent to assuming that all automatic elasticities of fiscal variables to macroeconomic variables are equal to zero.

3.1.1: The Blanchard-Perotti Approach

The identification procedure introduced by Blanchard and Perotti (2002) relies on institutional information about tax and transfer systems and the timing of tax collections in order to identify the automatic response of taxes and government spending to economic activity. This identification scheme relies on a two-step procedure: first, the institutional information is used to estimate cyclically adjusted taxes and government expenditures. In the second step, estimates of fiscal policy shock are obtained. Blanchard and Perotti (2002) and Perotti (2005) applied this approach to estimate the effects of government spending and tax shocks in the United States. This study

follows the identification procedure used by Perotti (2005). In addition to the adaptation of the identification scheme used by Perotti (2005), this study follows the four-step approach of Giordano et al (2006) to identify the fiscal shocks since the matrices A and B of the system equation are not identified without constraint. We use economic growth akin to Blanchard and Perotti (2002) and Perotti (2005) as the response variable to the shocks from social protection, tax revenue and educational spending. In the first step, the reduced-form VAR is estimated from the reduced-form residuals $U_t = [u_t^{soc\_exp}, u_t^{tr}, u_t^{y}, u_t^{ed}]$ in line with Perotti, (2005). The reduced form residuals of soc_exp_t and tr_t equations, ($u_t^{soc\_exp}$, u_t^{tr} respectively) is a linear combination of three components. The automatic response of economic activity to innovations in social protection, education expenditure and tax revenue, the systematic discretionary response of policymakers to economic activity and random discretionary shocks to fiscal policies; these are the "structural fiscal shocks, which unlike the reduced form residual are uncorrelated with all other structural shocks. The study , therefore, expresses the reduced form residuals of government spending, $u_t^{soc\_exp}$, tax revenue, u_t^{tr} and u_t^{ed}, education spending as linear combinations of underlying structural fiscal shocks $e_t^{soc\_exp}$ and e_t^{tr} of the reduced form residuals of economic growth, u_t^{y} without loss of generality we can specify the system of equations as:

$u_t^{soc\_exp} = \theta_1 y^{soc\_exp} u_t^{y} + \theta_2 tr^{soc\_exp} u_t^{tr} + \theta_3 ed^{soc\_exp} u_t^{ed} + \beta tr^{soc\_exp} + e_t^{soc\_exp}$ …(2)

$u_t^{tr} = \theta_1 y^{tr} u_t^{y} + \theta_2 soc\_exp^{tr} u_t^{soc\_exp} + \theta_3 ed^{tr} u_t^{educ} + \beta soc\_exp^{tr} e_t^{tr} + e_t^{tr}$ …….(3)

$u_t^{ed} = \theta_1 y^{ed} u_t^{y} + \theta_2 soc\_exp^{ed} u_t^{soc\_exp} + \theta_3 tr^{ed} u_t^{tr} + \beta ed^{soc\_exp} e_t^{ed} + e_t^{ed}$ …….(4)

$u_t^{y} = \sigma y\, u_t^{soc\_exp} + \sigma tr\, u_t^{tr} + \sigma ed\, u_t^{ed} + e_t^{y}$ ……. (5)

Where the coefficients $\theta_1 y^{soc\_exp}$, $\theta_1 y^{tr}$ and $\theta_1 y^{ed}$ capture the automatic response of economic growth to social protection spending, education expenditure and tax revenue under existing policy rules and any discretionary adjustment of fiscal policy in response to unexpected movements in

economic growth. The coefficients βtr^{soc_exp}, βsoc_exp^{tr} , and βed^{soc_exp} measure how the structural shocks to social protection expenditure, tax revenue and education expenditure affect output, social protection expenditure, tax revenue and education expenditure. $e_t^{soc\_exp}$, e_t^{tr} , e_t^{ed} and e_t^{y} are structural fiscal shocks, i.e. cov($e_t^{soc\_exp}$, e_t^{tr} , e_t^{ed} , e_t^{y})=0. Clearly $e_t^{soc\_exp}$, e_t^{tr} , e_t^{ed} , $and\ e_t^{y}$ are correlated with the reduced form residuals, hence the estimation of equations (2),(3) (4) and (5) cannot be obtained by an Ordinary Least Square (OLS) technique. The main focus of this paper under SVAR work is the identification of structural shocks.

From the system of equations above, the most exogenous variable is ordered first and is independent of all other variables in the system, implying that variables ordered first are not influenced by variables ordered at a later stage and the response variable is ordered last.

3.2: Impulse Response Functions and Computation of Multiplier Effects

We estimated the impulse response functions, with economic growth as a response variable and the rest of the variables as impulses, using Cholesky decomposition as the impulse definition to check how the shocks to these variables are propagated to economic growth. After obtaining the impulse response function, we compute the individual variable multiplier effect with respect to GDP growth, taking into account the time horizon taken for the shocks to take full effect. For instance, the dynamic multiplier of GDP growth rate following a shock in social protection expenditure (soc_exp_t) is given by:

$$multiplier = \frac{\%\Delta gdpgrowth(t)}{soc\_exp_t\,(0)} \ldots\ldots\ldots\ldots\ldots (6)$$

3.3. Data Sources

Quarterly data covering the period 2010Q1 to 2022Q4 is used to estimate the multiplier effect on social protection in Rwanda. All the data are obtained from the Ministry of Finance and Economic Planning (MINECOFIN), the National Bank of Rwanda (NBR), the National Institute of Statistics

of Rwanda (NISR) and the World Bank's World Development Indicators (WDI). Specifically, data on social protection is sourced from the budget execution reports for different years, data on revenues, grants and loans is sourced from the fiscal outturn and data on economic growth proxied by GDP growth is obtained from NBR, NISR and data on education and health protection from WDI.

The variables of interest in the model include gdp_growth (Gross Domestic Product growth rate), educ_gdp (natural logarithm of education spending as a percentage of GDP), social_exp (natural logarithm of social protection expenditure), and tax_rev (natural logarithm of tax revenue). Table 1 below presents the definition of variables used.

The summary which details all the ISIC classifications, definition and composition of the Variables used in the Study.

SN	Variable	Definition	Source
1	GDP growth	It is Rwanda's Growth domestic product on consumption, investment, government spending and Net Exports (Exports-Imports) (X-M)	National Institute of Statistics Rwanda (NISR) as a primary source, Central Bank including Monetary policy and World bank development indicator
2	Social Protection Expenditure (Including Social Security, disability benefits, Maternity, Survivor benefits)	That is Human health and social work activities and these Includes Hospital Activities, Medical and dental practices, Other human activities, Residential care activities like nursing care, elderly and disabled people and other social work activities without accommodation.	National Institute of Statistics Rwanda (NISR) and International Standard Industrial classification of All Economic Activities (ISIC), REV 4 **(More elaborated in the next Annex as it was requested by ILO team)**
3	Tax Revenue	Summation of Corporate income tax and personal income tax.	Rwanda Revenue Authority (RRA)
4	Education expenditure	Pre-primary and primary education, secondary education, general secondary education, technical and vocationary secondary education, higher education and other education activities.	National Institute of Statistics Rwanda (NISR) and International Standard Industrial classification of All Economic Activities (ISIC), REV 4

Particularly the definition and classification the social protection variables from NISR. Using ISIC. REV.4

The details below is from NISR using ISIC.REV.4 particularly about the composition of the Social Protection variables, indicating location of Variables of social security, maternity leave, social works, disability benefits in the ISIC REV 4.

The social protection data was obtained from ISIC .REV.4. LEVEL 4 8810 social work activities without accommodation.

Broad Structure(Individual Categorization of ISIC	**Broad economic Activity**	**ISIC High level (Level 1)**	**ISIC Level 2**	**ISIC Level 3**	**ISIC Level 4**
Section Q Division: (86-88)	Services	Human health and social work activities-High levels	Human health activities	88 sub division. Social Work	8810 social work activities without accommodation for elderly and disables.
Section P Division (85)	Education	Classified in group 851	Classified in group 852	Classified in group 852	Classified in group 853
Section O Division (84)	Public administration and defence; compulsory social security	Classified in group 843 class of 8430 Compulsory social security activities			

By Categorizations accommodation for elderly and disabled.(disability benefits and social security).

This class includes: social, counselling, welfare, referral and similar services which are aimed at the elderly and disabled in their homes or elsewhere and carried out by public or by private organizations, national or local self-help organizations and by specialists providing counselling services:

1. Visiting of the elderly and disabled

2. Day-care activities for the elderly or for handicapped adults

3. Vocational rehabilitation and habilitation activities for disabled persons provided that the education component is limited.

The Social security activities obtained from ISIC .REV.4. LEVEL 1 8430 Compulsory social security activities includes: —funding and administration of government-provided social security programs:

1. Sickness, work-accident and unemployment insurance
2. Retirement pensions
3. Programmes covering losses of income due to maternity, temporary disablement, widowhood etc.

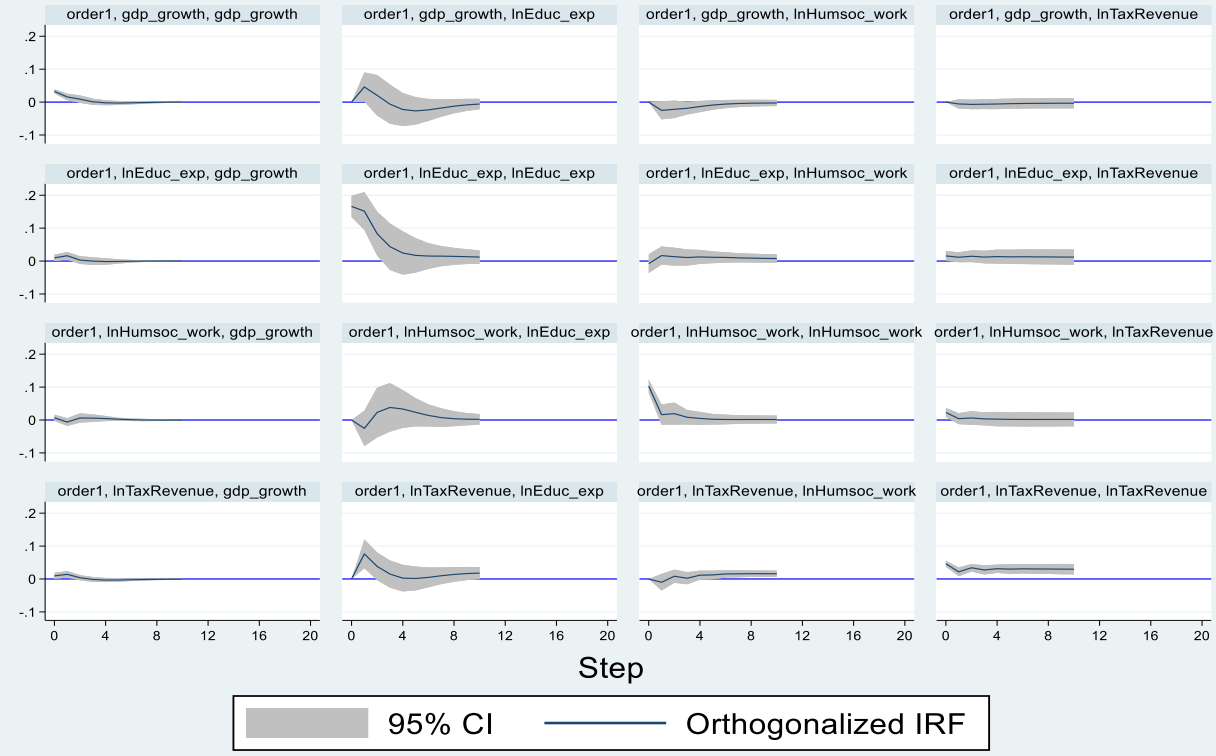
4. Result and Discussion of Structural VAR Results

This subsection presents the results of the structural VAR estimations, particularly the impulse response graphs for the expenditure and revenue variables. We report the associated dynamic multiplier of social protection expenditure with respect to GDP growth. Prior to estimating the SVAR model, we compute the preliminary statistics, including the unit root test and descriptive statistics, and their output results are in the appendices.

4.1: Impulse Responses Functions (Social protection and Tax Revenue)

The impulse responses in Figure 1, present the results of the impulse response of GDP growth to the shock of social protection expenditure and a set of related control variables, mainly on the expenditure and revenue side. The impulse definition is orthogonalized impulse function (oirf) and the time horizon is 20 quarters. The results on GDP, which is the response variable, are reported in the first column. The response of GDP growth to its own shock is positive, it takes effect after the second quarter and dies out in the fourth quarter. The shock of GDP growth to education expenditure is positive and significant, it increases GDP growth up until the fourth the quarter but begins to slow down thereafter. This finding suggests that higher education spending is supportive to growth. The shock to social protection expenditure negatively affects growth up until the second quarter but starts to pick up in the third quarter, implying that the social protection expenditure spurs GDP growth in the long run. For the tax revenues, the results presented in figure below indicates the response of GDP growth to shocks on tax revenue is positive until the second quarter and starts to decrease thereafter and dies out in about the fifth quarter. This finding implies that the shock to tax revenue lead to higher growth contemporaneously. The shocks lead to positive growth initially, but trends reverse after some lag.

Figure 1: Impulse Responses for Social protection and tax revenues



4.3: Dynamic Multipliers

From the impulse response function table, we compute dynamic multipliers of social protection expenditure and tax revenues with respect to GDP growth. We take the initial shock of both social protection expenditure and tax revenue with assumption that there is only one shock in the system for each respective impulse variable. The results on dynamic multipliers are reported in Table 2 below. The results broadly corroborate the respective impulse response graphs presented in Figure 1. For social protection multiplier, the effect of the initial shock peaks in quarter three and dies out in quarter four, thus taking the period where it peaked, we can deduce that the social expenditure multiplier is 0.17, indicating that an initial change in spending or investment results in a higher

final change in overall economic activity. This suggests that social protection expenditure not only ensures sustainable inclusive growth through reducing poverty and income inequality but also supports growth albeit with no contemporaneous effect. This finding retaliates the importance of computing disaggregated fiscal multipliers as indicated by (PEREIRA & WEMANS, 2013). Turning to tax revenue multiplier, the pass -through elasticity is negative for the first two quarters but starts increasing and takes full effect in the third quarter, with a pass- through elasticity of 0.54.

Table 2: Dynamic Multipliers

Time Horizon	Dm_social Exp	Dm_Tax Revenue
1	0.450739446	1.432551564
2	0.119381064	0.379419931
3	0.171506793	0.545087249
4	-0.024654263	-0.078356804
5	-0.126865854	-0.403208282
6	-0.062300195	-0.198004062
7	-0.082397891	-0.261879072
8	0.043588368	0.138533659
9	0.041423271	0.131652493
10	0.047865731	0.152128084

Source: Author's Computations

5: Conclusion and Policy Recommendations

The objective of this study is to estimate the multiplier on social protection expenditure in Rwanda in a sample spanning the period 2010Q1 to 2022Q4 using structural vector autoregressive model (SVAR).

The empirical analysis begins with checking the time series properties of the variables to avoid incidence of spurious regression. Using the SVAR model and the resultant impulse response functions indicate that social protection expenditure supports growth taking the full effect in the third quarter and disappears in the following quarter. Accordingly, we proceeded by computing the dynamic multiplier of social protection expenditure in Rwanda and the results point to a

dynamic pass-through elasticity of 0.17, suggesting that social protection expenditure is not only crucial for poverty reduction and income redistribution but also growth inducing. We also estimated the tax revenue multiplier, which emerged with a slightly higher pass-through elasticity of 0.54.

Broadly speaking, these results retaliate the importance of computing the disaggregated fiscal multipliers to ascertain individual contribution of the selected fiscal variables, and this particularly crucial for Rwanda given that this study is a primer in the case of Rwanda. Some policy implications arise out of the study findings and these include putting in place efficient social protection systems as a means to alleviating poverty and income redistribution. Secondly, the results point to the fact that tax revenue is growth inducing, therefore, efforts geared towards tax reforms should be strengthened.

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Descriptive analysis

Table 1: Summary Statistics

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
gdp_growth	52	.067692	.0470134	-.13	.21
Social protection expenditure	52	3.49710	.3017002	2.833213	4.025352
Education Expenditure	52	3.90981	.4516907	3.091043	5.036952
Tax Revenue	52	5.50283	.490697	4.540418	6.306604

Table 2: Pairwise Correlations

Pairwise correlations

Variables	gdp_growth	Social protection expenditure	Education Expenditure	Tax Revenue
gdp_growth	1.000			
Social protection expenditure	0.0	1.000		
Education Expenditure	0.2819	0.7520*	1.000	
Tax Revenue	0.0	0.9339*	0.8255*	1.0000

Note: The variables were transformed into logarithm.

Table 3. Lag selection.

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
s0	372.972				0.000	-14.599	-14.482	-14.293
1	577.188	408.430	64	0.000	2.4e-19*	-20.2075*	-19.159*	-17.4542*
2	637.532	120.69*	64	0.000	0.000	-20.061	-18.081	-14.861

**** shows significance at p<.01***

The lag selection table suggests that incorporating one lag in the model is crucial for studying the multiplier effect on social expenditure in Rwanda, as indicated by the highest likelihood ratio test statistic and lower information criteria values. This underscores the significance of considering past values in understanding the dynamic connections between economic variables and social spending. Researchers should focus on this lag order to effectively analyze the lagged effects of economic factors on social expenditure in Rwanda.

Table 4: Summary of Unit root test (Augmented Dickey-Fuller test).

Variable	**Order of integration**	**P-Value**	**Test-Stat**	**5% Critical Value**
gdp_growth	I (1)	0.0000	-5.249	-2.933
Social protection expenditure	I (1)	0.0000	-7.064	-2.933
Education spending	I (1)	0.0000	-6.258	-2.601
Tax Revenue	I (1)	0.0000	-6.647	-2.933

Source: Stata 15

Note: The Variables were transformed into logarithm and the Augmented Dickey-Fuller (ADF) unit root tests reveal that variables such as gdp_growth education spending, social expenditure and tax revenue, in Rwanda are integrated of order 1, implying non-stationary in their levels but stationary after differencing. With all variables showing statistical significance and rejection of the unit root hypothesis, it becomes suitable for time-series analysis. In the context of our study, there is an opportunity to explore how changes in mentioned economic indicators impact social expenditure over time. Structural vector autoregressive (SVAR) is employed to understand the dynamic relationships among these variables and unveil the long-term effects of economic shocks on social expenditure in Rwanda.

4.1. Trend analysis on social protection and tax revenue indicators (2010-2022)