Foreign Aid and Revenue Response: An Examination of Joint General Budget Support

Martin Knoll

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Abstract

The present paper explores the extent to which new joint General Budget Support (GBS) systems have been able to overcome the problems of aid dependency and negative fiscal incentives that can potentially result from high levels of on-budget aid. As approximately 90 percent of new joint GBS goes to sub-Saharan Africa, this analysis, which covers the period from 2000 to 2008, evaluates data from 37 sub-Saharan developing countries. According to fixed effect and system GMM estimations, joint GBS assistance – although highly discretionary – does not undermine recipients' revenue mobilization efforts. Indeed, on the contrary, while aid in general has no measurable impact on recipients' revenue performance, joint GBS programs are associated with higher revenue mobilization. This suggests that on-budget aid delivered under well-targeted conditionality successfully mitigates adverse fiscal incentives while substantially enhancing recipients' fiscal space.

Keywords: budget support, fiscal response, revenue mobilization, sub-Saharan Africa
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1. Introduction

The question of whether or under which circumstances development assistance discourages revenue mobilization efforts by recipient countries has been the subject of extensive debate in academia and among development practitioners for many years (e.g. Heller, 1975; Devarajan and Swaroop, 1998; McGillvray and Morrissey, 2000, McGillvray and Morrissey 2004; Teera and Hudson, 2004). A frequently raised concern is that development aid, particularly when delivered through highly discretionary arrangements, provides recipient governments, whose policymakers naturally aim at minimizing political cost, with a "free lunch" substitute for domestic revenue collection, thus increasing aid dependency. Recent empirical research suggests that high levels of development aid, particularly if provided in the form of grants, are, indeed, associated with lower revenue efforts and a higher degree of aid dependency (Gupta et al., 2004; Gupta, 2007; Clist and Morrissey, 2011).

However, new assistance and partnership strategies, based on national ownership and self-responsibility have emerged in response to the legitimacy crisis of the 1990s and to the growing consensus that development assistance had been largely ineffective – i.e. ill-targeted, poorly managed and highly fragmentary, and, in many cases, lacking the imperative buy-in from recipients (Stiglitz, 1998; Van de Walle, 1999; Menocal and Mulley, 2006). As a consequence, the way in which development assistance is delivered has changed considerably since the beginning of the new millennium (Mosely and Marion, 2000; Koeberle and Stavreski, 2006; Knoll, 2008). At a series of high-level fora, donors committed to significantly scale up aid and to adopt better coordinated intervention strategies. They also resolved to shift away from financing geographically specific projects, which often have limited and unsustainable impacts, and to focus more on assisting countries with good governance and policy records.[3] To meet donor commitments of scaled-up and more effective aid, new policy approaches, such as harmonized on-budget assistance by bilateral and multilateral agencies, referred to as joint General Budget Support (GBS), have been adopted in a number of Low and Lower Middle Income Countries (LICs and LMICs), particularly in sub-Saharan Africa (SSA). Joint GBS modalities serve as policy-based modalities of aid delivery whose purpose is to provide recipients with significant discretionary resources for implementing domestically developed and owned poverty reduction strategies. To sustainably enhance recipients' fiscal space, conditionality of joint GBS focuses, to a large extent, explicitly on Public Financial Management (PFM) reforms, comprising both revenue mobilization and expenditure management.

As joint GBS financing is a relatively recent modality, an empirical assessment of its revenue mobilization impacts has yet to be undertaken. To address this gap in the research, the present paper, applying a straight forward approach to model recipients' fiscal responses to budget

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[3] These comprise the 2002 UN Conference on Financing for Development in Monterrey (UN, 2002) and the High Level Fora on Aid Effectiveness in Rome (OECD, 2003), Paris, and Accra (OECD, 2008) held in 2003, 2005, and 2008 respectively.

aid, explores the extent to which new GBS programs have been able to overcome the conundrum whereby high levels of on-budget aid may potentially result in negative fiscal incentives.

The analysis covers the period from 2000 to 2008 and comprises 37 SSA LICs and LMICs.[4] According to the empirical results using fixed effect and dynamic panel estimations, joint on-budget assistance financing – although highly discretionary – does not undermine recipients' revenue mobilization efforts. On the contrary, while aid in general has no measurable impact on recipients' revenue performance, GBS programs are found to be associated with higher revenue mobilization. This suggests that on-budget aid, when coupled with well-targeted conditionality, intensive policy dialogue, and embedded technical assistance, successfully mitigates adverse resource mobilization incentives and enhances fiscal space.

The paper proceeds as follows: After providing an overview on the context and implementation procedures of GBS delivery in Section 2, Section 3 reviews the literature on fiscal revenue mobilization in developing countries, placing a particular focus on recent empirical findings. Sections 4 and 5 present the modelling strategy and specify the data used in the subsequent analysis. After outlining the estimation techniques employed to adequately control for fiscal revenue responses to GBS financing, Section 6 presents and interprets findings for the fixed effects and dynamic specifications. Section 7 concludes with a summary and final assessment.

2. Expansion of joint GBS

Traditional budget support, as provided until the late 1990s under the structural adjustment programs of the World Bank and IMF, was conceived primarily for the short-term, stand-alone redress of macroeconomic and fiscal policy imbalances (Phillips, 2009) and usually drew on a set of predefined Washington-formulated conditionality (Rodrik, 2006). The new approach to GBS financing, which has evolved since the beginning of the new Millennium, serves instead as a common platform for bi- and multilateral medium-to-long-term policy-based lending operations[5] and aims at supporting a nationally owned development strategy, as laid out in the Poverty Reduction Strategy Paper (PRSP). While the composition of bi- and multilateral GBS donor groups varies from country to country, a group of leading donors has emerged over time, including the World Bank, IMF, African Development Bank (AfDB), European Commission (EC), and several bilateral agencies.[6]

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[4] For a list of countries included see Appendix I.
[5] That is, concessional loans or grants with disbursement conditional upon the implementation of a policy menu.
[6] World Bank budget support to SSA recipients is generally provided under Poverty Reduction Strategy Credits (PRSC) at concessional IDA terms (World Bank, 2010). The IMF concessional lending window in support of the PRS has since 1999 been the Poverty Reduction and Growth Facility (PRGF). In January 2010 the PRGF has been formally replaced by the Extended Credit Facility (Adam and Bevan, 2001; IMF 2009; IMF, 2011a). AfDB's budget support aid to its regional member countries is delivered through its concessional lending arm, the African Development Fund (ADF). The EC provides budget support grants to SSA recipients from the European Development Fund (EC, 2007). The most important

The Development Assistance Committee of the OECD (OECD/DAC) defines General Budget Support as an aid modality in which foreign funds from various official donors are transferred to the recipient's treasury and are managed and spent according to national budgetary regulations and priorities (OECD, 2005a; OECD, 2006). In addition to the use of recipients' allocation, procurement, and auditing systems (which are referred to in the following as PFM systems), the key characteristic of joint GBS, as outlined by Koeberle and Stavreski (2006), is the provision of support at regular intervals (ideally, synchronized with recipients' budget cycle) with conditionality particularly focussing on public sector reform, institution and capacity building, and the strengthening of budgetary as well as other PFM processes.

Joint GBS is generally provided within a framework of institutionalized continuous policy dialogue between GBS donors and recipients. Policy dialogue serves as a platform for agreement on specific policy and reform measures directly related to the PRSP, to assess their implementation and decide on the release of funds to the recipient's treasury.

With donors' commitments to significantly scale up aid, budget support has become– when conditions on the ground are considered satisfactory – the modality of choice for various reasons:

First, with on-budget aid delivery untied and fully fungible, monies can be allocated according to national priorities – a significant element of the concept of country ownership. *Second*, compared to other forms of aid delivery, donor harmonization is easy to achieve, as co-ordination is limited to strategic targets and conditionality, reviewing, monitoring, and disbursement procedures. Donors can thus align with a set of conditionality negotiated with the recipient government, while joint allocation decisions or earmarking are obsolete. *Third*, GBS, in its capacity as a fast disbursing instrument, canalizes disbursement pressures and provides donors with significant leverage and a degree of control in the policy dialogue, which is an important factor for fiduciary risk mitigation.

Against this backdrop, GBS financing has gained increasing prominence over the last ten years, particularly in sub-Saharan Africa. According to OECD/DAC data maintained by the creditor reporting system (CRS), approximately 90 percent of joint GBS is allocated to Africa south of the Sahara.[7]

Since the gradual introduction of joint GBS funding, a group of 14 African countries has benefited from the modality.[8] Drawing on GBS disbursement data gathered by the author, the

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bilateral GBS donors to SSA recipients, providing either grants or concessional loans are Canada, France, Germany, the Netherlands, Norway, Sweden, and the UK (OECD/DAC CRS, micro data for purpose code 51010).

[7] OECD/DAC data can only be used as proxy for joint GBS activity as the respective CRS budget support purpose code (51010) only reports general budget support operations by donors irrespectively of the degree of whether GBS is provided jointly with harmonized conditionality and disbursement procedures (see below). The methodology for collection of GBS data used in the subsequent empirical analysis is described in section 4. Data sources are provided in Appendix III.

[8] Sierra Leone has been excluded from the sample as it does not represent a classical joint GBS operation but has been designed as a medium-term post-conflict and state building assistance program (Lawson, 2007).

average share of joint GBS operations in overall Official Development Assistance (ODA) has, as shown in Table 1, reached significant levels, with a fairly stable average level of approximately 20 percent for the time period from 2005 to 2008. With such high shares of aid provided in the form of joint on-budget funding, GBS significantly expands recipients' fiscal space, increasing available resources by between 16 and 25 percent of domestic revenue (Table 1).

Table 1: GBS share in total ODA (percent)/
Contribution to total domestic revenue excl. grants (percent)

Year	Start of Operation		2000	2001	2002	2003	2004	2005	2006	2007	2008
Benin	*2004*	GBS /total ODA					15.7	26.5	17.8	29.3	13.0
		GBS /total revenue					8.9	13.1	8.4	12.2	6.7
Burkina Faso	*2001*	GBS /total ODA		16.4	26.9	22.3	23.2	27.7	25.1	29.1	33.1
		GBS /total revenue		22.3	34.4	22.6	22.9	28.2	29.3	30.2	30.6
Cape Verde	*2005*	GBS /total ODA						18.6	9.7	21.5	13.6
		GBS /total revenue						11.2	4.1	8.6	5.7
Ghana	*2003*	GBS /total ODA				33.9	25.2	26.3	38.7	25.3	30.5
		GBS /total revenue				21.7	16.8	11.8	16.8	7.6	8.8
Madagascar	*2004*	GBS /total ODA					16.1	13.4	18.4	13.3	29.1
		GBS /total revenue					38.5	22.1	21.6	13.6	21.7
Malawi	*2000*	GBS /total ODA	15.0	11.8	0.0	4.5	13.0	24.8	13.2	15.0	26.3
		GBS /total revenue	20.9	15.3	0.0	4.1	10.0	20.3	12.0	16.1	27.3
Mali	*2002*	GBS /total ODA			10.5	18.4	13.7	16.1	22.5	11.2	18.4
		GBS /total revenue			10.7	14.4	9.4	11.8	19.1	9.6	13.0
Mozambique	*2000*	GBS /total ODA	17.5	17.6	10.5	20.3	18.3	23.9	22.9	23.5	27.9
		GBS /total revenue	28.3	31.4	41.5	35.4	24.1	28.4	26.1	22.0	23.1
Niger	*2001*	GBS /total ODA		4.2	21.2	15.4	13.7	12.4	12.3	13.7	9.0
		GBS /total revenue		5.9	28.0	26.5	23.9	18.0	13.6	12.8	6.6
Rwanda	*2002*	GBS /total ODA			18.2	19.8	25.7	32.7	18.2	30.7	21.7
		GBS /total revenue			33.0	27.6	46.0	52.4	30.5	51.6	30.4
Senegal	*2004*	GBS /total ODA					5.5	8.1	7.2	6.5	23.8
		GBS /total revenue					4.0	3.3	3.2	2.4	9.8
Tanzania	*2001*	GBS /total ODA		4.0	15.1	27.9	25.0	39.5	32.8	29.5	28.7
		GBS /total revenue		4.5	16.2	36.7	28.7	33.2	29.3	31.0	19.9
Uganda	*2001*	GBS /total ODA		19.4	13.0	29.3	22.8	21.6	23.4	13.9	15.9
		GBS /total revenue		25.9	13.3	40.2	30.0	23.8	28.9	15.8	13.8
Zambia	*2004*	GBS /total ODA					29.4	9.3	10.2	19.7	21.6
		GBS /total revenue					33.9	8.5	8.0	9.8	8.6
Unweighted Average		***GBS/total ODA***	*16.2*	*12.2*	*15.0*	*21.5*	*17.7*	*20.2*	*18.8*	*18.6*	*21.4*
Unweighted Average		***GBS /total revenue***	*24.6*	*17.5*	*23.8*	*25.2*	*21.2*	*19.6*	*17.6*	*16.8*	*15.7*

Source: World Bank, Global Development Finance, 2011, series codes DT.ODA.ODAT.GN.ZS (ODA in current USD), GC.REV.XGRT.GD.ZS (Central Government Revenue as share in GDP), and GBS disbursement data gathered by the author (see Appendix I).

As joint GBS has become the modality of choice for donors to deliver on their commitments to scale up and harmonize the provision of aid, the question becomes highly relevant whether GBS, as unearned free-lunch income, negatively impacts domestic revenue mobilization. To answer this question, the following sections will explore the extent to which joint GBS, along with structural determinates, impacts recipients' revenue-raising performance.

3. Determinants of Revenue Mobilization Efforts in Developing Countries

Harnessing increasingly advanced econometric tools, a series of recent empirical research studies has identified and validated a set of structural determinates of revenue mobilization in developing countries. According to the seminal analysis by Tanzi (1992), which has been used as the point of departure for most subsequent studies, developing countries' revenue mobilization efforts, proxied by the share of tax revenue in GDP, to a significant extent depend on i) the structural composition of value added, ii) per capita income, iii) the volume of trade, and iv) the stock of public debt.

i)   The composition of GDP, in particular the share of agricultural value added in aggregate output, is a salient factor affecting the tax base (Tanzi, 1992). As Teera and Hudson (2004) note, this is due to demand as well as supply effects. Economies with a high share of agricultural output tend to have a significantly smaller demand for publically provided goods and services. At the same time, the sector's ability to contribute to the financing of government activities and public services is, in the case of developing countries generally, limited by its subsistence and small-scale informal character (Stotsky et al., 1997; Teera and Hudson, 2004). Industrial production and services, on the other hand, generally require more publically produced goods as intermediate inputs for production. Consequently, these sectors are organized in more formal and easier-to-tax structures (Teera and Hudson, 2004). Nevertheless, to avoid collinearity problems in econometric analysis, it is recommended to control for the share of agriculture in GDP only, which has been identified by previous research as having the most explanatory power (see Table 2).

ii) Per capita income (GNI per capita) proxies the level of socio-economic development and serves as an index of surplus income available for taxation (Teera and Hudson, 2004). Furthermore, it is assumed that higher degrees of economic development entail higher levels of institutional capacity to levy and collect revenue (Chelliah, 1971).

iii) Customs and other trade related excises, levies and taxes – the extent of which primarily primarily depends on the overall volume of trade – have been a major source of revenue in developing countries (albeit with declining volumes after the Uruguay Round). Compared to income and value added taxes, trade related revenue is easy to collect, as administrative structures required for effective collection and enforcement are relatively small. Furthermore, trade operates within the formal economy, providing a significant base for various taxes, such as value added or general sales taxes (Tanzi, 1992). The

intensity of trade is generally measured by the sum of exports and imports as share in GDP.

iv) Accumulation of public and publically guaranteed debt (PPGD) entails recurrent government expenditure in the form of interest payments, which can either be financed through additional net borrowing or increased revenue mobilization. Studies covering longer and more distant time periods find empirical evidence for a substantive effect of PPGD on tax revenue mobilization (Tanzi, 1992; Gupta et al., 2004).[9] More recent research, however, has failed to detect a significant and meaningful positive relation, a point that will be considered in Section 6.

While these factors represent a rather parsimonious baseline set, more recent studies also control for other potential factors, such as the quality of governance (Gupta, 2007) or the assumed size of the informal economy (Teera and Hudson, 2004). However, while Gupta (2007) tests specifications with various Intra Country Risk Guide governance indicators (ICRG) such as political stability, law and order, government stability, and corruption – all of which would be expected to affect revenue mobilization efforts – only the perceived level of corruption appears to be moderately significant in some specifications.[10] Teera and Hudson's (2004) informal economy indicator is significant and meaningful, but counter-intuitively suggests that in the case of LICs, revenue mobilization positively depends on the size of the shadow economy.[11]

With the debate on the general effectiveness of aid, the focus has, however, shifted from determining and confirming principal factors for the revenue mobilization capacity of developing countries to identifying the effect of aid on domestic revenue collection (Gupta et al., 2004; Teera and Hudson, 2004, Gupta, 2007; Clist and Morrissey, 2011). The current predominate view taken by academia is that a recipient's fiscal response depends on whether aid comes in the form of grants or concessional loans (Gupta et al. 2004; Clist and Morrissey, 2011). While grants represent mere windfalls and free-lunch substitutes for politically costly revenue mobilization, it is assumed that concessional loans, due to the intrinsic repayment motive, tend to encourage spending decisions that yield positive socio-economic net benefits that, in turn, enable recipients to service and redeem outstanding concessional debt (Gupta et al., 2004; Bräutigam, 2000). The validity of this argument will be reviewed in the subsequent section.

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[9] The here cited studies use total external debt as proxy for PPGD as at this point in time consistent PPGD data was unavailable.

[10] Measures of perceived corruption generally aggregate the perceived level of petty corruption and the perceived level of heavy embezzlement and the willful causing of loss to the state.

[11] An overview on explanatory variables, the time period covered, and the applied estimation technique used by previous studies is provided in Table 2.

Table 2: Significant varialbes for domestic revenue mobilization identified by previous empirical research

Authors	Time period and sample	Significant explanatory variables for government revenue (percent in GDP)	Estimation technique
Leuthold (1991)	1973 – 1981, 8 SSA countries	— Agricultural value added as share in GDP (–) — Trade openness (Imports + Exports)/GDP (+)	— Autoregressive model controlling for AR(1)
Tanzi (1992)	1978, 1981, 1983, 1985, 1988, 83 developing countries	— Per capita income (+) — Agricultural value added as share in GDP (–) — Imports as share in GDP (+) — External debt stock as share in GDP (+)	— Cross-section OLS
Stotsky et al. (1997)	1990 – 1995 43 SSA countries	— Per capita income (+) — Agricultural value added as share in GDP (–) — Exports as share in GDP (+) — Mining as share in GDP (–)	— One error component FE model — One error component RE model
Teera et al. (2004)	1975 – 1998 40 LICs*	— Agricultural value added as share in GDP (–) — Trade openness (Imports + Exports)/GDP (+) — Population density (+) — External debt stock as share in GDP (+) — Proxy for scale of non-taxed informal shadow economy (+)	— Log one error component FE model with time trend
Gupta, S. et al. (2004)	1970 – 2000 107 Developing Countries,	— Agricultural value added as share in GDP (–) — Industry value added as share in GDP (+) — Trade openness (Imports + Exports)/GDP (+) — Per capita income (+) — ODA loans as share in GDP (+) — (ODA loans as share in GDP)^2 (–) — ODA grants as share in GDP (–) — (ODA grants as share in GDP)^2 (+) — ODA as share in GDP (–) — (ODA as share in GDP)^2 (+)	— Semi-log (regressors) one error component FE model — Semi-log (regressors) one error component RE model (unbalanced panel structure)
Gupta, A. (2007)	1980 – 2004 50 LICs*	— GDP per capita (+) — Agricultural value added as share in GDP (–) — Imports as share in GDP (+) — ODA as share in GDP (–) — ICRG Corruption Index (–) — Tax revenue from goods and services as share in total revenue (+) — Tax revenue from income, profits, and capital gains as share in total revenue (+)	— One error component FE model
Clist et al. (2011)	1970-2005 107 Developing Countries	— ODA loans as share in GDP (+) — (ODA loans as share in GDP)^2 (–) — ODA grants as share in GDP (–) — (ODA grants as share in GDP)^2 (+) — Agricultural value added as share in GDP (–) — Industry value added as share in GDP (+) — Imports as share in GDP (+) — Exports as share in GDP (–)	— One error component FE with and without IV (lagged aid, unbalanced panel) — First differences (unbalanced panel)

* *This refers to sub-sample results. As the present paper focuses on SSA LICs, estimation results for LIC sub-samples are being cited here.*

4. Modeling Strategy

The econometric analysis of the present paper follows the fiscal response framework as presented in Heller (1975) and Gupta et al. (2004). The recipient's government budget constraint is given by

$$(1) \qquad\qquad G_t = R_t + A_t + B_t,$$

with G_t, R_t, A_t, and B_t denoting overall government expenditure including interest on outstanding debt, total domestic revenue, total aid inflow, and net non-concessional borrowing in period t, respectively.[12] The revenue mobilization response to an exogenous increase in assistance is given by

$$(2) \qquad\qquad \frac{\partial R_t}{\partial A_t} = \frac{\partial G_t}{\partial A_t} - \frac{\partial B_t}{\partial A_t} - 1.$$

Hence, if the increase in government expenditure and the downward adjustment in net non-concessional borrowing do not offset the provision of additional aid resources, such that

$$(3) \qquad\qquad \frac{\partial G_t}{\partial A_t} - \frac{\partial B_t}{\partial A_t} < 1,$$

the revenue mobilization response turns negative, with

$$(4) \qquad\qquad \frac{\partial R_t}{\partial A_t} < 0.$$

This scenario is particularly likely if revenue mobilization is perceived to induce political costs that exceed political benefits from expanding expenditure and/or reducing non-concessional lending.

However, while previous empirical studies have explicitly or implicitly drawn on this response framework, only Heller (1975) and Gupta et al. (2004) point to the fact that it rests on the strong assumption of aid generally being provided as fully fungible on-budget aid. Yet this is rather unrealistic, as a good portion of aid remains either entirely off-budget or is tied (earmarked) to the provision of specific public services or investment activities and therefore remains completely outside the recipient's public financial management (PFM) system or, in the case of earmarked funding, outside the recipient's direct allocational control (Adugna, 2009). Thus, the modelling framework presented above can only be considered appropriate if applied to on-budget and fungible aid, as only those aid flows inform the recipient's budget constraint in the way stipulated by Equation (1) and hence do indeed induce the possible fiscal responses discussed here.[13]

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[12] As aid comprises concessional borrowing, B_t refers to gross non-concessional domestic and foreign borrowing.

[13] As shown in Appendix II, the share of total ODA that does not fulfil this precondition is quite substantial. A conservative, lower bound estimate for the share of committed total ODA delivered tied and/or off-budget ranges from approximately 30 to 50 percent to the SSA region for the period from 2000 to 2008.

As the present paper aims to detect the sign and magnitude of the revenue mobilization response to the provision of new joint GBS, the modality of fungible on-budget aid provision *par excellence*, the modelling framework appears valid and appropriate in this particular context.

5. Data

To undertake a meaningful empirical analysis of the effect of joint GBS on recipients' revenue mobilization efforts, a concise and unambiguous definition of the particular aid modality has to be applied. To this end, in the following paragraphs three principal qualitative, definitional and data source specifications are made explicit.

First, differences in the approach to joint provision of direct budget support, i.e. the degree of harmonization with respect to the formulation of conditionality, to the assessment of recipients' performance, and to disbursement decisions, have evolved over the last decade. To apply objective and unambiguous criteria for joint GBS operations, the present paper uses the definition provided by the World Bank (2010). According to this definition, recipients of joint General Budget Support are those where a common framework of conditionality (Policy Assessment Framework, PAF) or PAF-like framework are either being established or are partially or fully operational. According to the World Bank this is the case for Benin, Burkina Faso, Cape Verde, Ghana, Madagascar, Malawi, Mali, Mozambique, Niger, Senegal, Rwanda, Tanzania, Uganda, and Zambia.[14]

Second, as joint program features such as PAFs have evolved over time, we must address the question of how to correctly determine, in each particular case, the starting point for joint GBS interventions. As the preparation of government-owned PRSPs has been a universal and major precondition for budget support funding, the starting point for joint GBS has generally been the acknowledged acceptance of PRSPs by development partners. Hence, GBS disbursements to the above listed SSA countries, under evolving joint and harmonized policy frameworks after PRSP approval, are considered as fulfilling these definitional preconditions.[15]

Third, reliable aggregate disbursement data for joint GBS operations is hard to obtain, as the OECD/DAC CRS has reported bilateral as well as EU on-budget aid disbursals in a consistent manner only since 2004, while World Bank budget support lending operations have been continuously reported under varying categories.[16] In addition, CRS data on disbursals of the

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[14] As noted by the World Bank (2010), donor harmonization takes different forms depending on the recipient aid architecture. Joint donor matrixes of policy actions, referred to as PAFs, are intended to "provide the basis for joint monitoring by all donors, for management according to a set of predefined common principles, however with disbursement still subject to individual donor decisions."

[15] For data on PRSP approval, see the IMF's web page: http://www.imf.org/external/np/prsp/prsp.aspx [accessed 12 June 2011].

[16] CRS General Budget Support purpose code is 51010. However, although entirely un-earmarked and fully on budget, IDA's Poverty Reduction Support Credits are reported under varying sector codes.

African Development Bank's budget support operations seem somewhat inconsistent with data reported in the bank's program reports and statistical compendia. To overcome these limitations, multilateral program data were gathered directly from the World Bank, the IMF and the African Development Bank program reports and databases. Bilateral and EU program data drawn from the OECD/DAC CRS have also been cross-checked for consistency with independent sources, such as cross-country evaluation reports on joint GBS financing, country assessment reports from various agencies, and recipients' government budget statements.[17]

The econometric baseline specification of the following econometric analysis controls for determinates of developing countries' revenue mobilization capacity, as discussed in the previous section and identified as statistically and economically significant in previous empirical research. Revenue mobilization efforts are proxied by central government revenue, excluding grants, as a share of GDP (*REV*). Explanatory variables comprise GBS as share in GDP (*GBS*), the share of agriculture in total value added (*AGRIC*), per capita income (*GNIPC*), the sum of imports and exports as share in GDP as a measure for trade openness (*TRADE*), and the stock of public and publically guaranteed debt as share in GDP (*PPGD*).[18] As oil production has gained importance in SSA, particularly in the Gulf of Guinea, a dummy variable (*OIL*) has been included to control for windfalls from royalties and other extraction related revenue in oil producing countries.[19]

The sample includes SSA LIC and LMICs that are eligible for funding under the World Bank's concessional lending arm (IDA) and hence qualify as potential recipients of joint GBS.[20] The empirical analysis comprises the period from 2000, when the first PRSP-based joint budget aid disbursals were made to SSA recipients, to 2008.[21]

6. Methodology and Presentation of Results

6.1 Methodology

In the first step, the baseline specification, as outlined above, is estimated using a one error component fixed effects model (FE). The estimation equation is in the form of

$$(5) \quad REV_{it} = \beta_0 + \beta_1 GBS_{it} + \beta_2 GNIPC_{it} + \beta_3 AGRIC_{it} + \beta_4 PPGD_{it} + \beta_5 TRADE_{it} + \beta_6 OIL_{it} + u_{it}$$

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[17] A complete list of sources used is provided in Appendix III.
[18] Tanzi (1992) and subsequent studies drew on external debt stock data to proxy PPGD, as this data was not available at that point in time. In the meantime PPGD data has been made available through the World Bank's Global Development Finance database, published online in September 2010 [accessed 12 June 2011].
[19] SSA sample countries with oil extracting industries comprise Angola, Cameroon, Congo, Gabon, Equatorial Guinea, and Nigeria. Since 2000 the Dem. Rep. of Congo, Mauritania, Sudan, and Chad have taken up oil production. Start of oil production in Ghana in 2011 is not covered by the sample.
[20] IDA borrowing countries excluded from the sample due to data constraints are Cape Verde, Lesotho, Sierra Leone and Somalia.
[21] For a list of sample countries, detailed description of data sources and respective summary statistics, including correlation coefficients of explanatory variables, see Appendix I and III.

with i and t indexing countries and time, respectively. The one-error component model is such that

$$(6) \qquad\qquad u_{it} = \mu_i + v_{it}.$$

Hence, the error term consists of the country specific time invariant effect μ_i and an individual time variant residual term v_{it} (cp. Baltagi, 2009).[22] To control for time specific effects and to avoid potential omitted variable biases caused by parsimonious specification, dummy variables have been included.

As error terms might be autocorrelated, it is advisable to test a dynamic model specification to control for robustness, with

$$(7) \qquad\qquad REV_{it} = \alpha REV_{it-1} + \beta' \mathbf{X}_{it} + u_{it},$$

where the error term is given by Equation (6), and $\mathbf{X}_{it}$ representing a vector of contemporaneous explanatory variables of Equation (5). As OLS produces biased and, hence, inconsistent estimators, the model specification is estimated using the Generalized Method of Moments (GMM) framework (Arellano and Bond, 1991; Blundell and Bond, 1998).

The differenced GMM in the form of

$$(8) \qquad\qquad \Delta REV_{it} = \alpha \Delta REV_{it-1} + \beta' \Delta \mathbf{X}_{it} + \Delta v_{it},$$

eliminates country specific effects in the error term, which are correlated with REV_{it} and subsequently with REV_{it-1}. Assuming that v_{it} are serially uncorrelated, values of REV lagged two periods qualify as an instrument for the first differenced Equation (7). This implies the moment condition

$$(9) \qquad\qquad \mathrm{E}\left(REV_{it-s} \Delta v_{it}\right) = 0 \quad \text{for } t = 3, 4,..., T, \text{ and } 2 \le s \le t-1.$$

As revenue shares in GDP are highly persistent (Leuthold, 1991) with α approaching one, lagged levels of REV can be expected to be weak instruments for the differenced equation, which, as shown by Blundell, Bond and Windmeijer (2000), can lead to finite sample biases. When augmenting the moment condition in Equation (9) by the level moment condition

$$(10) \qquad\qquad \mathrm{E}\left(\Delta REV_{i,t-1}\left(\mu_i + v_{it}\right)\right) = 0 \quad \text{for } t = 3, 4,..., T,$$

differenced lagged dependent variables can, as shown by Blundell and Bond (1998), be used as valid instruments in the level Equation (7). In this case the differenced GMM estimator is augmented by the system GMM estimator (Blundell and Bond, 1998), where Equation (7) and (8) are estimated simultaneously, drawing on moment conditions as expressed by Equation (9) and (10).

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[22] The Hausman specification test consistently rejects random effects in favor of the fixed effects model.

If the explanatory variable x_{it}, which is assumed to be correlated with the country specific effect μ_i, is endogenous in the sense that it is also correlated with contemporaneous or past shocks of the error term v_{it}, two period lags or deeper can be applied as instruments for first-differenced Equation (7), assuming that

(11)
$$E\left(x_{i,t-s}\Delta v_{it}\right)=0 \quad \text{for } t = 3, 4,..., T, \text{ and } 2 \le s \le t-1.$$

If, in addition to Eq. (10), it can be assumed that first-differenced explanatory variables are uncorrelated with the country specific time invariant effects, the following moment conditions are available:

(12)
$$E\left(\Delta x_{i,t-1}\left(\mu_i +v_{it}\right)\right)=0 \quad \text{for } t = 3, 4,..., T.$$

Consequently, lagged first-differences of endogenous explanatory variables are suitable instruments for level Equation (7).

For the specification outlined by Equation (5) and (7), such endogeneity problems could, as discussed by Gupta (2004) and Clist and Morrissey (2011), arise in two instances. First, joint GBS funding as share in GDP (*GBS*) could be endogenous if donors allocate GBS funds to those recipients with satisfactory PFM performance, which are therefore more likely to perform well in revenue mobilization. Such a selectivity bias can be caused by the significant fiduciary risks that are intrinsic to GBS financing, as donors' means to control and influence the use of funds are very limited. Second, Public and Publically Guaranteed Debt as share in GDP (*PPGD*) might be endogenous, as shortfalls in revenue mobilization can, as specified in Equation (1), translate into higher borrowing by the public sector and, thus, a higher debt level.

The system GMM estimator is obtained by imposing moment conditions for the dependent variable, given by Equations (9) and (10), and moment conditions for endogenous explanatories as given by Equations (11) and (12).[23]

6.2 Presentation and Discussion of Results

Estimation results are presented in Table 3. Columns (I) and (III) are for FE and system GMM outputs of the baseline specifications outlined in Equations (5) and (7). Columns (II) and (IV) report results for FE and system GMM estimations, where the explanatory GBS variable has been replaced by total ODA as share in GDP. The latter specification serves to control whether results of previous studies on recipient's revenue response to development assistance can be reproduced for the sample considered here (cp. Table 2).

Dynamic estimation results report a high persistence for revenue as share in GDP with the lagged dependent variable's coefficient close to 0.8. Accordingly, system GMM compared to

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[23]   For system GMM estimation the STATA® Xtabond2 algorithm devised by Roodman (2006) has been used.

differenced GMM has to be considered the preferred estimation method, as the latter, due to weak instruments, tends to produce inefficient results (Blundell, Bond and Windmeijer, 2000).

Table 3: Determinates of Revenue Efforts in SSA LIC and LMICs, 2000–2008

Variable	FE Model [1]		System GMM Model	
	(I)	(II)	(III)	(IV)
Lagged CG Revenue	n.a.	n.a.	0.760 ***	0.756 ***
			(8.89)	*(9.01)*
GNI per capita	0.005 **	0.005 **	0.002 ***	0.002 ***
	(2.56)	*(2.50)*	*(3.59)*	*(3.46)*
GBS Disbursal	0.319 *		0.141 *	
	(1.84)		*(1.79)*	
ODA Disbursal		0.014		0.012
		(0.85)		*(0.83)*
PPGD	0. 022	0.021	0.007	0.005
	(1.55)	*(1.48)*	*(2.33)*	*(1.34)*
Agric. Value Added	-0.127 *	-0.115	-0.035 **	-0.038 **
	(-1.73)	*(-1.55)*	*(-2.48)*	*(-2.13)*
Trade Openness	0.063 ***	0.055 ***	0.024 **	0.022 **
	(4.14)	*(2.80)*	*(2.44)*	*(2.27)*
Oil	2.456	2.584	2.148 **	2.134 **
	(1.35)	*(1.53)*	*(2.70)*	*(2.50)*
Constant	13.396 ***	13.490 ***	2.408 **	2.726 **
	(4.12)	*(3.94)*	*(2.06)*	*(2.19)*
Hansen Test (p-value) [a]	n.a.	n.a.	0.35	0.65
Test for AR(1) in first differences (p-value) [b]	n.a.	n.a.	0.03	0.03
Test for AR(2) in first differences P-value) [b]	n.a.	n.a.	0.48	0.50
N	315	315	315	315
No. of groups	37	37	37	37
Max. no. per group	9	9	9	9
Avg. no. per group	8.5	8.5	8.5	8.5

* p<0.1, ** p<0.05, *** p<0.01

[1] Robust standard errors (Huber/White robust variance estimates) are used. Time invariant fixed effects capturing country specific factors such as institutional quality, colonial ties, and resulting government structures are jointly significant, as are time-specific effects controlling for external shocks.

[a] H_0: instruments used are not correlated with the residuals. The null hypothesis cannot be rejected.

[b] H_0: the errors in the first-differenced equation exhibit no first- or second-order serial correlation.

In accordance with system GMM moment conditions (9) and (10), the first-differenced estimations REV_{it} is instrumented using REV_{it-2}, plus ΔREV_{it} for the level equation. All explanatory variables are treated as strictly exogenous. Specifications, where *GBS* or *ODA*

and *PPGD* are treated as endogenous in the sense specified by Equation (11) and (12), yield similar results, albeit with increased statistical significance of *GBS* and *PPGD,* while total aid-over-GDP (*ODA*) remains economically and statistically insignificant.[24] Introducing lagged differences for these variables leads, however, to an excessive number of instruments, which significantly exceeds the number of groups. As shown by Roodman (2008), such instrument proliferation is likely to produce biased, and hence, misleading test statistics.

By contrast, the system GMM baseline specification presented in Table 3, where *GBS*, *ODA* and *PPGD* are treated as exogenous, produces consistent results: The null-hypothesis of the Hansen test of over-identified restrictions, that instruments as a group are exogenous, cannot be rejected. In addition, the Arellano-Bond test for first and second order autocorrelation in first-differenced residuals suggests that augmented instruments can be considered uncorrelated with the error terms and thus do meet the moment conditions set out in the previous section: As the hypothesis of first order autocorrelation cannot be rejected while the hypothesis of second order autocorrelation can be reliably rejected, there are no warning signs of serial correlation detected in the level residuals.[25]

Specifications (5) and (7) are rather parsimonious. Yet, as outlined in Section 3, recent empirical research has not been able to detect additional robustly significant determinates for the revenue performance of developing countries. Meanwhile, the inclusion of other control variables, such as the share of industry or the share of services in total GDP, respectively, leads to a substantial increase in correlation among explanatories, producing multi-collinearity problems.

FE and system GMM results confirm the significance of the structural determinates of revenue performance *AGRIC, GNIPC* and *TRADE*, identified by previous empirical research (cp. Table 2). When comparing the FE results presented here with those of Gupta et al. (2004), Teera and Hudson (2004), and Gupta et al. (2007), signs of coefficients, except for *PPGD*, are shown to be identical, and magnitudes fall in a similar range. The inclusion of a dummy variable for oil production seems highly advisable, as petroleum extraction appears, unsurprisingly, to be associated with a quite significant increase in revenue as share in GDP.

PPGD is shown to have, in neither the static nor the dynamic specification, an economically strong or statistically significant effect on revenue mobilization. This suggests that the positive causal relation between the level of public debt and the level of domestic revenue detected in previous studies (cp. Tanzi, 1992; Teera and Hudson, 2004) has diminished, due to substantial debt cancellations under the Heavily Indebted Poor Country (HIPC) and the Multilateral Debt Relief Initiative (MDRI).

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[24] Results are available from the author upon request.
[25] If residuals are serially uncorrelated, first-differenced residuals are, due to the time invariant country fixed effect, expected to follow a first order moving average process implying first-order autocorrelation. Second or higher order autocorrelation would, instead, hint towards autocorrelation in level residuals.

As shown in Figure 1, *PPGD* ratios for HIPC eligible SSA countries, after unprecedentedly high levels in the 1980s and 1990s, declined strongly during the HIPC implementation period and sharply fell in 2006 and 2007, when multilateral debt was cancelled under the MDRI.[26] With public debt stocks in many SSA LICs cut to levels well below 50 percent of GDP, the desideratum for revenue fed interest and debt servicing has, evidently, declined accordingly.

Figure 1: Public and Publically Guaranteed Debt as Share in GDP*
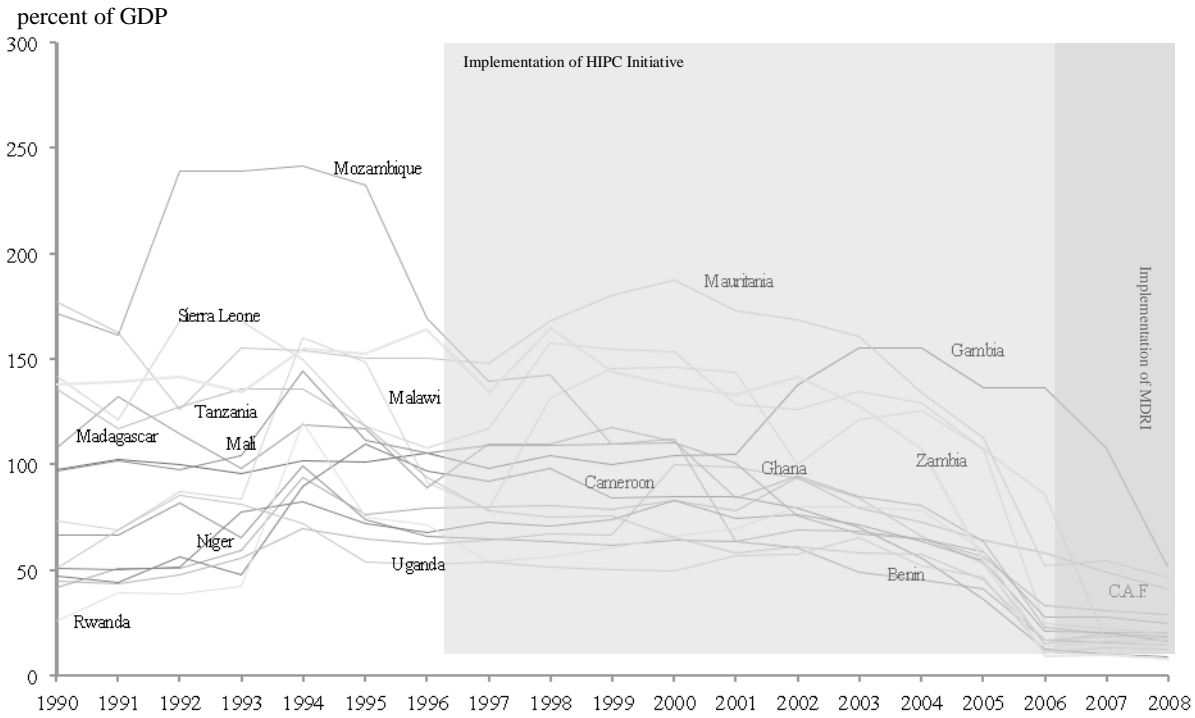
* Includes only countries that have reached HIPC completion point before 2009 and hence did also benefit from MDRI, which, for these countries, became effective in 2006 and 2007.
  Source: World Bank, Global Development Finance, 2011.

Most importantly, however, joint GBS modalities, for which the fiscal response can, as shown in Section 4, be appropriately modelled, appear to have a clear positive and statistically significant impact on revenue performance. This result holds true for both the FE and the system GMM specification, albeit with lower economic significance for the latter. Accordingly, joint GBS programs whose annual disbursements amount to around four percent of GDP (as is the case for Burkina Faso, Ghana, Malawi, Mozambique, Rwanda, and Tanzania) are associated with a 0.70 percent (system GMM coefficient) increase in revenue as

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[26] The HIPC initiative, launched in 1996 by the IMF and the World Bank and expanded in 1999 (HIPC II), comprises substantive relief of multilateral, bilateral and commercial debt for 40 LICs who at the time of appraisal were eligible for IDA and SAF/PRSC/ECF funding and faced unsustainable debt burdens measured by debt-to-export and the debt-to-government-revenues ratio. To reach completion (irrevocable cancellation of debt) countries must establish a good record of macroeconomic policy and reform with IMF and the World Bank, develop and implement a PRSP and allocate freed-up budgetary resources to poverty reducing expenditure (see: IMF, 2011; IDA and IMF, 2010). The MDRI was launched in 2006 and comprises the cancelation of all multilateral debt disbursed before 2004 by AfDF, IADB, IDA and the IMF. Countries eligibility depends on the successful completion of the HIPC initiative (see: IDA and IMF, 2010).

a share in GDP. This suggests that the identified adverse effects from fully fungible aid provision on recipient's revenue mobilization efforts can be counteracted by effective GBS program features – i.e., as outlined above, an institutionalized medium-to-long-term policy dialogue, fiscal policy conditionality, and PFM-related technical assistance components.

The positive effect of GBS becomes even more pronounced when the dynamic specification is estimated for the time period from 2005 to 2008, a period in which joint GBS programs became well established and policy dialogue matured (see Table 1). For this sub-period, a joint GBS program amounting to around four percent of GDP relates to a 1.3 percent increase in revenue as share in GDP.[27]

When controlling for the effect of total ODA on revenue mobilization efforts, instead of for the effect of joint GBS, the coefficient approaches zero and is shown to be statistically insignificant. This result is consistent with the underlying assumptions of Section 4: Due to its limited on-budget and fungibility characteristics – as shown in Appendix II, a substantial share of total aid is delivered tied or off-budget – ODA aggregates do not inform the recipient's budget constraint in the way stipulated by Equation (1) and hence do not induce the potential fiscal responses discussed above. These results are in line with those of Gupta et al. (2004), Teera and Hudson (2004), and Gupta (2007) who find the share of total ODA in GDP to be statistically and/or economically irrelevant in explaining recipients' revenue mobilization efforts.

7   Conclusion

Drawing on the standard fiscal-response-modelling approach to fungible on-budget aid, first applied by Heller (1975) and used in subsequent research, the present paper provides empirical evidence that new joint general budget support funding, although bearing unearned income characteristics and being fully subject to the recipient's allocational control, does not negatively affect recipients' revenue raising efforts. On the contrary, the results suggest that general budget support programs are associated with a measurable increase in domestic revenue mobilization. Such an effect cannot be detected when controlling for aggregate levels of aid, as significant shares in total ODA are not subject to the budgetary control of the recipient. In general, the findings presented above allow two principle policy conclusions to be drawn:

First, it appears that there is no basis for anxieties that joint GBS funding, due to its windfall characteristics, negatively impacts developing countries' domestic revenue generation efforts, thus increasing aid dependency. It seems that the risk of adverse fiscal policy incentives can be successfully mitigated by the following features of joint GBS operations in SSA countries:

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[27]   System GMM estimation results for the 2005 to 2008 sub-period are presented in Appendix IV. The FE estimations are not further considered, as system GMM, due to the dynamic properties of the dependent variable and the rather small number of years, is more appropriate.

i)   Program conditionality focuses primarily on public financial management in order to provide incentives for the measurable improvement of PFM and fiscal policy. According to the Budget Support Working Group of the Strategic Partnership with Africa (SPA BSWG), the most common areas of conditionality in SSA joint GBS programs are those related to PFM reform measures and macroeconomic performance (SPA BSWG, 2005, 2006).

ii)   GBS serves not only as a disbursement vehicle under the institutionalized policy dialogue between recipients and development partners, but it is also used as a platform for providing substantive technical assistance with a strong focus on institution and capacity building, particularly in the area of PFM.

iii) By establishing harmonized conditions for program assistance, donors' leverage and recipients' incentive to perform, i.e. to fulfill conditionality, may have significantly increased (Knoll, 2008), all the more so as GBS funding substantially increases available budgetary resources.

Second, while previous empirical studies have detected a statistically and economically weak overall effect of total aid, as well as a positive effect of loans and a negative effect of grants on recipients' revenue performance, respectively, this paper suggests that these findings are blurred as they rest on the unrealistic assumption of aid generally being provided on-budget and untied. OECD/DAC disbursement data by type of aid averaged for the SSA region for the years from 2000 to 2008 suggests that aggregate aid disbursal is an imprecise measure for on-budget aid provision as, at a conservative estimate, 30 to 50 percent of overall development assistance remains either tied or entirely off-budget and is therefore unlikely to directly impact the revenue mobilization behavior of the recipient government. This, in turn, suggests that when fiscal response to aid is being considered, the appropriate analytical approach and the resulting predominant policy question should not be whether development assistance is provided in the form of grants or loans, but rather whether it should come under an on-budget and untied modality of aid delivery.

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Appendix I: Country coverage and data sources

1. Data sources:

Data	Description (taken from source):	Source:
Domestic Revenue (% of GDP)	Revenue is cash receipts from taxes, social contributions, and other revenues such as fines, fees, rent, and income from property or sales. Grants are excluded. To obtain a balanced panel structure, missing values (approx. 70 percent) were filled drawing on IMF staff country reports (including article IV consultation reports, program reviews, statistical appendices and annexes, and recent economic developments reports) available from the Fund's website (see table below).	IMF Government Finance Statistics / Country Staff Reports
Exports of Goods and Services (% of GDP	Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments.	World Bank, WDI, national accounts data
Imports of Goods and Services (% of GDP	Imports of goods and services represent the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments.	World Bank, WDI, national accounts data
External debt stocks, public and publicly guaranteed (PPGD)	Public and publicly guaranteed debt comprises long-term external obligations of public debtors, including the national government, political subdivisions (or an agency of either), and autonomous public bodies, and external obligations of private debtors that are guaranteed for repayment by a public entity. Data are in current U.S. dollars.	World Bank, Global Development Finance
GDP in current US$	GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used.	World Bank, national accounts data
GNI per capita	Gross national income per capita is converted to U.S. dollars using the World Bank Atlas method, divided by the midyear population. GNI is the sum of value added by all resident producers plus any product taxes not included in the valuation of output plus net receipts of primary income from abroad. GNI, calculated in national currency, is usually converted to U.S. dollars at official exchange rates for comparisons across economies, although an alternative rate is used when the official exchange rate is judged to diverge by an exceptionally large margin from the rate actually applied in international transactions. To smooth fluctuations in prices and exchange rates, a special Atlas method of conversion is used by the World Bank.	World Bank national accounts data, and OECD National Accounts data
Agriculture value added (% of GDP)	Agriculture includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification, revision 3. As the share of agriculture value added in GDP shows to be rather persistent with a weak time trend (the within variance coefficient for the time period from 2000 to 2008 is 0.12), missing values (9 percent) have been filled applying linear interpolation.	World Bank, National accounts data
Industry value added (% of GDP)	Industry comprises value added in mining, manufacturing, construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification, revision 3. As the share of industry value added in GDP shows to be rather persistent with a weak time trend (the within variance coefficient for the time period from 2000 to 2008 is 0.17), missing values (9 percent) have been filled applying linear interpolation.	World Bank, National accounts data
ODA received (in % of GDP)	ODA consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the DAC, by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients. It includes loans with a grant element of at least 25 percent (calculated at a rate of discount of 10 percent). Data are in current U.S. dollars. World Bank GDP estimates are used as denominator.	OECD/DAC
GBS received (in % of GDP)	GBS consists of disbursements of loans on concessional terms and grants provided under CRS Purpose Code 51010 by official members of the DAC (incl. EU), under IDA PRSC and IMF PRGF arrangements, and ADF concessional lending operations if they are undertaken within the framework of a partially or fully harmonized and aligned policy dialogue (in particular with regard to conditionality and performance assessment). According to the World Bank (2010) a common PAF or PAF-like framework is either being developed or already in place in the following SSA countries: Benin, Burkina Faso, Cape Verde, Ghana, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Senegal, Tanzania, Uganda, and Zambia. GBS to Ethiopia has been suspended in 2005. World Bank GDP estimates are used for the denominator.	As listed below.

2. SSA countries included:

Angola, Benin, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Dem. Rep. of Congo, Comoros, Côte d'Ivoire, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sudan, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

3. Sources used to fill missing values in the IMF GFS data base (revenue as share in GDP):

No.	Country	IMF Source
1	Angola	IMF Country Staff Reports No. 03/291, 05/228, 07/354, 10/302, and 11/51.
2	Benin	IMF Country Staff Reports No. 02/158, and 10/195.
3	Burkina Faso	IMF Country Staff Reports No. 02/3, 05/354, and 10/361.
4	Burundi	IMF Country Staff Reports No. 02/242, 04/41, 05/322, 06/311, and 10/313.
5	Cameroon	IMF Country Staff Reports No. 02/258, 05/413, 07/285, 08/279, and 10/259.
6	Cape Verde	IMF Country Staff Reports No. 03/153, 04/304, 06/332, and 10/349.
7	Central African Republic	IMF Country Staff Reports No. 04/159, 08/16, and 10/332.
8	Chad	IMF Country Staff Reports No. 04/115, 05/74, 07/21, 07/28, 09/68, and 10/196.
9	Congo, Dem. Rep.	IMF Country Staff Reports No. 01/123, 07/328, 10/88, and 11/54.
10	Congo, Rep.	IMF Country Staff Reports No. 03/184, 09/74, and 11/67.
11	Comoros	IMF Country Staff Reports No. 04/83, 04/259, 06/383, 09/307, and 11/72.
12	Côte d'Ivoire	IMF Country Staff Reports No. 04/157, and 10/228.
13	Equatorial Guinea	IMF Country Staff Reports No. 03/386, 06/233, 06/237, 08/156, 09/102, and 10/103.
14	Eritrea	IMF Country Staff Reports No. 03/165, and 03/166.
15	Ethiopia	IMF Country Staff Reports No. 02/214, 06/122, 09/34, and 10/339.
16	Gabon	IMF Country Staff Reports No. 04/29, 05/3, 08/24, and 09/107.
17	Gambia	IMF Country Staff Reports No. 04/143, 06/8, 08/324, 10/61, and 11/22.
18	Ghana	IMF Country Staff Reports No. 03/133, 05/292, 09/256, and 10/178.
19	Guinea	IMF Country Staff Reports No. 01/31, 02/66, 03/251, 05/222, 08/20, and 08/275.
20	Guinea-Bissau	IMF Country Staff Reports No. 05/93, 07/370, 09/123, and 10/379.
21	Kenya	IMF Country Staff Report No. 11/48.
22	Liberia	IMF Country Staff Reports No. 02/148, 05/167, 07/356, 08/108/10/199, and 10/373.
23	Madagascar	IMF Country Staff Reports No. 01/219, 03/7, 09/227, and 09/327.
24	Malawi	IMF Country Staff Reports No. 02/182, 04/380, 06/445, 07/147, 08/26 and 10/87.
25	Mali	IMF Country Staff Report No. 11/37.
26	Mauritania	IMF Country Staff Reports No. 02/263, 03/314, 08/231, and 10/346.
27	Mozambique	IMF Country Staff Reports No. 04/50, 05/318, 06/254, and 08/220.
28	Niger	IMF Country Staff Reports No. 03/110, 05/79, 06/40, and 10/146.
29	Nigeria	IMF Country Staff Reports No. 04/242, 07/20, and 11/57.
30	Rwanda	IMF Country Staff Reports No. 03/192, 05/333, 07/233, and 11/19.
31	Senegal	IMF Country Staff Reports No. 06/127, 06/274, 07/358, 08/209, and 10/362.
32	Sudan	IMF Country Staff Reports No. 03/390, 06/182, 07/343, and 10/256.
33	Tanzania	IMF Country Staff Reports No. 03/1, 03/238, 04/285, 06/138, 08/178, and 10/351.
34	Togo	IMF Country Staff Reports No. 03/383 and 11/10.
35	Uganda	IMF Country Staff Reports No. 03/84 and 10/132.
36	Zambia	IMF Country Staff Reports No. 04/160 and 10/383.
37	Zimbabwe	IMF Country Staff Reports No. 02/126, 05/359, and 09/139.

4. Data sources for joint GBS disbursals to SSA recipients:

Institution	Principal Sources	Means of verification*)
AfDB (African Development Fund)	- AfDB (2008): *Statistical Compendium on Bank Group Operations*. Volume XXXI. Table 3.08 - AfDB (2009): *Statistical Compendium on Bank Group Operations*. Volume XXXII. Table 3.08	- OCED/DAC CRS - AfDB Country Programme Completion Reports - Gerster (2007, 2008, 2009, and 2010) - IDD (2006) - SPA-BSWG (2005, 2006, and 2007)
Bilaterals (incl. European Commission)	- OECD/DAC Creditor Reporting System, Purpose Code 51010.	- OECD/DAC CRS - Gerster (2007, 2008, 2009, and 2010) - IDD (2006) - SPA-BSWG (2005, 2006, and 2007)
IMF	- IMF online *Transactions with the Fund* database	- OECD/DAC CRS - IMF Country Reports - Gerster (2007, 2008, 2009, and 2010) - IDD (2006) - SPA-BSWG (2005, 2006, and 2007)
World Bank (International Development Association)	- World Bank (2010) *Poverty Reduction Support Credits: An Evaluation of World Bank Support*. Independent Evaluation Group. October. Appendix Table A1.3 Poverty Reduction Support Credits By Country and Date (FY01-08) - World Bank online *Projects and Operations* database.	- OECD/DAC CRS - Gerster (2007, 2008, 2009, and 2010) - IDA country program documents - IDD (2006) - SPA-BSWG (2005, 2006, and 2007)

*) *Gerster, IDD, and Budget Support Working Group of the Strategic Partnership with Africa (SPA-BSWG) sources only cover disbursement data for selected years and/or for a sub-sample of recipients.*

Appendix II: Lower bound estimate for tied and/or off-budget aid commitments to SSA

Using data from the OECD's Creditor Reporting System (CRS), a lower bound proxy can be calculated from several types of aid that are provided either entirely off-budget or subject to earmarking:

i) Off budget funding comprises stand-alone *Technical Co-operation* (TC), which is generally provided in kind by donor agencies for training, research, institutional capacity building, equipment, and administrative expenses (OECD/DAC, 2006; Adugna, 2009), and emergency assistance such as food aid, which is also directly managed by implementing agencies. Free-standing technical assistance refers to co-operation projects that are not embedded as components of other project or program activities. According to OECD/DAC (2006), the primary purpose of TC is to augment the level of knowledge, skills, technical know-how and productive aptitudes of people in aid recipient countries. Emergency and relief assistance is subsumed under CRS Purpose code 72010 (Material Relief and Assistance Services).

ii) The volume of aid provided under *Project Investments* (PI) can be used as a conservative, lower bound estimate for earmarked development assistance, as these funds are tied to specific sectors and expenditure items, i.e. investment. While PI funds clearly represent tied aid, they are also frequently kept off budget and are managed outside governments' consolidated accounts and PFM systems. Earmarked revenue is tied to specific expenditure programs and hence is infungible to the extent that it bypasses the consolidated account (Buchanan, 1963). In development cooperation practice there are, however, different approaches to PI financing: a) PI funds can be transferred to the recipient's treasury but kept and managed in special project accounts, using the governments or donors' procurement and auditing procedures, b) PI funds can be kept in commercial accounts outside the recipient's treasury and controlled either by the recipient government or donors, c) PI funds may be directly released by the donor agency to contracting partners upon request by the recipient government.

Lower bound estimates for committed off-budget and earmarked aid to SSA
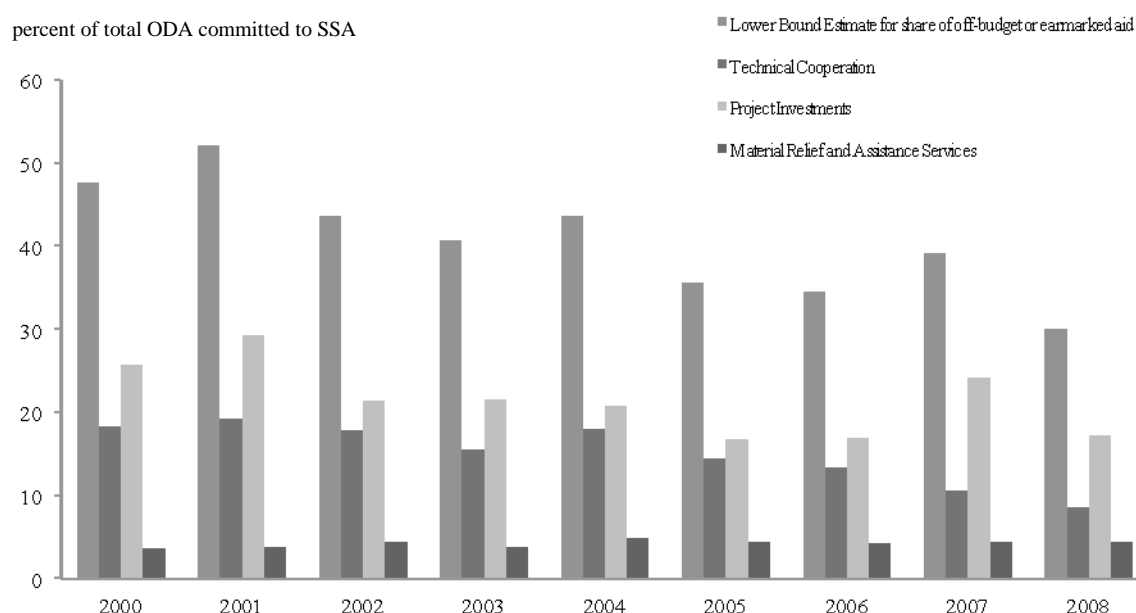
Source: OECD/DAC CRS (2011).

Appendix III: Summary statistics

Variable		Mean	Std. Dev.	Min.	Max.	Observations	
Domestic revenue	overall	19.135	8.722	3.734	51.700	N =	315
	between		8.192	9.424	43.800	n =	37
	within		3.519	8.552	32.978	T =	8.514
GNI per capita	overall	531.746	537.643	80.000	3340.000	N =	315
	between		559.467	108.889	2770.000	n =	37
	within		247.642	-414.921	2515.079	T =	8.514
GBS disbursal (in % of GDP)	overall	0.908	1.642	0.000	8.020	N =	315
	between		1.343	0.000	5.051	n =	37
	within		0.947	-3.235	6.007	T =	8.514
ODA received (in % of GDP)	overall	14.553	16.690	0.371	185.849	N =	315
	between		12.072	0.414	61.088	n =	37
	within		11.630	-36.982	139.313	T =	8.514
Agriculture value added (% of GDP)	overall	31.121	14.689	3.432	75.523	N =	315
	between		14.653	3.698	66.632	n =	37
	within		3.634	17.143	47.801	T =	8.514
Trade Openess	overall	71.472	35.790	19.350	219.179	N =	315
	between		32.120	34.178	179.729	n =	37
	within		15.043	14.461	186.181	T =	8.514

Source: Own calculations.

Correlation coefficients of explanatory variables

	GBS	ODA	AGRIC	GNIPC	TRADE	PPGD
GBS	1.000					
ODA	0.119	1.000				
AGRIC	0.055	0.345	1.000			
GNIPC	-0.134	-0.307	-0.621	1.000		
TRADE	-0.209	0.121	-0.432	0.390	1.000	
PPGD	-0.229	0.446	0.477	-0.373	0.050	1.000

Appendix IV: System GMM estimation output for the 2005–2008 sub-period

Variable	System GMM Model	
Lagged CG Revenue	0.424 **	0.477 **
	(2.30)	(2.65)
GNI per capita	0.004 ***	0.004 ***
	(3.12)	(2.91)
GBS Disbursal	0.345 *	
	(1.92)	
ODA Disbursal		0.032
		(1.28)
PPGD	0.013	0.006
	(1.46)	(0.98)
Agric. Value Added	-0.063	-0.079 **
	(-1.59)	(-2.07)
Trade Openness	0.0484 ***	0.032 *
	(2.44)	(1.88)
Oil	4.152 **	3.595 **
	(2.69)	(2.35)
Constant	5.380 *	6.333 **
	(1.96)	(2.54)
Hansen Test (p-value) [a]	0.21	0.28
Test for AR(1) in first differences (p-value) [b]	0.04	0.03
Test for AR(2) in first differences (P-value) [b]	0.35	0.36
N	135	135
No. of groups	36	36
Max. no. per group	4	4
Avg. no. per group	3.8	3.8

* *p<0.1, ** p<0.05, *** p<0.01*

[*] In the first-differenced equation REV_{it} is instrumented using REV_{it-2}; plus ΔREV_{it} for the level equation. Explanatory variables are treated as strictly exogenous.

[a] H_0: instruments used are not correlated with the residuals. The null hypothesis cannot be rejected.

[b] H_0: the errors in the first-differenced equation exhibit no first- or second-order serial correlation.

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