Distributional Effects of Growth and Public Expenditures in Africa: Estimates for Tanzania and Rwanda

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IFPRI, IFPRI

22 November 2014

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Version: February 2014

Abstract

In this paper we explore the effects of fiscal policies and growth on measures of the household welfare across the distribution of expenditure for two countries in Africa: Rwanda and Tanzania. We explore issues of inefficiency in government expenditures and dilution of growth benefits among the better off sectors of the population in these two countries (in lieu of the poor sectors) by looking at the effects within a country and across different groups of households and administrative entities. We exploit variation in expenditures and growth across and within regions of each country to estimate the elasticities of income with respect to these expenditures at different points of the expenditure distribution, using household survey data and government expenditure at the district level. We find that overall, mean income growth benefits the top income groups. The welfare spillovers are mostly present for top 20% of the income distribution, with the middle of the distribution in Tanzania responding slightly to these spillovers. Social Public expenditures does not affect inequality in a considerable manner, but tend to work towards decreasing inequality. However, mean income growth is related to 'increases' in inequality in the sense that the richest sectors of the population benefit the most from growth. We find that the growth elasticity of income is only above one for the top quintile in both countries. In Tanzania a 1% increase in average household expenditure is related to a 1.96% expenditure growth in the top quintile and 0.43% in the third quintile. While in Rwanda it is related to a 1.93% increase in household expenditure in the top 20% of the distribution.

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Introduction

The potential of fiscal policies as a way of reducing poverty and inequality cannot be understated. However, these policies are often mismanaged and when the final results are disappointing, many argue that the problem is intrinsically one of the weakness of fiscal policy as an instrument to achieve these goals. In this paper we explore the effects of fiscal policies and growth on measures of the household welfare across the distribution of expenditure for two countries in Africa: Rwanda and Tanzania.

There is little dispute that overall growth can reduce poverty. However, how the growth effects can be amplified or reduced by complementary fiscal policies is less understood. We explore the linkage between these two and how these effects are reflected in the expenditure distribution; thus bringing attention, not only to the power of growth and fiscal policies as poverty reduction tools, but also what kind of effects on inequality these have; namely, if fiscal policies in these developing countries ameliorate inequality.

The literature on the efficiency of government expenditures in developed countries is nuanced but mostly positive [Arjona et. al. (2003); Folster and Henrekson (2001); Schaltegger and Torgler (2004)]; nuanced, in that depending on the types of expenditures analyzed the results point to different levels of inefficiency. The case for developing countries might be much different. For example, Bose, Haque and Osborn (2003) find that only capital expenditures and education outlays are significantly correlated with growth in a sample of developing countries. In developing countries, the pressure from powerful sectors of society might be more effective, more related to political volatility, thus more likely to suffer from inefficiencies due to targeting; as possible benefits aimed for the poor might be diluted among the powerful classes or non-poor [World Bank (2006)].

We address these issues by looking at the effects within a country and across different groups of households and administrative entities. We prefer this method in lieu of usual averaging across countries, since it can provide a better picture of what groups are driving the dynamics of inequality and growth while allowing heterogeneity across countries.

The countries we study are Rwanda and Tanzania which present an exceptional case to study these issues. Both have gone through a decentralization process, where more responsibilities in the provision of public goods and general administration have been transferred to regional and communal institutions. This is important because we exploit variation in expenditures and growth across and within regions of each country to estimate the elasticities of expenditure with respect to these fiscal outlays at different points of the expenditure distribution.

We use two types of data: household survey data for the household sector variables, which will characterize the distribution of expenditure of each country. For Tanzania we use the Household Budget Survey (HBS) for 2000/01 and 2007. And for Rwanda we use the Household Living Conditions Survey EICV1 (2000/2001) and EICV2 (2005/6). The second type of data is public expenditure administrative data, which serves to characterize the government sector. These consist of budget reports that describe the amount and the types of projects to which the outlays refer to. For Tanzania we use data from districts level budget reports for the 2001-2007 period and for Rwanda we use provincial and regional level budget reports for the 2004-2005 period.

Using these data we estimate a model within a comprehensive distributional framework and evaluate the distributional impact of public expenditures instead of focusing on single measures of distribution such as the GINI coefficient or head count poverty as is commonly done. We separate government expenditures in two large groups: Public/Social goods expenditures, that include health, education and infrastructure; and, other expenditures, which include administrative expenses, and expenditures in sectors where social externalities are limited or nonexistent. We further disaggregate these variables as a function of the source of financing, for example development grants, and/or by the type of sector within each group of expenditure. This separation is largely determined by the availability of budget data at the regional or district level in each country. We part from the premise that an essential part of a government's responsibility is to provide public goods in general and that in most cases these goods should be targeted to the poor, this is especially true for developing countries. In reality, this might not be case because of the mentioned causes. How true this is, is an empirical question that we address in this paper.

Previous Literature

How fast poverty falls with growth and how growth is distributed across other income groups are still open questions. While some consensus exists about the power of economic growth to reduce poverty among developing countries [Dollar and Kraay (2002, 2004)] less agreement exist about the role of economic growth on other aspects of income distribution, in particular its effect on the welfare of the middle classes. Earlier studies have mainly focused on the effect of growth on the poor but there are no empirical studies that systematically look at the effects of growth on the complete distribution of income. The need for fiscal policy as a complementary instrument to reduce inequality in a growing economy is in general not well understood.

David Dollar and associates show that economic growth is good for the poor, meaning that the elasticity of the level of per capita income of the poor vis-à-vis the level of per capita GDP is about one or even higher; namely that incomes of the poor rise at the same rate as average incomes [Gallup et al. (1999); Dollar and Kraay (2002)]. Others suggest that the income of the poor does not rise one-for-one with increases in the average income [Foster and Székely (2008)]. These results are indeed an average for a large number of countries including from very poor to upper middle income countries. It is thus not clear whether the result is driven by particular groups of countries and whether or not it applies to a specific country. Additionally, Dollar and Kraay (2002) focuses mainly on "poor" household incomes or on the proportion of poor households as measured by head count measures, but they do not evaluate the impact of growth within a comprehensive distributional framework that encompass other important social groups as well. In addition, previous work does not systematically examine the role of fiscal policy as a mechanism that may alter the impact of growth on social distribution. Our objective is to develop a more comprehensive distributional framework that may allow us to evaluate the effects of economic growth on several social groups including the poor, the middle classes and the upper groups.

Theoretically, it has been shown that proper public expenditure can be effective in promoting economic growth within an endogenous growth framework [Barro (1990); Jones et al. (1993); Stokey and Rebelo (1993)]. Productive public expenditure, therefore, is what matters when it comes to economic growth. Thus, since the governments can provide a large array of good and services such as national defense, justice services, public infrastructure, primary education, etc., the allocation of public expenditure is what determines whether the public expenditure is productive or not [Shantayanan et al. (1996); Agénor and

Neanidis (2011)]. Hence, measuring the impact of public expenditure on economic growth would allow us to evaluate the effectiveness of certain public expenditure strategies. More importantly, measuring the impact of public expenditure on different income groups can provide valuable information on the effectiveness of public expenditure to improve the living conditions of those in the bottom of the income distribution (i.e., pro-poor public expenditure).

Studies that link aggregate public expenditure to economic growth, in general, have not yield consistent results. Thus, for instance, some of those studies have found that aggregate public spending is associated negatively with economic growth [Landau (1986); Levine and Renelt (1992); Folster et al. (2001); Schaltegger and Torgler (2004)], while others have found the opposite relationship [Ram (1986); Sattar (1993); Bose, Haque and Osborn (2003)]. Even, the neutrality of public expenditure on economic growth is claimed [Kormendi and Maguire (1985)].

Another group of studies have extended those studies by testing the effects of some components of public expenditure (public investment, education expenditure, defense expenditure, etc.) on economic growth. Some of these studies suggest that public sector consumption is negatively related with economic growth [Barro (1991); Levine and Renelt (1992); Kneller et al. (1999)], while others suggest the opposite [Devarajan (1996)].

Similarly, though assumed axiomatically to have a positive impact in boosting private productivity, public investment is found to have a positive effect on economic growth [Aschauer (1989); Barro (1991); Easterly and Rebelo (1993); Kneller et al. (1999)], and a negative effect in others [Devarajan (1996)]. Education indicators are also subject to conflicting results. Some studies have found a positive association between human capital investment and economic growth [Barro (1991); Mankiw et al. (1992); Easterly and Rebelo (1993)]; other studies, by addressing some endogeneity problems and using a panel data, have found a negative relationship between economic growth and measures of human capital investment [Islam (1995); Caselli et al. (1996)]. This wide array of results can be explained by, among other things, ignoring other economic policies that take place along with fiscal policies, differences in the set of explanatory variables [Levine and Renelt (1992)], overlooking government budget constraints [Kneller et al. (1999)].

Everybody agrees that economic growth is a key factor in poverty reduction. Yet, who benefits more from economic growth across income groups is still an open question. Ravallion (2004) found that, depending on the initial level of inequality, a one percent increase in income levels could result in poverty reductions ranging from 0.6 percent (with high inequality) to 4.3 percent (with low inequality).

This paper aims at estimating the joint effect of economic growth and of the structure of government expenditures on household expenditure distribution. To the best of our knowledge, this question has not been systematically explored before in the empirical literature despite its obvious importance and policy relevance. The closest existing literature deals with related questions mainly focused on the impact of growth on poverty and inequality: is economic growth good for the poor? Does economic growth have an impact on inequality?

As for the second question, there is consensus in the empirical literature that economic growth may affect inequality [Deininger and Squire (1998); Chen and Ravallion (1997)] but there is a significant variance in the literature that look into the relationship between public expenditure and inequality. These studies can roughly be categorized into three main themes: First, the relationships between different measures of

social capital, its relationship to government actions, and inequality; secondly papers that try to test the median voter hypothesis and its implications for fiscal policy; thirdly studies that specifically look into the effects on inequality by redistributive public spending (specifically education and health).

Within the first thematic group the main objective is to capture national or jurisdictional tastes for redistributive and collective goods because highly unequally distributed wealth in conjunction with unduly concentrated political power can prevent institutions from enforcing broad-based personal and property rights, and lead to skewed provisioning of public services and functioning of markets.

The second line of research looks to the way in which inequality could possibly affect growth through political channels. The degree of inequality could affect the median voter's desired pattern of policies or it could determine individuals' ability to access political markets, social spending, and participate in costly lobbying [Deininger and Squire (1996)]. These studies rely on some version of the median voter theorem [Persson and Tabellini (1994); Bertola (1993)] which in its simplest and most widespread version, assumes democratic determination of tax rates. Most of the empirical implementation of these papers[1] are motivated by the relationship between measures of inequality (e.g. median income levels, share of the median income, or Gini coefficients) and growth but they focus on the impact of inequality decision making process of the median voter. More recent literature on this topic, including the works of Moene and Wallerstein (2001), Bradley, et.al. (2001), and Kenworthy and Pontusson (2002), address similar issues but using empirical specifications that often yield more robust results.

The third strand of the literature focuses on inequality and growth as they are both affected by redistributive public spending particularly health and education[2]. Most of these studies conclude that there is no direct link between inequality and public spending in health and education.

Our empirical strategy departs from all the studies mentioned above in three main ways. First, we measure the impact of public expenditures in the different parts of the distribution directly by looking at the impacts over expenditure growth at each quintile of the distribution instead of focusing on single measures of distribution such as the Gini coefficient or head count poverty as is commonly done. This approach helps us to disentangle the relationship between changes in public expenditure and economic growth across several income groups, exploiting both the cross-regional and time-series variation in the data.

Secondly, the relationship between economic inequality and social spending is one of mutual interdependency – for which it may be crucial to distinguish specific types of social spending, which are differentially affected by different aspects of inequality and impinge upon inequality also differently. Moreover, different kinds of social expenditure – cash (income, maintenance, and social insurance), health and education, infrastructure, and others- may have different political determinants. We classify the public expenditure into two key categories: expenditures in public/social goods and other expenditures and estimate the effect of changes in these on income growth across different income

[1]For example, Arjona et.al (2003), Turnbull and Djoundourian (2005), Milanovic (2000), Bassett, et al. (1999), Alesina and La Ferrara (2005), Kristov, et.al (1992)

[2] For example, Ross and Wu (1995), Perroti (1992, 1996), Bassett, et al. (1999), Pearson and Tabellini (1994), Alesina and Rodrik (1994), Osberg (1995), Sala-i-Martin (1997); Benabou (1996, 2000), Castello and Domenech (2002) and most recently van der Ploeg (2003), Gylafson and Zoega (2003), and Deaton (2003)

groups; we also take the financing source of the expenses or the type of expense within each category into account when the data allows (for example, infrastructure, health and education, funds from development grants, etc.)

Wikstrom (1999) is one of the few papers that does something similar by estimating the income distribution effects from local public expenditures in Swedish Municipalities. This is done by estimating a model where quintile income shares are explained by municipality specific determinants. He also uses three categories of local public spending: social expenditures, primary and secondary education expenditures and recreational expenditures. The paper finds that social expenditure affects the within municipality distribution of income, but no effects can be found for education and recreation. Larger social expenditures appear to decrease the portion of income of the lowest quintile and the portion of income in the highest quintile; thereby concentrating income towards the middle income classes.

Theoretical Framework

We use a comprehensive distributional framework to evaluate the impact of public expenditures instead of focusing on single measures of distribution. We work with annual growth rates, instead of levels, which at least in part mitigates the problems of unbalanced panels and different lag lengths between observations that have affected some earlier studies [Ashley (2006)].

The effect of GDP growth on the per capita income of particular social groups (including the poor) is quite complex. We can separate the analysis of this effect into two stages.

Stage (1):

Estimating the effect of per capita GDP on per capita mean household expenditure as an indicator of the degree by which the benefits of economic growth spill into the household sector. Public policies, including government expenditure level and composition may play a role in affecting such relationship. For example, government tighter tax policies or a more pro-ordinary citizen (less pro-elite) public expenditure composition may reduce the gap between per capita GDP and per capita household income. This is particularly so if these policies would reduce the income of the very rich which, as discussed below, are not likely to be represented in the household surveys.

Stage (2):

Measuring the effect of changes in average per capita household income on the per capita income of the various social groups to reflect the within household distribution of household income growth. Given the mean per capita household income there is also a pure distribution effect of public policy among the various social groups represented in the household surveys. That is, government expenditure composition may cause a reallocation of income across the (mostly non-rich) groups represented in the household surveys.

We distinguish between per capita GDP which is a measure of real output produced in the regions and mean per capita household income which in most existing household surveys is after tax income accruing to the households. There are many reasons other than taxes why household income is likely to diverge from GDP. Part of GDP is directed to pay foreigners, part of it stays within the corporate sector as non-distributed profits, and certain households (particularly the richest) may not be represented in the national surveys and rich households that are in the survey may severely under report their income.

Consistent with the above two stage procedure we proposed a multiple equation model and derived cross sector restrictions to jointly estimate the equations and circumvent the need of first estimating the impact of GDP growth on the growth of per capita income of the mean household. This allows us to estimate the effect of growth of average per capita household income on the per capita income of the poor, middle classes and upper income classes still represented in the household surveys also controlling for public expenditure policies and other covariates.

Econometric Model

We divide the total household population of a country into M social groups to reflect the income distribution. We assume that the per capita household income of a particular group *i* at time *t* in district *j*, y_{ijt}, is determined by the household average per capita income in the district, Y_{jt} , by a vector reflecting the stock of various government provided goods which is in turn related to the government expenditure level and composition[3], E_{jt} , by unobserved effects specific to the social group and district, ψ_{ij} , unobserved time effects, ν_t , and a random disturbance, ε_{ijt}.

Thus if there are M household groups, we have M equations such as,

$$y_{ijt} = \psi_{ij} + \alpha_{1i}E_{jt} + \alpha_{2i}Y_{jt} + \nu_t + \varepsilon_{ijt} \quad for \quad i = 1 \ldots . M \qquad (1)$$

We note that the parameter vectors α_{1i} and α_{2i} are allowed to be different for each of the M groups considered in order to allow for differential effects of the stocks of government-provided goods and average household income on the per capita income of each particular group. We also note that the fixed effects ψ_{ij} allow for intrinsic or unobserved variability not just across districts but across income groups as well.

In addition, the average per capita household income of the whole district is related to the group per capita income as follows:

$$Y_{jt} = \sum_{i=1}^{M} \frac{n_{ij}}{N_j} y_{ijt}$$

Where n_{ij} the size of group *i* population in district *j* and N_j is the total population in district *j*. This implies the following restrictions to the coefficients in equation system (1):

(2a) $\sum_{i=1}^{M} \frac{n_{ij}}{N_j} \alpha_{1i} = 0$ (2b) $\sum_{i=1}^{M} \frac{n_{ij}}{N_j} \alpha_{2i} = 1$ (2c) $\sum_{i=1}^{M} \frac{n_{ij}}{N_j} \nu_t = 0$

These restrictions imply that the equations (1) need to be jointly estimated using a system estimation[4].While we have data on the flows of government expenditures for various key components we do not have reliable measures of their respective stock levels as would be needed to directly estimate (1), nor a measure for district level GDP. We thus express equation system (1) alternatively in absolute or

[3] Another important determinant of group income is the level and composition of taxes, which could also be part of the vector E_{jt}

[4] If a system like (1) were estimated then given the above restrictions one would only need to estimate M-1 equations of the system while the remaining one could be identified through the restrictions. However, for reasons to be clear below we do not directly estimate system (1)

proportional differences. Each of course has different stochastic properties and requires different assumptions. Expressed in absolute changes over time the system is,

$$\Delta y_{ijt} = \alpha_{1i}\Delta E_{jt} + \alpha_{2i}\Delta Y_{jt} + \Delta v_t + \Delta\varepsilon_{ijt} \quad for \quad i = 1 \ldots . M \qquad (3)$$

The use of the "*difference"* approach permits us to use the flows of public expenditures as proxies for the changes in the stocks of goods that may affect the changes in group income. Moreover, the goods provided by the government typically comprise a mix of durable investment goods such as education or infrastructure that have mainly a stock effect as well as other goods such as social assistance which may affect household income directly through their flow effects as well.

Another advantage of using a difference model is that it is naturally independent of the district and group fixed effects. This, as we shall see, allows us to use the region effects as valid instruments for some of the explanatory variables. The mean per capita household income is, in turn, related to per capita GDP as well as to a number of other factors that alter the relationship between household income and GDP discussed earlier. Thus, we postulate the following household income to GDP relationship:

$$Y_{jt} = \beta_1 Z_{jt} + \beta_2 E_{jt} + u_j + \phi_t + \eta_{jt} \qquad (4)$$

where Z_{jt} is GDP per capita for district *j* in t, E_{jt} is a vector of public policy variables that may affect the relationship between household income and GDP (including public expenditures and taxes); u_j and ϕ_t are fixed district and time effects and η_{jt} is the stochastic error term. The u_j allows for other unobserved sources of divergence between per capita GDP and per capita household income that are district specific.

Expressing equation (4) in relative or absolute differences,

$$\Delta Y_{jt} = \beta_1 \Delta Z_{jt} + \beta_2 \Delta E_{jt} + \Delta\phi_t + \Delta\eta_{jt} \qquad (4')$$

The specification in (4) or (4') captures some of the main sources of discrepancy between household per capita income as measured from household surveys and the district's per capita GDP as would be measured by national accounts. First is the level of per capita GDP itself; that is we allow for a one dollar increase in per capita GDP to affect average household income by more or less than a dollar. This is the reason why we do not a priori impose $\beta_1 = 1$ and in fact we test for such a result. Finally, we also control for district and time unobserved factors by using fixed effects. The district effects may among other things control for peculiarities to the way in which the household survey income is measured across districts.

Instead of directly estimating the system (3) and (4'), we insert (4') into (3) and obtain:

$$\Delta y_{ijt} = \gamma_i \Delta Z_{jt} + \theta_i \Delta E_{jt} + \sigma_t + \omega_{ijt} \quad for \quad i = 1 \ldots . M \qquad (5)$$

Where we have redefined the parameter vectors as

$$\gamma_i = \alpha_{2i}\beta_1 \quad \text{and} \quad \theta_i = \alpha_{1i} + \alpha_{2i}\beta_2.$$

Using the restrictions given by (2a) and (2b) we can identify the original parameter as follows,

$$(6a) \qquad \sum_{i\in I} \frac{n_{ij}}{N_j}\gamma_i = \beta_1 \underbrace{\sum_{i\in I} \frac{n_{ij}}{N_j}\alpha_{2i}}_{1} = \beta_1$$

$$(6b) \qquad \sum_{i\in I} \frac{n_{ij}}{N_j}\theta_i = \sum_{i\in I} \frac{n_{ij}}{N_j}(\alpha_{1i} + \alpha_{2i}\beta_2) = \underbrace{\sum_{i\in I} \frac{n_{ij}}{N_j}\alpha_{1i}}_{0} + \beta_2 \underbrace{\sum_{i\in I} \frac{n_{ij}}{N_j}\alpha_{2i}}_{1} = \beta_2$$

Given the β parameters we can further identify the α parameters. The income distribution parameters $\alpha_{2i} = \frac{\gamma_i}{\beta_1}$ and the fiscal distribution parameters $\alpha_{1i} = \theta_i - \alpha_{2i}\beta_2$. Standard errors for the coefficients β, α can be obtained using the variance covariance matrix of the estimated parameters θ, γ by the delta method.

In the estimation, we mainly look at five social groups although we experimented with different forms of disaggregating the households. We divide the households by expenditure quintile:

- The "Bottom poor" which is defined as the bottom 20% of the households;
- The "Poor" which is defined as the next 20% of the households;
- The "Lower middle class" comprised by the next 20% of the households;
- The "Upper middle class" constituted by the next 20% of the households;
- The "Upper class" constituted by the remaining 20% of the households.

Alternatively we also considered other cuts across the distribution, such as 40-40-20 type of grouping and 40-20-30-10. The results are qualitative the same; however we opt to present the results by quintile to shed light on the differences of these effects across more points in the distribution of expenditure.

Given the restrictions (2a) to (2c) it is clear that the parameters α_{1i} associated with the fiscal variables reflect changes in income distribution ***within the household sector***. That is, the parameters measure how the composition of the government expenditures affect the per capita household income of the various social groups given a fixed level of the mean per capita household income. By contrast the parameters θ_i measure the ***total or uncompensated*** impact of the fiscal variables on the per capita income of the various household groups. That is, while the α_{1i} effects measure the pure distribution effect of fiscal variables on the social groups keeping the average per capita household income constant, the θ_i effects measure both the distributional impact as well as the effect of the fiscal variables on the *average* household per capita income.

The effect of an increase in government expenditures in public infrastructure, for example, on a particular social group can be separated into two components: It may affect the per capita mean household income of all households and it may affect the distribution of income across the household groups for a given level of mean household income.

In addition we are interested in measuring how economic growth affects the distribution of income among the five social groups considered. We consider the effect of per capita GDP growth on the groups' household expenditure growth through the effect of average household expenditure growth on the groups' expenditure. The γ_i coefficients measure the total effect of GDP growth on the per capita income of group *i* while the coefficients α_{2i} measure how an increase in the average household per capita income is distributed across the groups.

Specification Issues

In estimating the system of equations (5) we need to be concerned about potential specification problems. The estimated parameters may be affected by biases due to reverse causality, omitted variables and/or measurement errors in the explanatory variables. To mitigate possible biases due to omitted variables we use first differences instead of levels of the variables and to deal with possible biases caused by reverse causality we use instrumental variables.

The use of first differences eliminates the district fixed effects as well as the group fixed effects. Therefore while the district dummies are part of the system (1) they are not part of the right-hand-side variables of system (5). As instruments for the fiscal expenditure and growth variables, we use regional[5] dummies and GIS variables, namely the annual mean, standard deviation and absolute deviations of rainfall and temperature during the study period in each district. We test for the exclusion of these dummies and GIS variables from equation system (5). The model without the region fixed effects report higher (in absolute value) AIC (Akaike Information Criterion) for Rwanda and the BIC (Bayesian Information Criterion) is higher for both countries, providing evidence that the regional fixed effects and GIS variables are not jointly omitted variables in the equations. Table 1 presents the results.

Table 1 Model Selection Criteria

Expenditure Equation	Unrestricted model	Including Instruments
Rwanda		
AIC	**-2111.7**	-2073.2
BIC	**-2049.2**	-1748.2
Tanzania		
AIC	-2314.046	-2322.542
BIC	**-2209.839**	-1840.586

In addition, regional dummies are highly correlated with the government expenditure variables considered. Hence, the fact that regional dummies have no explanatory power in the main regressions but are nonetheless correlated with the government expenditure variables allows us to use the regional dummies as valid instruments.

In addition, we need to correct for the fact that in the relative differences model we may have built in heteroscedasticity given that the disturbances in (5) are actually divided by y_{ijt-1} in the estimation, since we use the growth rates of expenditure in each quintile group. Therefore we need to use appropriate procedures to obtain the corrected (robust) standard errors.

Data

We need two types of data to estimate the model. First, we need household survey data for the household sector variables; second, public expenditure data that distinguishes between different sector expenditures to be able to classify them as social or other.

For Tanzania we use the Household Budget Survey (HBS) for 2000/01 and 2007. The 2001 Survey is representative of 20 regions in Mainland Tanzania and the 2007 Survey is representative of 3 strata in Mainland Tanzania. For Rwanda we use the Household Living Conditions Survey EICV1 (2000/2001) based on the 1991 Rwanda Census and EICV2 (2005/6) based on the 2002 Rwanda Census.

[5] A region comprises multiple districts in each country. Note that the district effects subsume a regional effect that also is differenced out. The choice of using regional dummies as instruments is to prevent a problem of weak instruments and low power due to the amount of degrees of freedom needed.

These data are not representative at the district level. However, they are a useful gauge of the growth in each district[6]. In Tanzania we are able to construct the measures for 100 districts in the mainland. For Rwanda we are able to construct 90 conglomerates of districts within each region to calculate a district level measure. In Rwanda, between the 2 surveys there where changes in the boundaries of districts, so a 1-to-1 matching across surveys was not possible. We use GIS information to allocate the districts in the EICV1 to the districts as they stood in the 2002 census. Similarly we map the location of a household in the EICV2 to the district classification of the 2002 census, as the boundaries changed again in 2006. The measures we calculate using the household level data consist of the average income and expenditure per capita of each district and the mean income and expenditure of each quintile in the district. That is, each district will have one observation per time period.

For the public expenditure data for Tanzania we use data from districts level budget reports for 2001 to 2007 and construct annualized growth measures for each expenditure type used in the analysis, as not all budget items had information for 2001. We calculate the average growth rate of each expenditure variable between 2007 and the earliest year for which we have data between 2001 and 2006, the period in between the survey. That is, assuming a geometric growth rate, for any year t before 2007, the average growth rate between 2007 and year t is given by: $r = \left(\frac{Y_{2007}}{Yt}\right)^{\frac{1}{2007-t}} - 1.$

In the case of Rwanda we use provincial and regional level budget reports for 2004-2005. Given that the data was only available at the regional level, and we require it at the district level, we use the formulas used to allocate the national budget to the different districts by the National government [Shirima (2004)]. In essence, we apply the formulas to each region/province and distribute the expenditures to each district within it following the formula. To some extent the allocation represents and 'ideal' allocation rule for available funds. The formula reflects infrastructure needs, poverty levels, etc., but most importantly they reflect the political reality at the time.

We transform all currency variables PPP constant dollars in the last year of the household survey for each country. We use the world development indicators data for purchase power parity (PPP) conversions and the official price index to bring all values to constant dollars; 2005 PPP dollars for Rwanda and 2007 PPP dollars for Tanzania.

Table 2 through Table 5 show the summary statistics for each country of the variables used in the study. In the tables we divide the districts in two groups, those above de median household expenditure in the last year of the household survey (High columns) and those that are below (Low columns).

In Rwanda (Table 2), the situation of the poor is very similar in the richer districts and the poorer districts with the top quintile having almost 3 times the annual expenditure per capita of the 4th quintile. The expenditures of the poor are considerable lower than other groups. Together these figures indicate wide disparities even across adjacent groups of the expenditure distribution

[6] In addition, our use of first differences and IV gives us more meaningful measures while accounting for the measurement error.

We note that the expenditures levels are well below the one dollar a day poverty line even for the third quintile[7]. On the government expenditure side, poorer districts spend only slightly more in health and education.

In Table 3 we can see the average growth rate across groups for our expenditure variables in Rwanda. Average expenditure growth is greater among the top quintile and growth is more intense for richer districts. Growth is similar across the bottom 80% of the distribution. The lower levels of growth among the poor point to the benefits of growth being concentrated at the top quintiles. We note that poorer districts (and poorer households) start from much lower levels expenditure in comparison to the middle class, thus have more room to increase. The shares of expenditure that are concentrated among the top quintile of the distribution are above 50%, with larger concentration among the above median districts.

Table 2 Summary Statistics for Rwanda Data: Expenditures

	District Category					
	High		Low		All	
	Mean	SD	Mean	SD	Mean	SD
Yearly Per Capita Government Expenditures						
Infrastructure	1.14	0.69	1.12	0.33	1.13	0.54
Health and Education	16.05	2.49	16.56	2.27	16.30	2.38
General Expenses	4.33	2.77	3.92	2.21	4.12	2.50
Yearly Per Capita Household Expenditure						
Quintile 1	81.65	11.99	81.34	9.84	81.50	10.92
Quintile 2	153.13	5.64	154.47	8.11	153.80	6.98
Quintile 3	237.60	9.73	239.81	10.46	238.70	10.11
Quintile 4	401.89	29.35	402.25	24.99	402.07	27.08
Quintile 5	1,175.43	537.60	818.12	299.70	1,000.84	470.95

Household averages were obtained using data from the 2005 EICV data. All figures are in 2005 PPP dollars

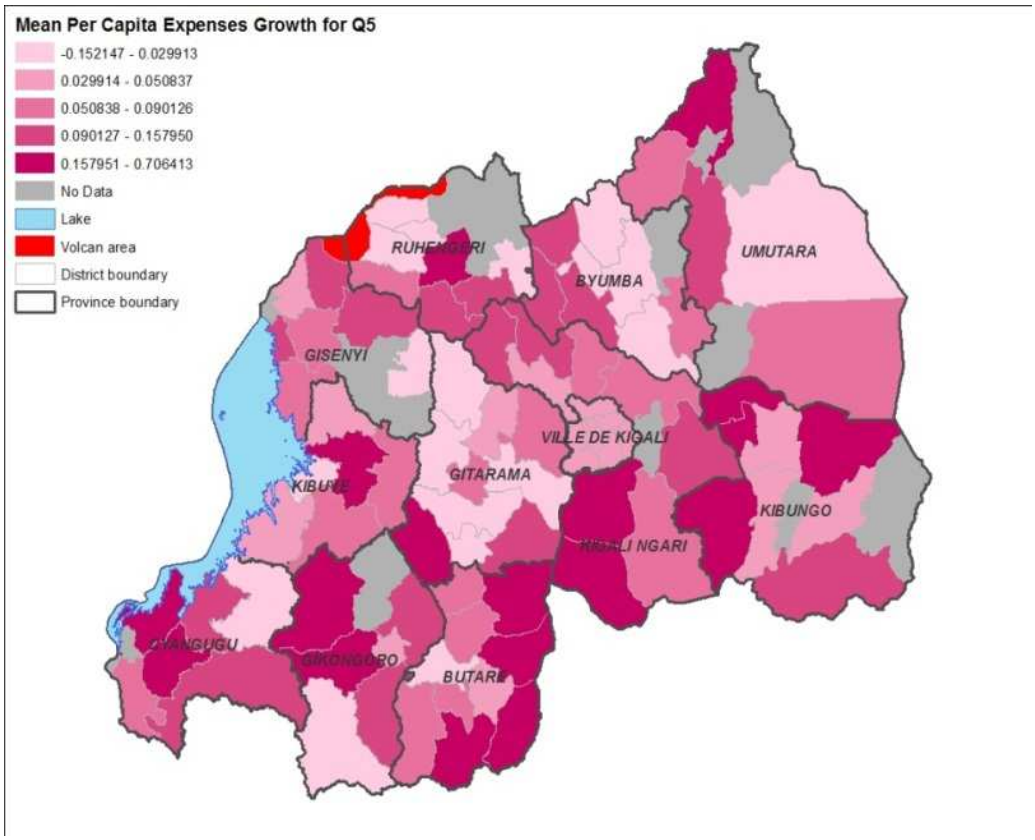
[7] With the caveat that as is well known the "very wealthy" are not usually represented in household surveys

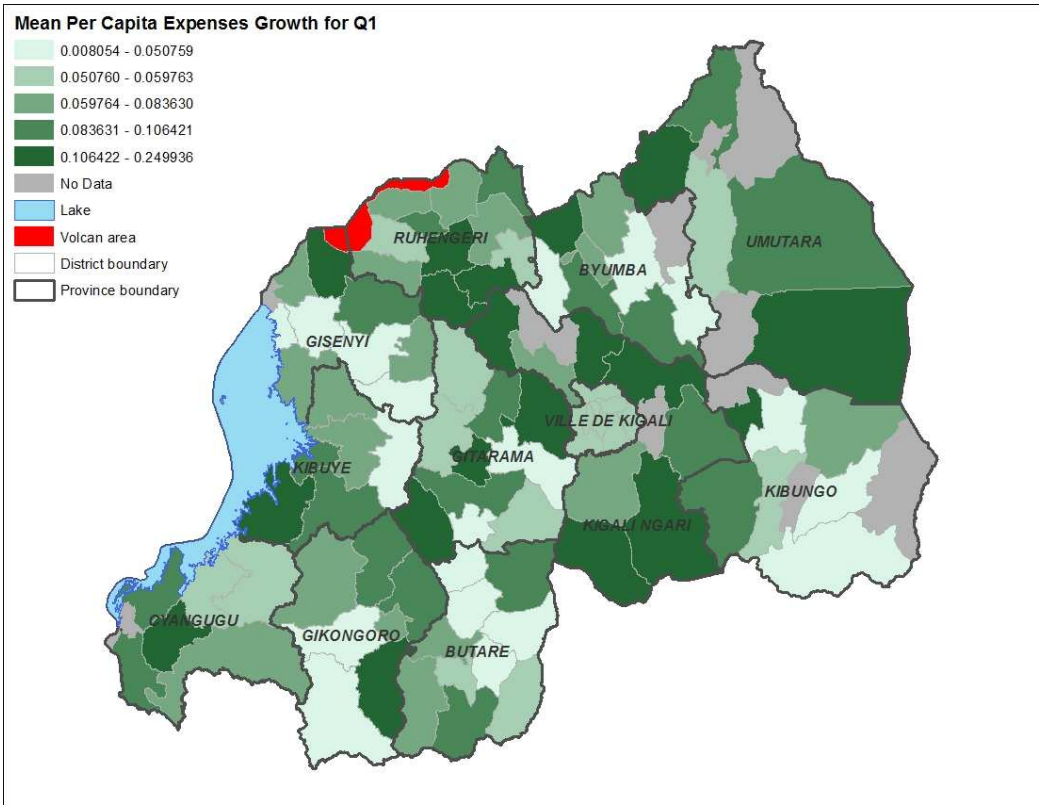
Table 3 Summary Statistics for Rwanda Data: Per capita expenditure Growth

	District Category					
	High		Low		All	
	Mean	SD	Mean	SD	Mean	SD
Average Per Capita Expenditure Growth by Quintile						
Quintile 1	7.9%	3.8%	7.6%	3.4%	7.8%	3.5%
Quintile 2	7.4%	1.1%	7.0%	1.5%	7.2%	1.3%
Quintile 3	7.2%	1.5%	7.0%	1.3%	7.1%	1.4%
Quintile 4	6.7%	1.6%	6.4%	1.9%	6.6%	1.8%
Quintile 5	11.0%	16.4%	8.9%	7.1%	10.0%	12.7%
Share of Household Expenditure by Quintile						
Quintile 1	3.7%	0.8%	5.0%	1.1%	4.3%	1.2%
Quintile 2	7.2%	1.3%	9.4%	2.7%	8.3%	2.4%
Quintile 3	11.6%	2.1%	15.5%	3.5%	13.5%	3.5%
Quintile 4	19.4%	3.3%	26.3%	5.8%	22.8%	5.8%
Quintile 5	58.2%	7.1%	43.9%	12.4%	51.0%	12.4%

Annualized growth rates are reported for years 2000-2005. Household figures are obtained using EICV1 and EICV2 data

Figure 1 Rwanda: Consumption Growth for the top 20% and the bottom 20% of the consumption/expenditure distribution





In Tanzania the situation is similar but with higher overall levels of expenditure, (Table 4 and Table 5). The main differences are that on average expenditure growth is similar across quintiles. For Tanzania our measure of social goods includes expenditures in health and education, while non-social public goods includes expenditures in water, energy, and agricultural. The gap in social expenditures between poorer and richer districts is important.

In Figure 1 and Figure 2 we can see that the districts that have higher growth of the bottom quintile are often not the ones with the higher growth in top quintile. These points to heterogeneity in growth rates across districts and not just between the groups; thus, taking into account these differences between and within districts we estimate the model for the bottom districts and for the top districts separately in an effort to explore heterogeneity in the effects of our fiscal variables across what could be very different environments in which the poor might dwell.

Table 4 Summary Statistics for Tanzania Data: Average Expenditures and Income

	District Category					
	High		Low		All	
	Mean	SD	Mean	SD	Mean	SD
Per Capita Government Expenditures						
Social Expenditures						
Expenditures from development funds	11.82	11.80	16.63	32.46	14.22	24.42
Expenditures on salaries and charges	48.36	49.88	69.72	159.29	59.04	117.92
Non-Social Expenditures						
Expenditures from development funds	4.71	5.27	5.51	8.24	5.11	6.89
Expenditures on salaries and charges	4.07	5.21	7.00	16.51	5.53	12.27
Taxes and Levies	5.15	9.45	4.21	12.62	4.68	11.10
Total collected revenue	6.67	9.79	5.54	13.59	6.11	11.80
Per Capita Household Expenditure						
Quintile 1	193.08	24.49	192.50	22.54	192.79	23.42
Quintile 2	334.73	14.68	332.33	15.77	333.53	15.21
Quintile 3	495.65	18.84	495.74	21.37	495.70	20.05
Quintile 4	750.50	34.96	745.35	51.97	747.92	44.14
Quintile 5	1,839.21	967.12	1,456.84	300.55	1,648.02	737.95

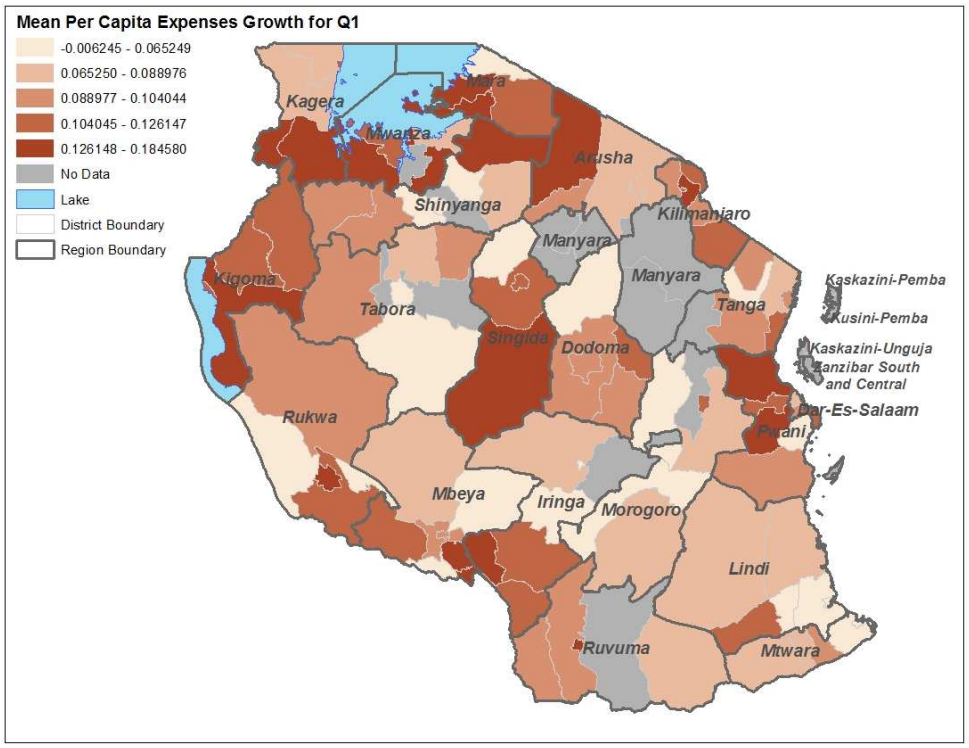
Household averages were obtained using data from the 2007 HBS data. All figures are in 2007 PPP dollars

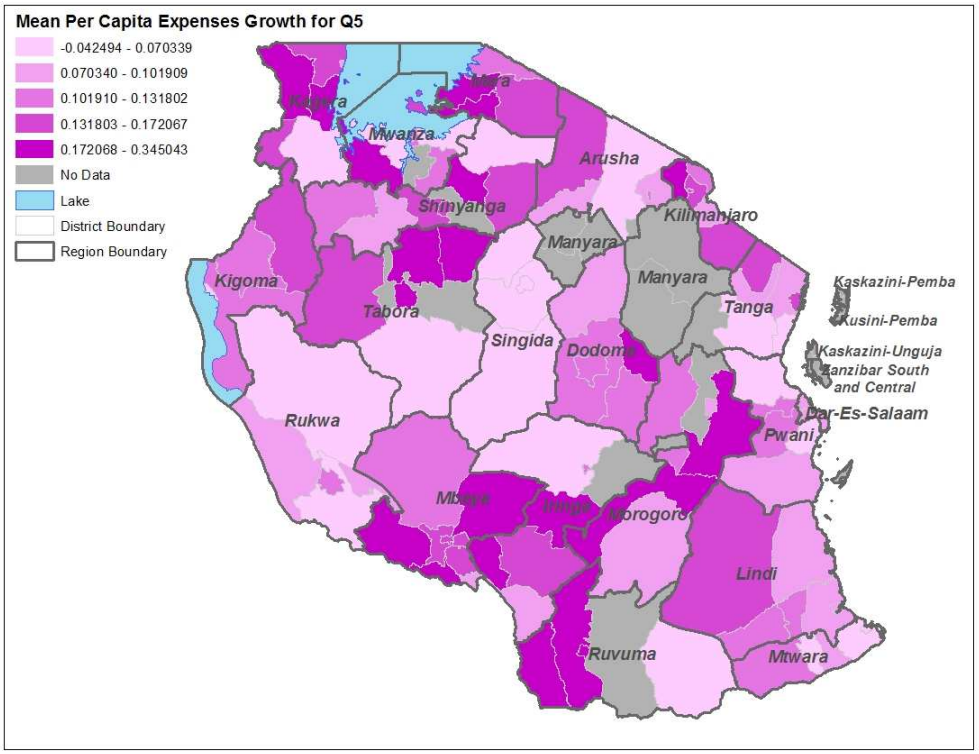
Table 5 Summary Statistics for Tanzania Data: Mean Growth and Expenditure Shares

	District Category					
	High		Low		All	
	Mean	SD	Mean	SD	Mean	SD
Average Per Capita Expenditure Growth by Quintile						
Quintile 1	9.8%	3.4%	9.5%	3.5%	9.7%	3.4%
Quintile 2	11.2%	1.1%	11.2%	1.1%	11.2%	1.1%
Quintile 3	11.9%	0.9%	11.7%	1.2%	11.8%	1.1%
Quintile 4	12.6%	1.8%	12.5%	2.1%	12.6%	2.0%
Quintile 5	11.3%	6.9%	12.7%	6.3%	12.0%	6.6%
Share of Household Expenditure by Quintile						
Quintile 1	5.5%	0.8%	6.3%	0.6%	5.9%	0.8%
Quintile 2	9.7%	0.9%	11.2%	0.6%	10.4%	1.0%
Quintile 3	14.3%	1.2%	16.5%	0.7%	15.4%	1.5%
Quintile 4	21.5%	2.0%	24.3%	1.3%	22.9%	2.2%
Quintile 5	49.1%	4.4%	41.8%	1.9%	45.5%	5.0%

Annualized growth rates are reported for years 2001-2007. Household figures are obtained using HBS2001 and HBS2007 data

Figure 2 Tanzania: Consumption Growth for the top 20% and the bottom 20% of the consumption/expenditure distribution





Results

We now discuss the results for the estimation of equation 5 for Rwanda and Tanzania. We focus on the expenditure per capita growth variables. We opt to discuss in detail the expenditure growth because we believe that expenditure variables better reflect the economic wellbeing of household and potentially have less measurement error than the income that can be computed from household surveys. The estimation was also performed with income variables (net and gross) and the results are qualitative similar.

Tanzania

The dependent variables are the per capita expenditure growth rates for each quintile and the explanatory variables are the fiscal expenditure growth variables are: Social expenditures from development funds and for salaries and other charges, in this category we have expenditures on health and education sectors; Non-Social Expenditures from development funds and for salaries and other charges, in this category we have expenditures on agricultural development, energy, etc. Finally we have taxes and levies collected by the districts, total own revenue and the mean expenditure growth in the district.

The effect of an increase in government expenditures in public infrastructure, for example, on a particular social group can be separated into two components: It may affect the per capita mean household income of all households and it may affect the distribution of income across the household groups for a given level of mean household income. The estimates show the total effect of the fiscal expenditure variables in each expenditure group.

In addition we are interested in measuring how economic growth affects the distribution of expenditures among the five social groups considered. We consider the effect of mean per capita expenditure growth on the groups' household expenditure growth. The coefficients of growth in household expenditure measure the total effect of 'income' growth on the per capita expenditure of each group.

Table 6 presents the coefficients from equation 5 without using the restrictions in equations 2a and 2b. These estimates reflect the total effect allowing for both redistribution within the household sector and for changes in the average household income. Fiscal Expenditures from development funds, in social goods benefit the bottom quintile but this effect is counteracted by non-social public goods effects which is negative and larger; this negative effect is also significant for the second quintile group. Social expenditures from development funds are negatively associated with expenditure growth of the top quintile. Also note that mean expenditure growth, disproportionately, benefits the top 20% of the income distribution, with larger and significant estimates for the 3rd and 5th quintile equations.

Table 6 TANZANIA - Rate of Growth of per capita group Expenditure: Unrestricted Estimates

All Districts :

SURE-IV with Instruments for Government Expenditures and Expenditure growth

	Q1	Q2	Q3	Q4	Q5
Social Expenditures					
Expenditures from development funds	0.203	-0.004	-0.018	0.234	-3.639
	[0.116]*	[0.067]	[0.099]	[0.260]	[1.424]**
Expenditures on salaries and charges	-0.28	-0.013	0.121	-0.203	2.65
	[0.162]*	[0.092]	[0.139]	[0.360]	[1.965]
Non-Social Expenditures					
Expenditures from development funds	-0.53	-0.299	-0.139	-0.874	-0.025
	[0.317]*	[0.177]*	[0.256]	[0.705]	[3.989]
Expenditures on salaries and charges	0.29	0.281	0.293	2.389	-1.166
	[0.818]	[0.516]	[0.748]	[2.039]	[9.797]
Taxes and Levies	3.33	-1.547	-5.1	6.28	-78.856
	[3.471]	[1.964]	[2.833]*	[8.095]	[42.183]*
Total collected revenue	-2.046	2.636	6.16	-5.701	52.028
	[3.154]	[1.790]	[2.601]**	[7.341]	[38.801]
Growth in HH Expenditure/Income	0.064	0.023	0.1	0.065	2.4
	[0.033]*	[0.023]	[0.032]***	[0.085]	[0.418]***
Constant	0.075	0.109	0.105	0.119	0.014
	[0.013]***	[0.005]***	[0.005]***	[0.008]***	[0.021]
N	100				

Standard errors in brackets

* p<0.10, ** p<0.05, *** p<0.01

In Table 7 we impose the restrictions to obtain the pure redistribution effects within the household sector of the fiscal variables in the estimation in equation (1). Namely, that $\beta_1 = 1$, average household income is affected 1 to 1 by GDP increases; and that the β_2's are zero, to isolate the distributive effects of fiscal expenditures on household income. The estimates in Table 7, are precisely the α_{1i} and α_{2i} of equation 1[8]. The redistributive effects within the household sector of social expenditures from development funds promote growth towards the bottom and middle of the expenditure distribution, with the persistent negative effects on the top quintile we saw in the unrestricted estimates. District average expenditure growth benefits the top income bracket more than on the other income groups, and the evidence suggests that the poor benefit from mean income growth but less so than higher income groups. The negative distortion to the high income groups seems to increase when we allow for both redistribution within the

[8] Note that under these restrictions $\alpha_{2i} = \gamma_i$ and $\alpha_{1i} = \theta_i$

household sector and for changes in the average household income (in Table 6), in comparison to the point estimates for social expenditures from development funds in Table 7; the effects of the expenditure variables on this group is reflected more through their effects on average income than on their pure distribution effects.

Table 7 TANZANIA - Rate of Growth of per capita group Expenditure: Restricted Estimates

All Districts

SURE-IV with Instruments for Government Expenditures and Expenditure growth

	Q1	Q2	Q3	Q4	Q5
Social Expenditures					
Expenditures from development funds	0.262	0.064	0.164	0.483	-0.974
	[0.110]**	[0.072]	[0.101]	[0.277]*	[0.373]***
Expenditures on salaries and charges	-0.307	-0.049	0.003	-0.362	0.714
	[0.153]**	[0.099]	[0.142]	[0.384]	[0.517]
Non-Social Expenditures					
Expenditures from development funds	-0.453	-0.241	0.021	-0.634	1.307
	[0.300]	[0.191]	[0.265]	[0.757]	[1.017]
Expenditures on salaries and charges	0.232	0.077	-0.265	1.346	-1.39
	[0.773]	[0.549]	[0.755]	[2.134]	[2.785]
Taxes and Levies	4.077	-0.515	-2.032	9.001	-10.53
	[3.281]	[2.108]	[2.907]	[8.577]	[11.275]
Total collected revenue	-2.407	1.87	3.888	-7.77	4.419
	[2.983]	[1.924]	[2.665]	[7.794]	[10.278]
Growth in HH Expenditure/Income	0.104	0.091	0.274	0.359	4.172
	[0.031]***	[0.024]***	[0.034]***	[0.090]***	[0.120]***
Constant	0.061	0.095	0.081	0.091	-0.066
	[0.012]***	[0.005]***	[0.005]***	[0.009]***	[0.010]***
N	100				

Standard errors in brackets

* p<0.10, ** p<0.05, *** p<0.01

The next step is to use the unrestricted estimated parameters, which allow for both redistribution within the household sector and for changes in the average household income, and use the restrictions to recuperate the structural parameters in equations 1 and 4. Table 8 shows these results using the point estimates for the equations that use observations for all districts, districts below (Bottom) and above (Top) the median average per capita household expenditure.

The β model parameters show the total effect of public expenditure across the distribution (note that equation 4 is a district level equation), we call this fiscal diffusion effects. The model parameters show

that the public expenditure (β's) diffusion effects are significant and negative for the social expenditures from development funds because of the distortions to the top quintile; especially, in the below median districts. The effect of mean per capita expenditure growth or consumption growth diffusion effects are significant for both bottom and top districts and larger for top districts; the parameter estimate is well below one, so that $\beta_1 \neq 1$ and average household income is not affected 1 to 1 by GDP increases .

Consumption multipliers (α_2's) measure how an increase in the average household per capita income is distributed across the groups. These effects tend to affect the top quintile of the expenditure distribution, and for the rest of the groups they are much smaller and significant near the middle of the distribution, specifically quintile 3.

An important result is that the differences across Top and Bottom districts arise from the β coefficients which are statistically significant but not from differences in the α_2's which are practically identical across; meaning that the differences between poor and rich districts are due to difference in the responsiveness of the household sector to macroeconomic conditions.

The message is clear, multipliers are reflected among the higher income groups, the poor might not have the resources to respond to (positive) shocks; moreover, the spillovers are disproportionately reflected in the top quintile group. There is also some evidence that towards the middle of the distribution there are spillover effects of smaller magnitude.

Table 8 TANZANIA – Model Parameters Based Expenditure: Unrestricted Estimates

β Parameters	All Districts	Bottom Districts	Top Districts
Social Expenditures			
Expenditures from development funds	-0.645	-0.698	-0.416
	[0.293]**	[0.199]***	[0.364]
Expenditures on salaries and charges	0.455	0.157	0.459
	[0.404]	[0.260]	[0.594]
Non-Social Expenditures			
Expenditures from development funds	-0.373	2.301	-1.05
	[0.817]	[0.609]***	[0.633]*
Expenditures on salaries and charges	0.418	-0.169	6.744
	[2.022]	[1.017]	[16.373]
Taxes and Levies	-15.178	-11.666	-5.535
	[8.664]*	[7.220]	[6.301]
Total collected revenue	10.615	10.127	8.676
	[7.966]	[6.461]	[6.225]
Growth in HH Expenditure/Income	0.53	0.183	0.427
	[0.086]***	[0.059]***	[0.072]***
α_2 Parameters			
Quintile 1	0.12	0.381	0.142
	[0.061]**	[0.213]*	[0.066]**
Quintile 2	0.044	0.201	-0.013
	[0.042]	[0.149]	[0.037]
Quintile 3	0.188	0.257	0.123
	[0.055]***	[0.165]	[0.048]***
Quintile 4	0.122	0.19	0.104
	[0.161]	[0.527]	[0.136]
Quintile 5	4.526	3.972	4.644
	[0.187]***	[0.657]***	[0.173]***
N	100	50	50

Standard errors in brackets
* p<0.10, ** p<0.05, *** p<0.01

The final step to gauge the effect of these variables across the expenditure distribution is to compute the elasticities of group expenditure with respect to each of these variables. These elasticities measure how the effects of these variables are seen in relative aggregate terms and the distributional implications. The elasticities of per capita group expenditure with respect to the fiscal expenditure variables (E_{jt}) for each group *i* are defined as (using equation 1):

$$\varepsilon_{E}^{i} = \mathbf{E}\left(\frac{E_{jt}}{y_{ijt}}\right) * \alpha_{1i} = \mathbf{E}\left(\frac{E_{jt}}{y_{ijt}}\right) * (\theta_i - \alpha_{2i}\beta_2) = \mathbf{E}\left(\frac{E_{jt}}{y_{ijt}}\right) * (\theta_i - \frac{\gamma_i}{\beta_1}\beta_2) \qquad (6)$$

where β_2 is the beta parameter vector for the expenditure variables, *i* is the quintile group or the mean, and $\mathbf{E}()$ is the expectation operator. In addition the elasticity of per capita group expenditure with respect to average district income is:

$$\varepsilon_{y}^{i} = \mathbf{E}\left(\frac{Y_{jt}}{y_{ijt}}\right) * \alpha_{2i} = \mathbf{E}\left(\frac{Y_{jt}}{y_{ijt}}\right) * \frac{\gamma_i}{\beta_1} \qquad (7)$$

Standard errors can be obtained using the delta method.

Error! Reference source not found. shows the estimated elasticities for each expenditure group using observations for all districts. The elasticities are evaluated at the average value of the ratios of equations 6 and 7[9]. The effects for *social expenditures* (health and education) from development funds are small but positive and significant for quintile 1, implying that an increase of 10 percent in this type of expenditure would be reflected as a 0.2 percent increase in the mean expenditure of the quintile 1 group. It is interesting to note that this effect is negative for the top quintile group; this is because the distortions in the top quintile we mentioned before. The elasticity of social expenditures in salaries and other charges is negative for the bottom quintile. Together we can conclude that expenditures in social goods, namely health and education, tend to increase the share of the household sector in the economy, which can be regarded as a pro-equity effect, meaning that it promotes growth toward the bottom of the distribution.

[9] Note $\mathbf{E}\left(\frac{X}{Z}\right) \neq \frac{\mathbf{E}(X)}{\mathbf{E}(Z)}$ and we use $\mathbf{E}\left(\frac{X}{Z}\right)$ as presented in equations (6) and (7) as it seems a more natural approach. We calculated the elasticities using the ratio of the expected values and the results are almost identical.

Table 9 TANZANIA – Elasticities of Group Expenditures for All Districts: Unrestricted Estimates and Mean of the Ratio

All Districts

Expenditure	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
Social Expenditures										
Expenditures from development funds	0.021	**	0.001		0.003		0.006		-0.007	**
	(0.009)		(0.003)		(0.003)		(0.005)		(0.003)	
Expenditures on salaries and charges	-0.102	**	-0.006		0.004		-0.021		0.023	
	(0.049)		(0.016)		(0.015)		(0.029)		(0.017)	
Non-Social Expenditures										
Expenditures from development funds	-0.013		-0.004		-0.001		-0.006		0.006	**
	(0.008)		(0.003)		(0.002)		(0.005)		(0.003)	
Expenditures on salaries and charges	0.007		0.004		0.002		0.017		-0.011	
	(0.023)		(0.008)		(0.007)		(0.015)		(0.008)	
Taxes and Levies	0.120		-0.012		-0.021		0.051		-0.030	
	(0.077)		(0.026)		(0.023)		(0.049)		(0.027)	
Total collected revenue	-0.101		0.039		0.051	*	-0.057		0.015	
	(0.092)		(0.032)		(0.029)		(0.059)		(0.033)	
Growth in HH Expenditure/Income	0.434	**	0.090		0.260	***	0.112		1.963	***
	(0.220)		(0.087)		(0.076)		(0.147)		(0.081)	

Notes: Standard errors in parentheses. Elasticities are estimated at the respective means

* p<0.10, ** p<0.05, *** p<0.01

For *non-social expenditures* the only significant elasticity is that of the expenditures that come from development funds for the top quintile. These effects affect the distribution within the household sector concentrating growth to the top of the distribution, contrary to that found with the social expenditures. This is shown by the fact that restricted or compensated estimates of the effect of the non-social expenditure variables are jointly and individually insignificant for the bottom quintiles in Table 7.

Taxes and levies have no discernible effects on the household income the groups. While not precisely estimated, these effects seem to be counteracted by total revenue of the district. The implication is that districts with high average income might use revenue from taxes with a progressive distributive purpose.

All coefficients of household consumption growth were positive and significant as expected in Table 6 and Table 7. However, the elasticities of all groups' income with respect to per capita household consumption are positive and only significant for quintile 1, 3 and 5, reflecting the results in Table 6. The household expenditure growth elasticity is well above one for the top quintile. This implies that mean expenditure growth is not reflected one-to-one among the poorest sections of the population and disproportionally benefit the better-off sectors of the population. When analyzing the distributional effects within the household sector the neutrality is rejected; meaning that the larger coefficients in the unrestricted model (Table 6) for the higher income groups are reflected differently across the expenditure distribution, as the elasticities are different among all income groups. Moreover, it implies that given large differences between the GDP and household income in these districts, household income for all groups except for the top quintile will tend to catch up slowly.

Table 10 and Table 11 show similar results but now separating the sample into the below the median expenditure districts and those above. The effects for *social expenditures* from development funds are

only positive and significant in quintile 1 for the bottom districts and are similarly significant for the top districts. In general, we can see that among the bottom districts significant effects are concentrated among non-social public expenditures from development funds and benefiting the top of the expenditure distribution, while for top districts they are concentrated in the social expenditures from development funds and tend to be positive for the bottom quintiles. The evidence suggests that the richer districts are perhaps more efficient in their targeting of social expenditures towards the poorer sectors of the population, even though these elasticities are very small.

Table 10 TANZANIA – Elasticities of Group Expenditures for Bottom Expenditure Districts: Unrestricted Estimates and Mean of the Ratio

Expenditure	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
Social Expenditures										
Expenditures from development funds	0.035	**	0.010		0.005		0.006		-0.011	*
	(0.017)		(0.007)		(0.005)		(0.011)		(0.007)	
Expenditures on salaries and charges	-0.040		-0.029		0.013		-0.022		0.018	
	(0.066)		(0.022)		(0.017)		(0.035)		(0.022)	
Non-Social Expenditures										
Expenditures from development funds	-0.037	**	-0.013	*	-0.006		-0.005		0.012	*
	(0.019)		(0.007)		(0.006)		(0.012)		(0.007)	
Expenditures on salaries and charges	-0.004		0.006		0.002		-0.007		0.002	
	(0.022)		(0.008)		(0.006)		(0.014)		(0.008)	
Taxes and Levies	0.249	*	0.066		-0.003		0.000		-0.045	
	(0.151)		(0.057)		(0.043)		(0.093)		(0.056)	
Total collected revenue	-0.291		-0.064		0.024		-0.002		0.044	
	(0.178)		(0.067)		(0.051)		(0.109)		(0.066)	
Growth in HH Expenditure/Income	1.372	*	0.413		0.355		0.174		1.723	***
	(0.769)		(0.307)		(0.228)		(0.483)		(0.285)	

Notes: Standard errors in parentheses. . Elasticities are estimated at the respective means

* p<0.10, ** p<0.05, *** p<0.01

Table 11 TANZANIA – Elasticities of Group Expenditures for Top expenditure Districts: Unrestricted Estimates and Mean of the Ratio

Expenditure	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
Social Expenditures										
Expenditures from development funds	0.025	**	-0.001		0.000		0.004		-0.005	
	(0.012)		(0.004)		(0.003)		(0.006)		(0.004)	
Expenditures on salaries and charges	-0.070		0.054	**	0.023		-0.037		0.008	
	(0.086)		(0.025)		(0.022)		(0.044)		(0.027)	
Non-Social Expenditures										
Expenditures from development funds	-0.003		-0.002		0.000		-0.005		0.003	
	(0.007)		(0.002)		(0.002)		(0.004)		(0.002)	
Expenditures on salaries and charges	-0.186		-0.049		-0.065		-0.023		0.066	
	(0.216)		(0.060)		(0.052)		(0.100)		(0.063)	
Taxes and Levies	0.076		-0.005		0.000		0.014		-0.015	
	(0.068)		(0.020)		(0.017)		(0.035)		(0.021)	
Total collected revenue	-0.080		0.056	**	0.011		-0.022		0.005	
	(0.090)		(0.028)		(0.023)		(0.048)		(0.029)	
Growth in HH Expenditure/Income	0.511	**	-0.027		0.170	***	0.096		2.014	***
	(0.237)		(0.077)		(0.066)		(0.125)		(0.075)	

Notes: Standard errors in parentheses. . Elasticities are estimated at the respective means

* p<0.10, ** p<0.05, *** p<0.01

Rwanda

For the estimation using the data for Rwanda the dependent variables are the group per capita growth rates as before. The fiscal expenditure growth variables are: social expenditures where we have expenditures in infrastructure and health and education sectors; non-social expenditures which are general expenses, in this latter category we have expenditures for other public goods like good governance, industrial development, agricultural management among others.

The estimates in Table 12 reflect the total effect allowing for both redistribution within the household sector and for changes in the average household income as well. Expenditures in social and non-social public goods do not seem to benefit the poor and middle classes. There are significant negative effects for the bottom quintile (Q1) and only a large positive effect but not significant of infrastructure for the top quintile. Mean expenditure growth, disproportionately, benefits the top 20% of the income distribution, with large positive estimates for the 5th quintile equation.

Table 12 Rate of Growth of per capita group Expenditure: Unrestricted Estimates

	Q1	Q2	Q3	Q4	Q5
Social Expenditures					
Infrastructure	-8.79	-2.55	-4.35	-4.68	54.9
	[3.13]***	[2.18]	[3.41]	[7.40]	[61.6]
Health and Education	-1.09	0.5	-0.018	0.44	-4.35
	[0.60]*	[0.46]	[0.74]	[1.57]	[11.3]
Non-Social Expenditures					
General Expenses	-1.06	-0.62	-1.13	-0.77	0.039
	[0.56]*	[0.40]	[0.64]*	[1.36]	[10.6]
Growth in HH Expenditure/Income	0.014	-0.0061	-0.0046	0.055	3.84
	[0.021]	[0.016]	[0.025]	[0.053]	[0.52]***
Constant	0.082	0.076	0.075	0.064	-0.033
	[0.0080]***	[0.0030]***	[0.0031]***	[0.0039]***	[0.018]*
N	90				

Standard errors in brackets

* p<0.10, ** p<0.05, *** p<0.01

In Table 13 we impose the restrictions, discussed above, to reflect to the pure redistribution effects within the household sector of the fiscal variables estimated and the results are similar. Social expenditures in infrastructure promote expenditure growth at the top quintile of the distribution, with negative effects on the bottom quintile as with the unrestricted estimates in the previous table. Total average expenditure growth benefits the top income and the evidence suggests that the poor do not benefit as much from growth in expenditures and the top quintile.

Table 13 Rate of Growth of per capita group Expenditure: Restricted Estimates

SURE-IV with Instruments for Government Expenditures and Expenditure growth

acRestALL3

	Q1	Q2	Q3	Q4	Q5
Social Expenditures					
Infrastructure	-8.96	-2.64	-4.5	-5.14	21.2
	[3.07]***	[2.18]	[3.52]	[8.25]	[10.8]**
Health and Education	-1.06	0.52	0.036	0.59	-0.082
	[0.59]*	[0.46]	[0.76]	[1.74]	[2.27]
Non-Social Expenditures					
General Expenses	-1.04	-0.6	-1.1	-0.65	3.4
	[0.55]*	[0.40]	[0.66]*	[1.51]	[1.98]*
Growth in HH Expenditure/Income	0.019	-0.0017	0.0034	0.079	4.9
	[0.021]	[0.016]	[0.026]	[0.060]	[0.079]***
Constant	0.081	0.076	0.074	0.062	-0.067
	[0.0079]***	[0.0030]***	[0.0032]***	[0.0044]***	[0.0083]***
N	90				

Standard errors in brackets

* p<0.10, ** p<0.05, *** p<0.01

Table 14 shows the model structural parameters estimates using the unrestricted equations coefficients and the model restrictions to recuperate the structural parameters in equations 1 and 4 for the sample with all districts, the bottom districts and the top districts.

The fiscal diffusion effects (β's), show that the public expenditure variables are not significant and the effect of mean per capita expenditure growth or consumption growth diffusion effects are significant for both bottom and top districts and slightly larger for top districts. The parameter estimate is below one, so that we reject that $\beta_1 = 1$, average household income is not affected 1 to 1 by GDP increases. The consumption multipliers (α_2's) show that increases in the average household per capita expenditure is concentrated in the top quintile.

Table 14 Rate of Growth of per capita group Expenditure: Unrestricted Estimates

SURE-IV with Instruments for Government Expenditures and Expenditure growth

	All Districts	Bottom Districts	Top Districts
β Parameters			
Infrastructure	6.9	11.7	-12.7
	[12.2]	[16.1]	[13.1]
Health and Education	-0.9	-0.25	-1.98
	[2.25]	[3.22]	[2.11]
General Expenses	-0.71	-0.16	-1.82
	[2.11]	[2.60]	[2.12]
Growth in HH Expenditure/Income	0.78	0.65	0.77
	[0.10]***	[0.12]***	[0.063]***
α Parameters			
Quintile 1	0.018	0.015	0.044
	[0.027]	[0.052]	[0.027]
Quintile 2	-0.0079	0.015	-0.01
	[0.020]	[0.049]	[0.017]
Quintile 3	-0.0059	-0.042	-0.02
	[0.032]	[0.082]	[0.029]
Quintile 4	0.071	0.21	0.022
	[0.069]	[0.16]	[0.064]
Quintile 5	4.92	4.81	4.96
	[0.089]***	[0.20]***	[0.086]***
N	90	45	45

Standard errors in brackets

* p<0.10, ** p<0.05, *** p<0.01

Table 15 shows the estimated elasticities for each expenditure group using observations for all districts. The elasticities are evaluated at the average value of the ratios of equations 6 and 7, as before. The effects for expenditures in infrastructure are significant for quintile 1 and quintile 5; but with opposite effects, promoting growth in the top quintile and reducing it at the bottom quintile. The elasticity of health and education expenditures is negative for the bottom quintile, concentrating growth toward the middle of the distribution. The expenditures in social goods tend to be neutral in the aggregate, as the growth that is promoted among a group tends to be neutralized by decreases elsewhere. For example, the results suggest that a 10% in infrastructure spending is reflected as an increase of 0.26% among the top quintile and a decrease of 1.25% among the bottom quintile; taken into account the different levels of mean income among these groups the effects mute one another.

In the case of health and education expenditures the situation is similar, but we cannot detect significant positive effects elsewhere in the distribution. The points to draw from these results are the different nature of health and education expenditures and infrastructure expenditures. As we mentioned before, these effects also reflect the differential capacity of these groups to benefit from these investments, which are dictated by their initial conditions. So the poorest groups are less likely to experience mean expenditure growth through investments in infrastructure investment that are reflected in the fiscal expenditure data.

General expenses have a positive and significant effect on the average household income of the top quintile and negative effects on the household income of the other groups. The elasticities of *household consumption growth* are only positive and significant for the top quintile and the household expenditure growth elasticity is only above one for the top quintile. This implies that mean expenditure growth is not reflected among the poorest sections of the population and is better reflected among the top quintile of the expenditure distribution in Rwanda.

Table 15 RWANDA – Elasticities of Group Expenditures for All Districts: Unrestricted Estimates and Mean of the Ratio

Expenditure	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
Infrastructure	-0.125	***	-0.018		-0.020		-0.015		0.026	**
	(0.04)		(0.02)		(0.02)		(0.02)		(0.01)	
Health and Education	-0.218	*	0.052		-0.002		0.021		0.002	
	(0.12)		(0.05)		(0.05)		(0.06)		(0.04)	
General Expenses	-0.053	*	-0.017		-0.020	*	-0.007		0.016	**
	(0.03)		(0.01)		(0.01)		(0.01)		(0.01)	
HH Expenditure	0.085		-0.019		-0.009		0.065		1.933	***
	(0.12)		(0.05)		(0.05)		(0.06)		(0.04)	

Notes: Standard errors in parentheses. Elasticities are estimated at the respective means.

* p<0.10, ** p<0.05, *** p<0.01

Separating the estimation of the elasticities by the average expenditure levels of each district, presented in Table 16 and Table 17, shows a more nuanced picture of the effects discussed. These estimates show that the negative elasticity found above for infrastructure expenditure for the bottom quintile is coming from the poorer districts, while the positive effect observed for the top quintile comes from the richer districts. In the top districts mean income growth benefits the bottom of the distribution but the estimate is considerably smaller for the bottom quintile.

Table 16 RWANDA – Elasticities of Group Expenditures for Bottom expenditure Districts: Unrestricted Estimates and Mean of the Ratio

Expenditure	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
Infrastructure	-0.063		-0.022		-0.036		-0.032		0.033	*
	(0.06)		(0.03)		(0.03)		(0.03)		(0.02)	
Health and Education	-0.199		-0.003		-0.005		0.029		0.007	
	(0.16)		(0.08)		(0.08)		(0.10)		(0.06)	
General Expenses	-0.045		-0.030	**	-0.008		0.010		0.007	
	(0.03)		(0.02)		(0.02)		(0.02)		(0.01)	
HH Expenditure	0.069		0.035		-0.065		0.190		1.887	***
	(0.24)		(0.12)		(0.13)		(0.14)		(0.08)	

Notes: Standard errors in parentheses. Elasticities are estimated at the respective means.

* p<0.10, ** p<0.05, *** p<0.01

Table 17 RWANDA – Elasticities of Group Expenditures for Top expenditure Districts: Unrestricted Estimates and Mean of the Ratio

Expenditure	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
Infrastructure	-0.179	***	-0.013		-0.014		-0.001		0.023	
	(0.06)		(0.02)		(0.02)		(0.03)		(0.02)	
Health and Education	-0.176		0.062		0.001		0.030		-0.009	
	(0.18)		(0.08)		(0.06)		(0.09)		(0.05)	
General Expenses	-0.089	**	-0.011		-0.019		-0.005		0.017	
	(0.04)		(0.02)		(0.01)		(0.02)		(0.01)	
HH Expenditure	0.201	*	-0.024		-0.030		0.020		1.948	***
	(0.12)		(0.05)		(0.04)		(0.06)		(0.03)	

Notes: Standard errors in parentheses. Elasticities are estimated at the respective means.

* p<0.10, ** p<0.05, *** p<0.01

Conclusions

In this paper we explored the effects of fiscal policies and growth on measures of the household welfare across the distribution of expenditure for Rwanda and Tanzania. The purpose is to better understand what groups are benefiting more from growth and public investment in these countries. We explore issues of inefficiency in government expenditures and dilution of growth benefits among the better off sectors of the population in these two countries (in lieu of the poor sectors) by looking at the effects within a country and across different groups of households and administrative entities.

We find contrasting results in the two countries we study. In Tanzania, the benefits of growth are reflected in a wider range of the expenditure distribution but with benefits concentrated on the top income bracket. Mean expenditure growth is not reflected one-to-one among the poorest sections of the population and disproportionally benefits the better-off sectors of the population, so that the distributional effects of

growth within the household sector do not reduce inequality. Making the distinction between better-off and worse off districts we find that the richer districts are perhaps more efficient in their targeting of social expenditures towards the poorer sectors of the population, even though the effects are very small. Public expenditures tend to have small effects and most of the effects are muted in the aggregate by distortions to the top quintiles in the expenditure distribution. The distributional effects of social expenditures tend to increase the share of the household sector in the economy, which can be regarded as a pro-equity effect, meaning that it promotes growth toward the bottom of the distribution.

In the case of Rwanda, we find that mean expenditure growth disproportionally benefits the top quintile. We find that the public expenditure variables do not promote growth for the poor and middle classes. We find small positive effects only for the top quintile of the expenditure distribution.

The welfare spillovers are mostly present for top 20% of the income distribution in both countries, with the bottom and middle of the distribution in Tanzania responding slightly to these spillovers. The elasticities of household consumption growth are only positive significant and above one for the top quintile. Public expenditures do not affect inequality in a considerable manner, but tend to concentrate growth towards the middle of the distribution, which can be seen a pro-equity effect. On the other hand, growth is related to 'increases' in inequality in the sense that the poorest sectors of the population benefit the least from growth. We find that the growth elasticity of income for the bottom quintile well below 1 in both countries.

In summary, following conclusions emerge from this study:

- Growth is good for the household sector as a whole and tends to benefit the top income group the most.
- The fiscal sector as a whole contributes very little to increase equity among the households that are represented in the surveys although it does affect the income of the household sector vis-à-vis the rest of the economy. Public expenditures contribute modestly to increase the household per capita income and some components of the expenditures have a small effect on the distribution within the household sector. Government expenditures in the non-social category leave little or no significant effect on average household income and tend to be regressive.
- Government expenditures in social goods on the other hand have a positive effect on the mid groups of household income and their distribution effect tends to be progressive.

East Africa has been in a solid growth path in the last years. In Rwanda and Tanzania growth has been accompanied with budgetary deficits and the results in this paper have some implications as to what type of policies can better exploit the growth that they are experiencing and the way to allocate the existing budget. The results suggest that there is ample room to ameliorate the unequal effects fiscal policies have across different income groups. Social expenditures should be better targeted towards the poor to achieve a higher pass-through from the fiscal to the household sector among the poorer sectors of the population. Finally, the possible distortionary effects that fiscal outlays can have among the better-off group is buffered by the higher incidence of growth on this group.

The limitations of the study are mainly due to the data availability and the changes in administrative sections in Rwanda. Ideally, we would want higher frequency survey data to construct annual growth

measures and have more than one observation per district. In the same spirit, the fiscal expenditure data would ideally provide more detailed categories and provide district level outlays that can be matched to each yearly growth rate computed from the household surveys.

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