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Abstract

This paper empirically studies the impact of decentralization on foreign aid effectiveness. For this purpose, we examine a commonly used empirical growth model, considering aid modality as well as different measures of political and fiscal decentralization. Our panel estimations reveal that fiscal decentralization negatively impacts aid effectiveness, while measures of political decentralization have no significant effect or even a positive one. This result is robust for grants and overall ODA, while the growth impact of other aid types is not generally conditional on decentralization. We therefore conclude that donor countries should carefully consider how both anti-poverty instruments - foreign assistance and decentralization - work together.

JEL-Code: O10, O20, O40, H70.

Keywords: foreign aid, growth, decentralization.

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1 Introduction

Since the 1960s, more than 2 trillion US dollars have been spent on foreign aid by member countries of the OECD's Development Assistance Committee (DAC). In recent years, official development assistance (ODA) exceeded 100 billion US dollars per year. In 2010, the DAC members each intend to spend between 0.2% (USA) and 1.0% (Norway and Sweden) of their GNI as ODA. Despite this enormous effort, there are still very poor countries in the world that rely heavily on external resources. Some of the poorest countries, such as Timor-Leste or the Democratic Republic of Congo, show a share of development aid in gross national income above 50% [Worldbank (2009)].

Against this background, a controversial discussion is held about the effectiveness of foreign aid. The major questions are whether aid promotes economic growth, and under which circumstances aid is more or less effective. A large empirical literature has emerged in the past 35 years studying this research question. The main result of this literature is that aid has no significant direct impact on growth [see, e.g., Doucouliagos and Paldam (2009a)]. However, there seem to exist particular institutional features in developing countries that make aid more or less effective. One positive feature is a 'good policy' environment, which was initially studied by Burnside and Dollar (2000).¹ The conclusion from this body of literature is straightforward: give more aid to those countries that meet this criterion and help other countries to build performance-enhancing political conditions. However, the result has been criticized by Easterly (2003), Easterly et al. (2004) and others, so the literature has begun to focus on other determinants of aid effectiveness, such as geographic location [Dalgaard et al. (2004)], political stability [Islam (2005)] or rent-seeking activities [Economides et al. (2008)].

One issue that has been neglected so far is the design of the federal systems of aid-receiving countries. This is quite surprising, as national and supranational development agencies consider decentralization as a major part of their anti-poverty programs. For instance, between 1993 and 1997, around 12% of the World Bank projects completed involved decentralizing responsibilities to lower levels of government [Litvack et al. (1998)]. The reason for considering decentralization in anti-poverty programs is that it may have a direct positive effect on economic development and growth [Oates (1972)]. Decentralization brings the government closer to the people so that local officials are better informed about the local needs and are thus better able to provide the optimal mix of local policies. This increase in efficiency contributes to economic growth [Oates (1993)]. The decentralization theorem may also be important for aid effectiveness. If local bureaucrats have better information about local needs,

¹For comprehensive literature surveys, see McGillivray et al. (2006), Roodman (2007), Rajan and Subramanian (2008), Doucouliagos and Paldam (2009a), and Lessmann and Markwardt (2009).

they may also have an advantage in selecting the most effective development projects to be financed by foreign aid. According to Oates, foreign aid should therefore be more effective in decentralized countries. However, the efficiency-enhancing effect of decentralization may be undermined by factors such as coordination problems, excessive regulation, administrative costs, and corruption or cronyism. These problems are much more likely to occur in developing countries than in developed ones, so the direct growth impact of decentralization is debatable, as is the impact on aid effectiveness. Assume, for example, a poor country in which local governments are formed by local elite groups. Within such a framework, it is unlikely that aid is spent effectively at the local level, as the elite groups favor spending the money at the benefit of their members instead of spending the money on the most effective projects from a growth perspective [Bardhan (2002), Bardhan and Mookherjee (2006)]. In such a situation, decentralization would decrease aid effectiveness.

We further argue that the result regarding decentralization depends on the particular federal design of aid-receiving countries as well as the aid modality. If, for example, local bureaucrats are held accountable through local elections, the efficiency-enhancing effect of decentralization may outweigh the disadvantages mentioned. Simultaneously, rent-seeking activities are much more likely to occur if the development assistance comes in the form of grants or loans instead of technical assistance. If donor countries concede technical assistance at the local level, it is much more difficult for the elites to embezzle money as in the case of a general budget, as spending decisions are influenced and controlled by the donor. In this context, Doucouliagos and Paldam state that *"researchers should focus their attention away from aggregate measures of aid to more disaggregate ones."* [Doucouliagos and Paldam (2009b), p. 7].

In light of these multi-faceted arguments, the aim of our paper is to investigate the impact of different types of decentralization on the effectiveness of different aid modalities. To answer this research question, we estimate a commonly used growth model based on a panel data set of 72 developing countries. In doing so, we use various indicators for fiscal and political decentralization and distinguish between alternative types of foreign aid. Our main finding is that fiscal decentralization has a negative impact on aid effectiveness, while political decentralization has no significant effect or even a positive one. The negative impact of fiscal decentralization is robust for grants and overall development assistance, while the growth impact of loans and technical assistance does not depend on decentralization. Our results have important implications for the optimal mix of anti-poverty programs, especially for those which involve decentralization.

The paper is organized as follows. Section 2 reviews the theoretical literature and discusses the impact of decentralization on the effectiveness of foreign aid. Section

3 discusses the econometric specification and underlying data. The empirical results are discussed in section 4, and section 5 concludes.

2 The theory of decentralization and aid effectiveness

Decentralization is in vogue in developing countries, at least because donor countries and international development agencies consider decentralization as an important element in their anti-poverty programs. The main argument in favor of decentralization is based on the *decentralization theorem*: the transfer of powers to sub-national governments increases public-sector efficiency, thus promoting economic development [Oates (1972), Oates (1993)]. Decentralized authorities are much better informed regarding local needs and can provide the economically efficient quantity and quality of local public goods. Especially in the case of a federation with heterogeneous regions, decentralized officials are in a better position to meet local demands [Oates (1972)]. Another argument in favor of decentralization is the role of local governments in preserving markets [Weingast (1995)]. The idea is that the government acts as monopolist and has the power to exploit the private sector [Shleifer and Vishny (1993)]. In a decentralized setting, local governments compete on mobile factors. This fiscal and institutional competition limits the government's ability to extract rents, enhancing economic efficiency and thus economic growth.

The main question is how decentralization affects aid effectiveness. The efficiency argument above can also be used in this context. Local governments are better informed regarding local demands and are thus in a better position to allocate aid to the most useful projects compared to the central government. If foreign aid is aimed at overcoming the shortness of local public goods, such as infrastructure, schools, or health care, then decentralization should increase the efficiency of public services and aid effectiveness. The competition argument is also relevant in light of the limited amount of aid available in developing countries. Sub-national jurisdictions have an incentive to perform well in exchange for aid payments increasing aid effectiveness. From this point of view, decentralization should increase aid effectiveness.

However, several economic researchers deny the positive effects of decentralization for developing countries. Swaroopa et al. (2000) analyze the fungibility of aid in federal systems and find that aid merely substitutes for spending that the government would have undertaken anyway. Moreover, aid received by sub-national governments decreases central government transfers in a similar amount. From a political economy perspective, Prud'homme (1995) argues that in decentralized countries, there are more opportunities for corruption at the local level, as local politicians and bureaucrats are more likely to be subject to the pressing demands of local interest groups. In addi-

tion, local decision makers usually possess more discretionary powers than national officials, increasing the possible negative effects of decentralization. In the same vein, Tanzi (1996) argues that local officials live closer to the citizens, and this contiguity leads to a higher impact by local interest groups on local policy outcomes. Bardhan and Mookherjee provide a formal analytical framework to investigate the effects of decentralization on the provision of public service in developing countries, considering the capture of local governments [Bardhan and Mookherjee (2006)]. With local capture, defined by an elite group receiving a larger weight in the local government's welfare function, there is a tendency for the local government to provide excessive services to the local elite at the expense of the non-elite [see also Bardhan (2002)].² The DAC and the aid-receiving countries identify rent-seeking and corruption as the most important obstacles for economic growth and aid effectiveness [OECD (2008)]. These problems may also occur if local bureaucrats decide on the allocation of foreign aid to local development projects. Therefore, aid may be less effective in decentralized countries due to corruption and cronyism.

The quality of bureaucrats is also an important factor for the relationship between aid, growth, and decentralization. Prud'homme (1995) and Tanzi (1996) argue that central government bureaucracies are likely to attract more qualified people because they offer better career opportunities and higher salaries [Brueckner (2000)]. If qualified individuals are abundant, as in most industrial countries, sub-national governments may have staff that is as qualified as those in national governments. In developing countries, however, educational standards are low and qualified human capital is scarce. Therefore, under decentralization, sub-national government officials entrusted with aid disposition may be less qualified for this task than central bureaucrats, reducing the effectiveness of aid. The previous discussion shows that the hypothesis regarding the relationship between aid effectiveness and the federal government structure is well grounded in the theoretical literature.

An issue not yet discussed is aid modality. Not all arguments mentioned are relevant to each type of foreign assistance. Consider, for instance, grants vs. technical assistance. Unconditional grants add to the general governments' budget, and we can easily assume that they go to lower levels of government through the budgetary process in a manner similar to that used for other kinds of revenue. Following the decentralization theorem, the growth impact of unconditional grants should be higher in decentralized countries. However, if there are corrupt or badly educated bureaucrats at the local level, the positive effect of those payments is weakened. In the past, unconditional grants have been one of the most important types of aid because debt reliefs are

²An empirical study by Lessmann and Markwardt (2010) shows that decentralization has indeed a negative impact on corruption if the monitoring of bureaucrats does not work, which is the case in most aid-receiving countries.

nothing else than unconditional grants.

In contrast, technical assistance has different effects. Assume that a donor country sends development aid workers to construct schools or basic infrastructure in an aid-receiving country. In this case, decentralization should be advantageous, as local bureaucrats have better knowledge on the best location than central bureaucrats. However, most importantly, the potentially adverse effects of decentralization are less pronounced now. Most of the monetary value of technical assistance comes in the form of personnel costs and material costs accrued by the donor himself. Due to this fact, it is much more difficult to dissipate or to embezzle the money, as the monetary value cannot be transferred to personal bank accounts. Of course, local elite groups can still try to influence the donor to carry out construction at the location that is best suited for their members and in a way that involves politically connected local firms. But the problem should be less eminent as in the case of unconditional grants or loans. Our example shows, that aid modality matters in our context.

Another question to be discussed is the role of the particular federal design of aid-receiving countries in this context. The decentralization theorem requires that sub-national governments have a certain amount of authorities in decision making. This aspect is measured generally by the degree of fiscal decentralization, such as the share of sub-national government expenditures in total government expenditures. However, having a high degree of fiscal decentralization does not necessarily imply that sub-national jurisdictions have autonomy in decision-making. It is also possible that central governments devolve responsibilities and financial resources to local governments, but the fulfillment of tasks at the local level is defined by the central government's legislature. In this case, measures of fiscal decentralization are merely an insufficient indicator for the real autonomy of sub-national governments. It is therefore important to consider the degree of political decentralization, that is, whether local governments make spending decisions autonomously [Fan et al. (2009)]. Measures of political decentralization are also important in the context of local government accountability. In contrast to fiscal decentralization, which strengthens accountability only indirectly through inter-jurisdictional competition, political decentralization may directly impact local government accountability through local elections. If there are elections at the local level then local governments are directly accountable for their actions. In this case, the discussed negative effects of decentralization on aid effectiveness through, for example, corruption and cronyism at the local level are unlikely to occur. Our discussion shows that the theoretical literature implies that decentralization impacts aid effectiveness in one way or another. Also, both aid modality as well as the particular federal design of aid receiving countries matter in this context. The following section tests these relationships empirically.

3 Empirical analysis

Our theoretical discussion suggests that the degree of decentralization in aid-receiving countries may determine aid effectiveness. Following Oates' decentralization theorem, aid should be more effective in decentralized countries and therefore stimulate more growth. At the same time, decentralization may have reverse effects, such as through increased corruption and cronyism or through poor bureaucratic quality at the local government level. Moreover, the aid modality should also have an influence on the relationship between aid, decentralization, and growth. In light of these opposing arguments, this section studies the effectiveness of aid on economic growth by considering both the degree of decentralization and the aid modality in aid-receiving countries. Our empirical work attempts to answer two key questions: (1) Is the effect of aid on growth conditional on the federal structure of aid-receiving countries? (2) Do aid modality and the federal style in particular matter in this context?

3.1 Econometric specification

To answer our research questions, we estimate variants of a well-established time-effects panel data model. The basic growth regression for N countries and T time periods, where countries are indexed by i and time by t , has the following form:

$$\hat{y}_{i,t} = \alpha y_{i,t} + \sum_{j=1}^k \beta_j \text{control}_{j,i,t} + \gamma_1 \text{aid}_{i,t} + \gamma_2 \text{dec}_{i,t} + \gamma_3 (\text{aid}_{i,t} \cdot \text{dec}_{i,t}) + \mu_t + \epsilon_{i,t}. \quad (1)$$

Here, $\hat{y}_{i,t}$ is the real per capita GDP growth rate, $y_{i,t}$ is the logarithm of the initial real per capita GDP at the beginning of each period, $\text{control}_{j,i,t}$ are k exogenous control variables affecting growth, $\text{aid}_{i,t}$ represents aid receipts relative to GDP, $\text{dec}_{i,t}$ represents alternative measures of fiscal or political decentralization, μ_t are time effects, and $\epsilon_{i,t}$ is a random error term. Our growth equation is similar to specifications often used in the literature on aid effectiveness [see, e.g., Burnside and Dollar (2000), Hansen and Tarp (2000), Easterly (2003), Easterly et al. (2004), Burnside and Dollar (2004) and many others].

Our explanatory variables are taken from the aid and growth literature rather than from the cross-country growth literature in order to achieve a better comparability of our results to existing studies. It is unusual in the aid and growth literature to include standard growth determinants such as investment or savings, as this decreases the size of the sample to an extent, which would make a serious econometric analysis impossible. Keep in mind that we are dealing with developing countries, for which we have only very poor data in terms of quantity and quality.³

³See Rajan and Subramanian (2008) for a detailed discussion of this issue.

As a control variable, we allow growth during period t to depend on $y_{i,t}$, the logarithm of real per capita GDP at the beginning of the period, to capture convergence effects. Moreover, our growth equation also considers k exogenous control variables. These variables are necessary to capture institutional and political factors that might affect growth and help us to avoid an omitted variable bias. The first control is *ethnolinguistic fractionalization*, which the literature has shown to be correlated with poor growth performance. A second control is the number of *assassinations*, which captures civil unrest, as well as an interaction term between *ethnic fractionalization* and *assassinations* [see, e.g., Burnside and Dollar (2000)]. Third, we consider the *institutional quality* using a combined governance indicator. Fourth, we include *inflation* in our growth regressions, which serves as a proxy for macroeconomic stability. Finally, we include *regional dummies* for sub-Saharan countries and East Asia, as it is commonly known that Asian countries have performed well in the past, while sub-Saharan Africa continues to perform poorly. These differences are of a systematic nature, which we cannot explain by control variables other than regional dummies. Note that not all of our variables are time variant. Our measures of ethnic fractionalization, institutional quality and the regional dummies capture time-invariant heterogeneities, while the variation within these groups is explained by the initial GDP, assassinations, inflation, aid, the degree of decentralization and interaction terms. Due to these data restrictions, it is not possible to use a country fixed-effects model.

Our theoretical discussion in section 2 suggests that the effectiveness of foreign aid depends on decentralization; our growth equation thus includes not only measures of aid and decentralization but also their interactions.

We estimate variants of equation 1 using a panel across eight four-year periods from 1966 through 1997. Our data set consists of up to 72 developing countries. The bottleneck for our research is the availability of government finance data, which are required to calculate decentralization measures. This restricts our sample to a maximum of 72 countries, which decreases to a minimum of 38 countries, depending on the measurement concept of decentralization. Our set of countries is always congruent for smaller samples with the whole set of 72 countries, although we thereby lose several observations. However, always using the same sample of countries makes our subsamples comparable. The number of periods and countries in our sample implies a maximum of 480 observations. Because we have only a maximum of 381 observations in our regressions, our panel is unbalanced.

3.2 The data

The GDP and inflation data are from Worldbank (2009).⁴ Alesina et al. (2003) provide the data for ethnolinguistic fractionalization; the number of assassinations come from the Easterly et al. (2004) data set. Our measure of institutional quality is the mean value of the three governance indicators: ‘government effectiveness’, ‘control of corruption’, and ‘rule of law’, provided by Kaufman et al. (2009).

Our main variables of interest are the measures of development, foreign aid and decentralization. In line with the literature, we use the real GDP per capita growth rate as a measure of economic development. Our measures of foreign aid are extracted from the OECD DAC database. We thus refer to the official development assistance (ODA) rather than to measures of effective development assistance (EDA). The main difference between EDA and ODA is that EDA is the sum of grants and the grant equivalents of official loans, whereas ODA includes both the direct grants and concessional loans for which the grant component is above 25%. Which measure to use and whether it should be used in current or constant U.S. dollars is widely discussed in the literature [see, e.g., Chang et al. (1998)]. In the end, it should not make any difference in our context, as Dalgaard and Hansen (2001) have shown that the Pearson correlation between nominal ODA/GDP and nominal EDA/GDP is 0.98, and the correlation between nominal ODA/GDP and real EDA/GDP is 0.95 [see also Roodman (2007)]. We decided to use the nominal ODA/GDP ratio, allowing us to use one additional four-year period in our panel.

The theoretical discussion has shown that aid modality should matter in the aid-decentralization-growth nexus. We therefore distinguish between five different aid types (each as share of GDP): *grants*, *loans*, *technical assistance*, *humanitarian aid*, and *total net ODA*. A meaningful measure to compare the relevance of the different aid types is to relate them to the total net ODA. We thereby find that at the end of the 1990s, which is our last observation period, about 88% of the total net ODA was composed of grants, while 12% was spent as loans (net). About one third of the total net ODA is classified as technical assistance. This aid type includes development assistance in terms of building up local infrastructure, schools, or health care, and it incorporates the public advisory of the government in general, which also includes expenditures in donor countries. This is why technical assistance cannot be declared as the provision of local public goods, as one might first presume. Humanitarian (food) aid amounts to only 3% of the total net ODA. Aside from these different spending categories, we are also able to distinguish between *bilateral* and *multilateral aid*. This distinction might also be important in the aid-growth nexus, as single countries may

⁴See Table A.1 in the appendix for details. Table A.2 provides summary statistics of all considered variables.

be self-interested in their development policy [see Annen and Kosempel (2009)].

The last variables to be discussed in detail are our measures of decentralization. Several measurement concepts are used in the literature [see, e.g., Treisman (2002) and Rodden (2004)]. We have seen from our theoretical discussion that the particular federal design of aid-receiving countries should matter for aid effectiveness. In general, decentralization is viewed as the devolution of authority towards sub-national governments, with total government authority over society and economy perceived as fixed. Attempts to define and measure decentralization have focused on fiscal authority rather than political authority. In our context, we are interested in both issues. First, we need an indicator capturing whether aid is spent on the central or local level, and second, we need a measure capturing whether local governments are involved in the decision-making process, which assigns aid to particular projects.

The first issue can be approximated by using measures of fiscal decentralization, which can be calculated from the IMF Government Finance Statistics. The IMF-GFS includes budgetary data on more than 60 aid-receiving countries. Those measures include the degree of expenditure decentralization (*EXPDEC*) and the degree of revenue decentralization (*REVDEC*), which relate expenditures (revenues) of sub-national governments to total government expenditures (revenues). The problem with the IMF data is that it does not cover our whole observation period, which starts in 1966. The GFS data starts in the 1970s, and there are many missing values. We thus compute the average of decentralization measures between the years 1966 and 1997 and we thereby lose the time-series properties of the decentralization data, but we are able to substantially extend the number of observations in our estimations. Both measures are commonly used in the literature on decentralization and growth [see, e.g., Davoodi and Zou (1998), Zhang and Zou (1998), and Woller and Phillips (1998)]. However, these indicators do not necessarily reflect sub-national government autonomy in decision-making, as the central government may also determine spending at the local level through central government legislation. To capture these effects, a commonly used measure based on budgetary accounts is that of so-called vertical imbalances (*VERTIMB*). This measure relates central government transfers to sub-national government expenditures and is therefore a measure of the transfer dependency of sub-national governments. Note that a high value of this measure indicates little local autonomy, while all other decentralization measures we use are defined such that a high value represents a high degree of decentralization. A final measure of fiscal decentralization reflecting local government autonomy is the degree of tax decentralization, which relates the tax revenues of sub-national governments to total government revenues (*TAXDEC*). This is an alternative fiscal indicator of sub-national government autonomy. These measures are imperfect to the extent that

they do not reflect the political dimension of the underlying decision-making process. Assume, for example, that the central government determines the tax base and that sub-national governments determine the tax rate. In this case, the tax decentralization index might indicate a high degree of autonomy, although the central government has the major influence on sub-national revenues.

To capture the dimension of political decentralization, we refer to decentralization measures provided by Daniel Treisman [see Treisman (2002) and Fan et al. (2009)]. The data set is built on earlier work on the operationalization of federalism by Lijphart (1984), Elazar (1995), and others. A first measure of political decentralization is a dummy variable for those countries that have a federal constitution (*FEDERAL*).⁵ Only 8 out of the 72 countries in our sample are classified as federal, so the variance of this measure is not very high. Nevertheless, higher variance is provided by the measure for the number of vertical government tiers (*TIERS*), which ranges from 1 to 6 by definition. In our sample, the range is between 2 (Trinidad and Tobago) and 6 (Uganda and Senegal). This measure is important to test for double-marginalization effects in decentralized systems [Shleifer and Vishny (1993)]. Treisman's data also contain data on local elections, which are important for testing electoral accountability arguments. One measure is a dummy variable that takes the value one if there are elections at the lowest government level; a second dummy variable, takes the value one if there are elections at the second-lowest government level. We combine these measures to a new dummy variable indicating whether there are elections at any sub-national level of government (*BOTEL*). In the context of local government efficiency it is very important to also include a measure of local autonomy. For this purpose, Treisman creates several dummy variables based on the constitutions of countries. A sub-national legislature is said to have 'residual authority' if the constitution assigns the exclusive right to legislate on issues that are not specifically assigned to one level of government (*RESID*). Another measure captures the 'autonomy' of a sub-national legislature. It is said to exist if the constitution reserves exclusive decision-making power on task considered (*AUTON*).

In addition to the measures of fiscal and political decentralization, we use the share of sub-national government employment in total government employment as a further decentralization indicator (*SUBEMPL*) which cannot be assigned to either of the two categories. The necessary data on public sector employment are provided by the International Labor Organization's (ILO) LABORSTA database. This decentra-

⁵The following criteria have to be fulfilled to be counted as a federal country: a country has at least two levels of government that which share parts of the executive and legislative authority; the sub-national governments have representation in the federal parliament (second chamber); there is a duty to obtain consent on constitutional amendments; a constitutional jurisdiction solves disputes between organs of state; institutions foster collaboration [see Watts (2008)].

lization measure is essential for testing the hypothesis that decentralization increases corruption and cronyism, as local bureaucrats have more opportunities for face-to-face interactions with firms and individuals than their central counterparts [Bardhan (2002), Prud’homme (1995)]. From this perspective, countries with a greater share of public-sector employees located at sub-national levels may be more corrupt, and foreign aid may thus be less effective. At the same time, a greater share of sub-national government employment increases the probability of being detected in corrupt activities and embezzlements so that the sign of the net effect is *ex ante* ambiguous. We use all discussed decentralization measures to test the impact of decentralization on the aid-growth nexus.

3.3 Estimation results

In the following, we test our hypothesis that the relationship between foreign aid and growth is conditional on the degree of decentralization and that both aid modality as well as federal style matter in this context. The data on 7 aid types and 10 different decentralization measures imply 70 regressions without testing for endogeneity and robustness. This is definitely more information than we can present in detailed tables containing regression coefficients and diagnostics. We thus decided to discuss one result in detail, which helps the reader to understand the underlying methodology and potential threats. All other results are summarized in table 2 at the end of this section.

Table 1 presents the estimation results including the degree of expenditure decentralization (*EXPDEC*) and the total net ODA. In column (1), we show OLS estimations without interaction of aid and the decentralization measure; in column (2), we added the interaction term ($ODA \times EXPDEC$) to address whether the effectiveness of total net ODA depends on the degree of expenditure decentralization. In the following two columns, we repeat these estimations by applying the two-stage least-squares (TSLS) estimation procedure instrumented for foreign aid by its one-period (four-year averaged) lagged values, as donor countries might respond to negative growth shocks by providing more assistance. In this case, aid is influenced by growth, and we would have an endogeneity bias. Our instrumentation strategy follows Burnside and Dollar (2000), Dalggaard and Hansen (2001), and others.

The estimation without the interaction of aid and decentralization (column 1) shows that the degree of expenditure decentralization is positively associated with economic growth for our sample of developing countries. This result is in line with the theoretical predictions [see, e.g., Oates (1972)] and previous empirical findings [see, e.g., Iimi (2005)]. Noteworthy is that foreign aid has a significant negative impact on growth

in the OLS regressions, while the effect disappears when controlling for endogeneity. Again, this result is supported by the majority of literature, which finds no significant direct effect of aid on growth [see, e.g., Burnside and Dollar (2000), Easterly (2003), Easterly et al. (2004), and others].

Table 1: Estimation results: Expenditure decentralization and total net ODA

	Dependent variable: real GDP growth			
	OLS		TSLS	
	(1)	(2)	(3)	(4)
initial GDP	-0.018 (-1.07)	-0.012 (-0.71)	-0.005 (-0.29)	0.002 (0.10)
ethnic fractionalization	-0.022 (-0.66)	-0.010 (-0.32)	0.002 (0.06)	0.020 (0.59)
assassinations	-0.015 (-1.01)	-0.017 (-1.14)	-0.017 (-1.08)	-0.019 (-1.23)
ethnic \times assassinations	0.011 (0.30)	0.009 (0.27)	0.021 (0.57)	0.017 (0.49)
governance	0.046*** (3.03)	0.044*** (3.06)	0.048*** (2.95)	0.046*** (3.13)
log(1+inflation)	-0.073*** (-3.64)	-0.079*** (-3.91)	-0.079*** (-3.64)	-0.087*** (-4.08)
Sub-Saharan Africa	-0.013 (-0.56)	-0.011 (-0.46)	-0.041** (-2.14)	-0.037* (-1.93)
East-Asia	0.096*** (8.44)	0.097*** (8.67)	0.105*** (8.29)	0.103*** (8.17)
expenditure decentralization	0.001* (1.78)	0.002*** (3.03)	0.001** (2.25)	0.002*** (4.01)
total net ODA	-0.895*** (-2.87)	-0.374 (-0.94)	-0.168 (-0.43)	0.463 (1.00)
expenditure decentralization \times ODA		-0.034*** (-2.92)		-0.044*** (-3.75)
Period dummies	yes	yes	yes	yes
Obs.	246 (46)	246 (46)	214 (44)	214 (44)
adj.-R ²	0.31	0.32	0.33	0.35

All t -statistics reported below the coefficient estimates are based on robust standard errors [see Beck and Katz (1995)]. Significance levels are reported as follows: * for a 90%-significance-level, ** for 95% and *** for more than 99%.

As we are primarily interested in the impact of fiscal decentralization on aid effectiveness, we focus on the specification using the interaction term. Column (2) shows that the coefficient of our decentralization measure is significant and positive, the coefficient of aid is insignificant, and the coefficient of the interaction term is significant and negative. However, we are not particularly interested in the individual statistical significance of either of these terms. Instead, we want to know their joint significance or, more correctly, the marginal effect of aid on growth.⁶ The marginal effect can be

⁶For an excellent overview on do's and don'ts in interaction models, see Brambor et al. (2006).

calculated by the derivation of equation (1) with respect to the aid term:

$$\frac{\partial \hat{y}}{\partial aid} = \gamma_1 + \gamma_3 \cdot dec. \quad (2)$$

The interaction model implies that the effect of a change in aid on growth depends on the value of the conditioning variable decentralization. While it is possible to calculate the marginal effect using equation 2 and the results obtained in Table 1, it is not possible to do likewise for the standard errors. The standard error of interest is:

$$\hat{\sigma}_{\frac{\partial \hat{y}}{\partial aid}} = \sqrt{var(\gamma_1) + dec^2 \cdot var(\gamma_3) + 2 \cdot dec \cdot cov(\gamma_1, \gamma_3)}. \quad (3)$$

The standard errors are used to calculate the confidence bands around the marginal effects. To help the reader see more precisely how the marginal effect of aid on growth varies by the degree of expenditure decentralization in developing countries, this marginal effect is plotted in Figure 1. Note that we refer to results we receive using the TSLS estimation procedure (column (4)). The figure also includes confidence bands for the 1 and 10 percent significance levels.

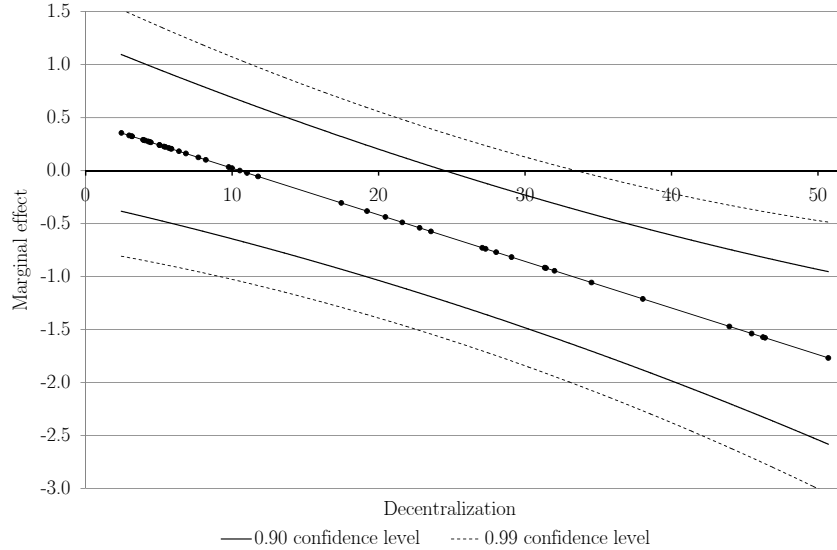


Figure 1: Marginal effect of total net ODA on growth: expenditure decentralization

The cutoff value of decentralization is the value of decentralization for which $\partial \hat{y} / \partial aid = 0$ is 10.52 in the fully specified regression. Our results imply that for about 50% of countries in our sample, the total net ODA is not significantly associated with economic growth. For the remaining countries, foreign aid has a negative impact on economic growth. The effect strengthens as the degree of expenditure decentralization increases. The marginal effect is statistically different from zero, with more than 90% (99%) confidence with a degree of expenditure decentralization exceeding roughly

27% (35%). In other words, the impact of aid on growth is significantly negative in one third of the countries in our sample. Our results imply that the total net ODA is less effective in countries with a high degree of expenditure decentralization. The efficiency-enhancing effect of fiscal decentralization is overcompensated by negative ones, as there are coordination problems, excessive regulation, administrative costs, and corruption.

Our findings are in line with Lessmann and Markwardt (2009), who show that the impact of decentralization on the aid-growth relationship is more important than the ‘good policy’ hypothesis proposed by Burnside and Dollar (2000). However, departing from this study, it is of interest to know whether this result varies with the measurement concept of decentralization and/or the aid modality. There are features of decentralized countries that strengthen accountability, such as local elections. Additionally, there are types of aid that are more difficult to embezzle or to waste than other ones. To study these issues, we apply similar estimations to our discussed example, using alternative decentralization measures while distinguishing between different aid types. Table 2 summarizes our results.

Table 2: Summary of estimation results

Aid type	Fiscal decentralization				Political decentralization					
	expdec	revdec	vertimb	taxdec	federal	tiers	botel	auton	resid	subempl
grants	-/-	-/-	(-/-)	-/-	(-/+)	(-/+)	(-/+)	(-/+)	(-/+)	(-/+)
loans	(-/-)	(-/-)	(+/-)	(-/+)	(-/+)	(-/+)	+/-	(-/+)	(-/+)	(+/-)
technical	(+/-)	(+/-)	(-/+)	(+/-)	(-/+)	(+/-)	(-/+)	(-/+)	(-/+)	-/+
human	(-/-)	(-/-)	(-/-)	(-/-)	-/-	(-/-)	(-/-)	(-/+)	(-/-)	(-/-)
ODA total	-/-	-/-	(-/-)	-/-	(-/+)	(-/+)	(-/+)	(-/+)	(-/+)	(-/+)
multilateral	-/-	(-/-)	-/+	(-/-)	(-/-)	(-/-)	-/+	(-/-)	(-/-)	(-/+)
bilateral	+/-	(+/-)	-/+	(+/-)	(-/-)	(-/-)	-/+	(-/-)	(-/+)	(-/+)

Note: The first symbol in each cell indicates the sign of the coefficient of the aid variable, the second symbol indicates the sign of the aid×decentralization interaction term. Results in parentheses are not significant at conventional confidence levels.

The table reads as follows: Each cell summarizes the result of one OLS regression combining one particular aid type (rows) with one decentralization measure (columns). The first symbol indicates the sign of the regression coefficient of the respective aid variable. The second symbol concerns the interaction term of aid and the decentralization measure. For example, “-/-” reads as the negative effect of aid on growth and negative sign of the interaction term with the decentralization measure. If the marginal effect of aid on growth is insignificant for all values of the underlying decentralization variable, the results are put in parentheses. This does not necessarily mean that the coefficient of the interaction term is insignificant. Nevertheless, this is not the relevant criterion for evaluating the impact of decentralization on aid ef-

fectiveness. A meaningful interpretation of results is only possible in cases where the marginal effects are significant.

Let us now turn to the alternative measures of fiscal and political decentralization. The degree of expenditure decentralization (*EXPDEC*) has significant effects in several cases. It worsens the effectiveness of grants as well as total net ODA, irrespective of whether aid is given on a multilateral or a bilateral basis. The effects of the degree of revenue decentralization (*REVDEC*) are quite similar. Vertical imbalances (*VERTIMB*) do not impact the relationship between a single aid type and growth, although the effect on multilateral and bilateral aid effectiveness is positive. The degree of tax decentralization (*TAXDEC*) incorporates sub-national government autonomy to some extent. The effect on the effectiveness of grants as well as on the total net ODA is again negatively impacted by this decentralization measure. The main result from this exercise is that fiscal decentralization has a negative impact on the effectiveness of total net ODA, which is based on the negative effect on the effectiveness of grants. Keep in mind that grants are the major source of all aid types. Moreover, we are not able to identify a significant effect of fiscal decentralization on the effectiveness of types of aid other than grants.

The estimation results using measures of political decentralization can be discussed very briefly, as we find no significant marginal effects of foreign aid except in one specification: the effectiveness of bilateral aid is increased by sub-national elections (*BOTEL*). The positive effect is in line with our expectations, as local elections strengthen government accountability. The effect is statistically significant when only bilateral aid is considered. However, if we ignore the conventional confidence levels for a moment, we find an interesting difference in the measures of fiscal decentralization in general: the sign of the interaction variable of measures of political decentralization and foreign aid is positive - although insignificant - in almost all cases. This indicates that political decentralization is, in contrast to fiscal decentralization, at least not harmful to the effectiveness of foreign aid.

The last column summarizes results using the sub-national share of public-sector employment (*SUBEMPL*) as a decentralization measure. This is the only decentralization measure, where one of the other aid types except for grants turns out to significantly impact growth depending on the degree of decentralization. The impact of technical assistance on economic growth increases with the sub-national employment share. We plotted the marginal effect of technical assistance on growth in figure 2. In countries with a low level of decentralization, the marginal impact of technical assistance on growth is significantly negative. With a degree of decentralization exceeding 50%, the negative impact of aid on growth disappears. Decentralization can thus also have a positive impact on aid effectiveness. The type of aid and the measure

of decentralization both matter in this context.

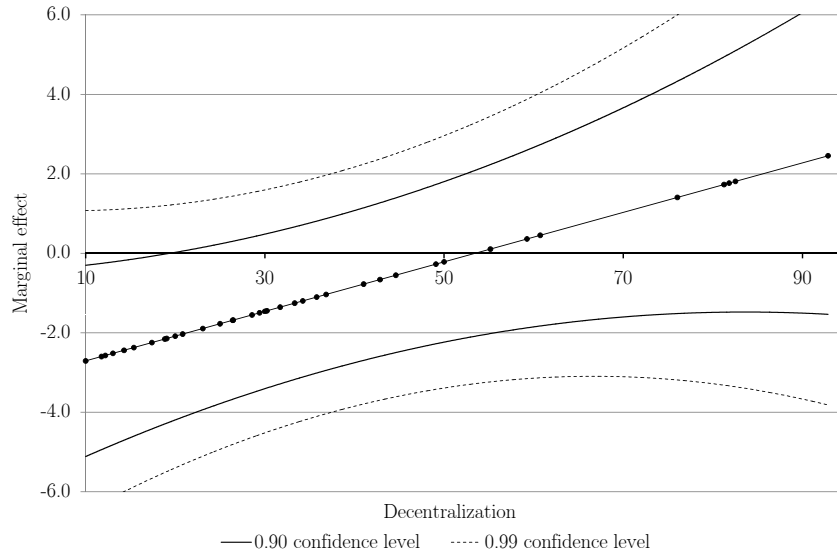


Figure 2: Marginal effect of technical aid on growth: public sector employment decentralization

Turning to the different types of aid, we cannot identify robust differences. The effectiveness of grants, being the most important modality of aid spending is impacted by measures of fiscal decentralization. Accordingly, the findings on the total net ODA look quite similar. The signs of the coefficients are also similar if we consider loans as the type of aid used. However, the effects are not statistically significant. Technical assistance is definitely less harmful for growth and may even be a positive influence. Humanitarian aid is always negatively correlated with economic growth, and the effect is worsened by decentralization. In this case, due to the apparent endogeneity problem, we do not want to stress these findings. Finally, we also cannot find meaningful differences between multilateral and bilateral aid.

4 Summary and conclusions

The growing literature on the effectiveness of foreign aid has thus far been unable to identify a robust direct relationship between aid and growth. Accordingly, researchers start to focus on the conditions determining the success of aid. In almost all existing studies, the federal structure as a determinant of aid effectiveness has been neglected. The aim of our paper was to close this gap in the literature and to investigate whether the growth impact of foreign aid depends on the federal structure of aid-receiving countries and/or the aid modality.

For this purpose, we estimated the impact of different aid types on growth by considering the interdependency between aid and various decentralization measures. Our estimations are based on a panel of 72 developing countries covering the period from 1966 to 1997. The results can be summarized as follows: Measures of fiscal decentralization negatively impact the effect of aid on growth, and the results are statistically significant for grants and total net ODA. In almost all regressions, measures of political decentralization have no significant impact on the aid-growth nexus. However, the signs of the (insignificant) coefficients suggest that the relationship may be the converse. In some cases, we identify a positive impact of decentralization on aid effectiveness, such as in the case of technical assistance and the sub-national share of public sector employment. We can thus conclude that the aid modalities and the particular federal design both matter in the aid-growth relationship.

Our study provides some important implications for the design of anti-poverty programs. Both national and international development organizations consider public-sector decentralization as part of their development strategy. This is in line with our finding that most measures of decentralization have a positive impact on growth in developing countries. However, at the same time, some institutional features of decentralization undermine the effectiveness of foreign aid. Therefore, the design of anti-poverty programs should carefully consider how both instruments – foreign aid and decentralization – work together. The decentralization of public-sector employment can be a promising strategy in this context.

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Table A.1: Data sources & definitions

Variable	Definition	Source
real per capita GDP growth	Growth rate of 4-year-averaged GDP per capita in 2000 \$ prices	WDI 2006
Log of initial GDP	Log of initial real GDP per capita in 2000 \$ prices at the start of each period	WDI 2006
ethnic fractionalization	Ethnolinguistic fractionalization is computed as one minus Herfindahl index of ethnolinguistic group shares, and reflects the probability that two randomly selected individuals from a population belonged to different groups.	Alesina et al. (2003)
assassinations	Assassinations: number of assassinations per million population, see Banks (2002) for details.	Easterly et al. (2004)
institutional quality	Mean of three governance indicators (1996): ‘government effectiveness’, ‘control of corruption’, and ‘rule of law’	Kaufman et al. (2009)
Log of (1+inflation)	Log of one plus the period averaged annual inflation rate (Laspéyres)	WDI 2006
expenditure decentralization (<i>EXPDEC</i>)	The degree of expenditure decentralization relates the sum of sub-national (state & local) government expenditures to total government expenditures.	IMF Government Finance Statistics
revenue decentralization (<i>REVDEC</i>)	The degree of revenue decentralization relates the sum of sub-national (state & local) government revenues to total government revenues.	IMF Government Finance Statistics
vertical imbalances (<i>VERTIMB</i>)	Grant-share of sub-national government expenditures	IMF Government Finance Statistics
tax decentralization (<i>TAXDEC</i>)	Share of sub-national government tax revenues in total government revenues	IMF Government Finance Statistics
federal (<i>FEDERAL</i>)	Dummy for countries with a federal constitution	Treisman (2002) and Elazar (1995)
vertical tiers (<i>TIERS</i>)	Number of vertical government tiers	Treisman (2002) and Fan et al. (2009)
local elections (<i>BOTEL</i>)	Dummy variable, which is one if a country has elections at the lowest or second lowest tier of government.	Treisman (2002) and Fan et al. (2009)
local autonomy (<i>AUTON</i>)	Local jurisdictions have a certain amount of ‘autonomy’ regarding a given question, if the constitution reserves exclusive decision-making power on that question.	Treisman (2002) and Fan et al. (2009)
residual authority (<i>RESID</i>)	A sub-national legislature is said to have ‘residual authority’, if the constitution assigns the exclusive right to legislate on issues that are not specifically assigned to one level of government.	Treisman (2002) and Fan et al. (2009)
employment decentralization (<i>SUBEMPL</i>)	Share of sub-national government employment in total government employment	ILO LABORSTA

Table A.2: Summary statistics

	Observations	Mean	Std. Dev.	Maximum	Minimum
real per capita GDP growth	669	0.068	0.142	0.773	-0.526
Log of initial GDP	789	3760.655	3584.693	27761.900	418.556
ethnic fractionalization	864	0.494	0.251	0.930	0.002
assassinations	530	0.268	0.799	9.750	0.000
institutional quality	864	2.189	0.624	4.596	1.154
inflation	649	42.945	210.550	3357.528	-3.242
EXPDEC	552	17.259	14.511	50.707	2.439
REVDEC	552	13.917	13.272	51.436	1.176
VERTIMB	456	35.303	27.157	98.122	0.139
TAXDEC	492	7.520	9.409	47.187	0.028
FEDERAL	864	0.111	0.314	1.000	0.000
TIERS	864	3.833	1.065	6.000	1.000
BOTEL	564	0.670	0.465	1.000	0.000
AUTON	852	0.113	0.316	1.000	0.000
RESID	852	0.099	0.298	1.000	0.000
SUBEMPL	504	36.939	21.597	92.857	10.000
grants	584	0.030	0.038	0.270	0.000
loans	584	0.003	0.010	0.093	-0.094
technical	584	0.011	0.013	0.077	0.000
human	455	0.003	0.006	0.070	-0.001
total net ODA	739	0.053	0.065	0.417	-0.006
multilateral	341	0.660	0.991	8.379	-0.064
bilateral	347	1.470	1.837	11.909	0.000

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