

Lessmann, Christian; Markwardt, Gunther

Working Paper

Fiscal federalism and foreign transfers: does inter-jurisdictional competition increase foreign aid effectiveness?

Dresden Discussion Paper Series in Economics, No. 10/10

Provided in Cooperation with:

Technische Universität Dresden, Faculty of Business and Economics

Suggested Citation: Lessmann, Christian; Markwardt, Gunther (2010) : Fiscal federalism and foreign transfers: does inter-jurisdictional competition increase foreign aid effectiveness?, Dresden Discussion Paper Series in Economics, No. 10/10, Technische Universität Dresden, Fakultät Wirtschaftswissenschaften, Dresden

This Version is available at:

<https://hdl.handle.net/10419/48163>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

*Dresden Discussion Paper Series
in Economics*



**Fiscal federalism and foreign transfers: Does
inter-jurisdictional competition increase foreign
aid effectiveness?**

CHRISTIAN LESSMANN

GUNTHER MARKWARDT

Dresden Discussion Paper in Economics No. 10/10

Address of the author(s):

Christian Lessmann
Technische Universität Dresden
Department of Business and Economics Chair for Public Economics
1062 Dresden
Germany

e-mail : christian.lessmann@tu-dresden.de

Gunther Markwardt
Technische Universität Dresden, CESifo
Department of Business and Economics Chair for Public Economics
1062 Dresden
Germany

e-mail : gunther.markwardt@tu-dresden.de

Editors:

Faculty of Business and Economics, Department of Economics

Internet:

An electronic version of the paper may be downloaded from the homepage:
<http://rcswww.urz.tu-dresden.de/wpeconomics/index.htm>

English papers are also available from the SSRN website:
<http://www.ssrn.com>

Working paper coordinator:

Andreas Buehn
e-mail: wpeconomics@mailbox.tu-dresden.de

Fiscal federalism and foreign transfers: Does inter-jurisdictional competition increase foreign aid effectiveness?*

Christian Lessmann
Technische Universität Dresden
1062 Dresden
christian.lessmann@tu-dresden.de

Gunther Markwardt
Technische Universität Dresden, CESifo
1062 Dresden
gunther.markwardt@tu-dresden.de

Abstract:

This paper empirically studies the impact of decentralization and inter-jurisdictional competition on foreign aid effectiveness. For this purpose we examine a commonly used empirical growth model, considering different measures of fiscal decentralization. Our panel estimations reveal that expenditure decentralization and inter-jurisdictional competition – reflected by the degree of tax revenue decentralization – negatively impact aid effectiveness. We therefore conclude that donor countries should carefully consider how both anti-poverty instruments – foreign assistance and decentralization – work together.

JEL-Classification: O1; O2; O4; H7

Keywords: Foreign Aid, Growth, Interjurisdictional Competition

* We would like to thank Clemens Fuest, George R. Zodrow, and the participants of the CESifo Venice Summer Institute 2010 on “Taxation in Developing Countries” for helpful comments.

1 Introduction

In September 2000 the 55th general assembly of the United Nations (UN) has passed the Millennium Development Goals (MDGs). The MDGs include 8 goals with 21 targets and a series of measurable indicators for each target. The targets aim, among other things, to overcome extreme poverty, to reduce child mortality rates, to fight disease epidemics, and to develop a global partnership for development. All 192 UN member states have agreed to achieve the development goals up to the year 2015. While the goals are based on consensus, there are disagreements among the member countries regarding adequate instruments for the achievement. In particular, there is a controversy about the extent of financial development assistance. In 2010, the OECD's Development Assistance Committee (DAC) members spent between 0.2% (USA) and 1.0% (Norway and Sweden) of their GNI as Official Development Assistance (ODA). However, the majority of the donor countries will miss the MDGs-target of 0.7%. Although the aid payment commitments will not be fulfilled in 2010, the ODA payments currently amount to well more than 100 billion U.S. dollars per year. Since 1960 DAC member countries have spent almost 2.5 trillion U.S. dollar ODA.

In light of these enormous efforts made by the donor countries, a political and academic discussion is held about the effectiveness of foreign aid. A first question is whether aid promotes economic growth and thus helps to overcome poverty, famine, and child mortality. If so, a second question is under which circumstances aid is more or less effective. A large empirical literature has emerged studying these research questions. The main result of this literature is that aid has no significant direct impact on growth [see, e.g., Doucouliagos and Paldam (2009)]. However, there seem to exist particular institutional features in developing countries that influence foreign aid effectiveness. One such feature is a 'good policy' environment, which was initially studied by Burnside and Dollar (2000).¹ The political implication from this body of literature is straightforward: give more aid to those countries that meet this 'good policy' 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) and Angeles and Neanidis (2009)].

Beside foreign transfers, decentralization is an important part of national and supranational anti-poverty programs. A recent World Bank study of 20 representative developing countries reveals that between 1990 and 2006 the World Bank spent 22 billion U.S. dollars, of which 7.4 billion U.S. dollars were aimed at decentralization-related activities. Within this period, almost 47% of the 203 Bank commitments contained decentralization components [Gopal (2008)]. The reason for considering decentralization in anti-poverty programs is that it may have a direct positive effect on economic growth [Oates (1972)]. Decentralization brings government closer to the people so that local officials are better informed about local needs and are thus better able to provide the optimal mix of local policies. Additionally, decentralization strengthens the competition between the different regions within a country. The tax competition tames the leviathan and may attract foreign aid, and foreign indirect investments [Edwards and Keen (1996)]. These increases 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, they

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

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 [Tanzi (1996)]. The tax competition induced by decentralization can result in an under provision of public goods [Zodrow and Mietzkowski (1986)]. Many of 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 situations, decentralization would decrease aid effectiveness.

The aim of our paper is to investigate the impact of decentralization and inter-jurisdictional competition on the effectiveness of foreign aid. To answer this research question, we estimate a commonly used growth model based on a panel data set of 41 developing countries. In doing so, we use measures of expenditure decentralization and tax decentralization. Our main finding is that decentralization has a clear negative impact on aid effectiveness. The 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 and competition on the effectiveness of foreign aid. In section 3 we conduct our empirical analysis, and section 4 concludes.

2 Some theoretical considerations

The most important 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 about local needs and can provide the economically efficient quantity and quality of local public goods. In particular, in the case of a federation with heterogeneous regions, decentralized officials are in a better position to meet local demands [Oates (1972)]. A second argument in favor of decentralization is the role of local governments in preserving markets. A government strong enough to protect property rights and to enforce contracts is also able to exploit the private sector [Brennan and Buchanan (1980) and Weingast (1995)]. Fiscal and institutional competition induced by decentralization limits the government's ability to extract private rents, enhancing economic efficiency and thus economic growth [Shleifer and Vishny (1993)].

How does decentralization affect aid effectiveness? The efficiency argument can also be used in this context. Decentralized authorities are featured with better information, and are thus in a better position to allocate aid to the most useful projects compared to the central government. If foreign transfers are designated 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

thus the aid effectiveness. The competition argument is also applicable for foreign aid. Since aid is only limited available in developing countries the decentralized governments have an incentive to perform well in exchange for aid payments and thus increasing aid effectiveness. From this point of view, decentralization and inter-jurisdictional competition should increase aid effectiveness.

At the same time, decentralization weakens the coordination of politics between regions of a country which is necessary to realize major interregional projects. Without sufficient central coordination it is more likely that developing countries do not take advantage of positive interregional externalities, thus hampering foreign aid effectiveness. Moreover, several economic researchers deny the positive effects of decentralization for developing countries. 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 addition, 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 the contiguity between local officials and citizens leads to a higher impact by local interest groups on local policy outcomes. Bardhan and Mookherjee (2006) 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. 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 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.

Also inter-jurisdictional competition may impact foreign aid effectiveness. Assume that sub-national governments compete on a limited amount of aid provided by donor countries, than it is straightforward to expect competition to have a positive impact on aid effectiveness. Competition forces sub-national governments to perform well and hampers corruption and embezzlement of foreign transfers [Arikan (2004)]. But competition also involves the danger of a race to the bottom in local taxes resulting in a suboptimal amount of revenues raised [Zodrow and Mietzkowski (1986)]. The insufficient government revenues limit investments in state capacity, which are necessary to establish an institutional framework in which foreign aid works [Besley and Persson (2010), Burnside and Dollar (2004)]. Another argument against inter-jurisdictional competition are competition-induced rent-seeking activities. Foreign aid can be seen as an exogenous rent income sub-national governments compete on. Since a part of the rent is wasted in rent-seeking activities, which increase with the number of competitors, the amount of aid available for investments decreases [Tullock (1975)]. The discussion shows that our hypothesis of decentralization and inter-jurisdictional competition to determine foreign aid effectiveness is well grounded in the theoretical literature.

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.

3 Empirical analysis

The theoretical discussion of section 2 suggests that decentralization and inter-jurisdictional competition in aid-receiving countries determine foreign aid effectiveness. This section empirically studies the relationship between aid and growth by considering the degree of expenditure as well as the degree of tax revenue decentralization. The structure of this section is the following: After introducing the econometric model and the underlying data, we first test whether the ‘good policy’ hypothesis applies for our data set. Using these results as a benchmark, we estimate our model considering the interdependency between aid and decentralization. Finally, we test whether aid is allocated effectively in terms of our results.

3.1 Econometric specification

We parse our research questions by estimating variants of a fixed time effects panel data model. Our 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 real per capita GDP growth rate, $y_{i,t}$ is the logarithm of initial real per capita GDP, $\text{control}_{j,i,t}$ are k exogenous control variables affecting growth, $\text{aid}_{i,t}$ is aid receipts relative to GDP, $\text{dec}_{i,t}$ is the degree of fiscal or political decentralization, μ_t are time effects, and $\epsilon_{i,t}$ is a random error term.

The growth equation (1) is similar to specifications often used in the literature on foreign aid effectiveness. Note that our explanatory variables are taken from the aid and growth literature, rather than the cross-country growth literature, for 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, since data on these factors is very scarce decreasing 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 suboptimal data in terms of quantity and quality.³

As is standard in this literature, we capture convergence effects by allowing growth during period t to depend on $y_{i,t}$, the logarithm of real per capita GDP at the beginning of the period. Our growth equation also considers k exogenous control variables, which we assume to be independent from aid and growth. These variables are necessary to capture institutional and political factors that might affect growth, and they also help us to avoid an omitted variable bias on our coefficients. One of these controls is ethnolinguistic fractionalization, which the literature has shown to be correlated with poor growth performance. Another control is the number of assassinations, which captures civil unrest, as well as an interaction term between ethnic fractionalization and assassinations. We also control for the institutional quality. Moreover, we consider inflation in our growth regressions, which serves as a proxy for macroeconomic stability. Our measures of ethnic fractionalization and institutional quality are time-invariant. Together with regional dummies for Sub-Saharan countries

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

and East Asia, these controls capture time-invariant heterogeneity. In section 2, we argued that the effectiveness of foreign aid depends on decentralization, so our growth equation includes not only measures of aid and decentralization, but also their interactions.

After investigating the role of decentralization in the relationship between foreign aid and growth, we are interested to know if foreign aid is allocated correctly with respect to our findings. To examine the past allocation of aid, we estimate a time effects panel data model:

$$aid_{i,t} = +\alpha y_{i,t} + \sum_{j=1}^m \beta_j control_{j,i,t} + \delta dec_{i,t} + \mu_t + \epsilon_{i,t}, \quad (2)$$

where $control_{j,i,t}$ are m exogenous control variables that might affect aid receipts. We control for the initial GDP at the beginning of each period, the population size, infant mortality, country size in square kilometers, regional and colonial dummies, the distance from the equator, and the share of population speaking a major European language.

The equations are estimated using a panel across eight four-year periods from 1966 through 1997. Our data set consists of 41 developing countries. The bottleneck for our research is the availability of government finance data, which is required to calculate decentralization measures. Our measures of fiscal decentralization are derived from the IMF GFS Manual 1986, which provides data until 1999. Before we test the impact of decentralization on aid effectiveness, we first test the ‘good policy’ hypothesis for our sample. The number of periods and countries in our sample implies 287 observations. With a maximum of 223 observations in our regressions we have an unbalanced panel.

3.2 The data

The sources of the main variables in our regressions are the following: the GDP and aid data are from Worldbank (2006), the number of assassinations comes from the Easterly et al. (2004) data set, Alesina et al. (2003) provide the data for ethnolinguistic fractionalization, and institutional quality is measured by the mean of three governance indicators provided by Kaufman et al. (2009) – ‘government effectiveness’, ‘control of corruption’, and ‘rule of law’. See Table A.1 in the appendix for sources and definitions of all considered variables including determinants of aid flows and instrumental variables. Descriptive statistics are provided in Table A.2, and Table A.3 lists all considered countries.

Our main variables of interest are our measures of development, foreign aid, and decentralization. In line with the literature, we use the real GDP per capita growth rate as measure of economic development. As measures for foreign assistance, two variables have often been used: official development assistance (ODA) and effective development assistance (EDA), each as share of GDP. 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 since 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, providing us with one additional four-year period in our panel.

The last variables to be discussed in detail are our decentralization indices. Several measurement concepts are used in the literature [see e.g. Treisman (2002) and Rodden (2004)]. Decentralization is often 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. In our context, we are particularly interested in whether aid is spent on the central or local level. We approximate this issue by using the degree of expenditure decentralization which relates expenditures of sub-national governments (state + local) to total government expenditures. The IMF Government Finance Statistics provides the underlying data. A major shortcoming of this measurement concept is that we do not know whether donors channel aid directly to central or sub-national governments of recipient countries. However, there is some evidence that this does not make any difference. Swaroopa et al. (2000) have studied 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 so that it seems to be straightforward to assume that aid goes through the budgetary process as all other sources of revenue do. In this case, our decentralization measure should be a good proxy, although we have to admit that we cannot consider details of the budgetary processes in developing countries.

The standard literature on inter-jurisdictional competition suggests a positive impact of tax competition on foreign aid effectiveness. Measuring tax competition is, however, a difficult task in particular in developing countries. The major problem is, that there is no cross-national data available on the distribution of tax authorities among central and local governments. To our knowledge the only helpful data source is again the IMF Government Finance Statistics which includes data on tax revenues of the different levels of government. In order to approximate the degree of tax competition we relate the sum of sub-national government tax revenues to total government tax revenues. However, also this measure has a major drawback since it does not cover cross-country differences in central government's impact on local revenues. Our measure may indicate a high degree of tax revenue decentralization although sub-national governments have only little competencies in determining tax rates or tax basis since this decision is left to central government authorities.⁴ But the problem may be less relevant, as it appears at a first glance, since tax competition does not work just through different tax rates and tax bases, but also through tax enforcement. Even if the central government determines both parameters, sub-national jurisdictions still have the possibility to compete with each other through restrictions in tax collection. In the end, we have to admit that these data problems cannot be solved convincingly so that we have to keep it in mind when we interpret the regression results. The correlation between the degree of expenditure decentralization and the degree of tax revenue decentralization is 0.79 based on our sample of countries. Note that we use a time-invariant long period average of both fiscal indicators, since we would lose almost half of our observations if we use the original frequency of the data. However, the major findings of our study also hold for time-varying decentralization measures.

⁴Note that the OECD (1999) has developed an internationally comparable framework to assess and analyze the degree of control that sub-central governments have over their revenues. Unfortunately, this data is available for OECD member countries only.

3.3 The ‘good policy’ hypothesis

Since our data set strongly differs from those of other authors, we first investigate whether the ‘good policy’ hypothesis also holds for our sample. The ‘good policy’ index $policy_{i,t}$ is constructed from an OLS growth regression with no aid terms [see Burnside and Dollar (2000) or Easterly et al. (2004) for details]:

$$\hat{y}_{i,t} = \alpha y_{i,t} + \sum_{j=1}^k \beta_j control_{j,i,t} + \lambda_1 budget_{i,t} + \lambda_2(1 + inf_{i,t}) + \lambda_3 open_{i,t} + \mu_t + \epsilon_{i,t}, \quad (3)$$

where $budget_{i,t}$ is the budget surplus, $inf_{i,t}$ is the inflation rate, and $open_{i,t}$ reflects economic openness measured by the Sachs Warner index [Sachs and Warner (1995)]. Table A.4 in the appendix provides the estimation results. The policy index is formed by using the regression coefficients:

$$policy = 0.210 - 0.008 \cdot budget - 0.042 \cdot \log(1 + inf) + 0.016 \cdot open. \quad (4)$$

In this way we let the growth regression determine the relative importance of the different policies in our index. The advantage of this procedure is that we capture those macroeconomic country characteristics in just one variable, which we can later use to analyze aid effectiveness.⁵

The policy index is then used in a growth regression to investigate whether aid’s impact on growth depends on those ‘good policies’ ($policy_{i,t}$). The basic estimation equation looks similar to equation (1) discussed earlier:

$$\hat{y}_{i,t} = \alpha y_{i,t} + \sum_{j=1}^k \beta_j control_{j,i,t} + \rho_1 aid_{i,t} + \rho_2 policy_{i,t} + \rho_3 (aid_{i,t} \cdot policy_{i,t}) + \mu_t + \epsilon_{i,t}. \quad (5)$$

In addition to the control variables, our regressions include foreign aid ($aid_{i,t}$), the policy index ($policy_{i,t}$), and the interaction of aid and the policy index ($aid_{i,t} \cdot policy_{i,t}$). Since we use an interaction term of two continuous variables, the coefficients of our variables have to be interpreted with caution. Without interaction of variables, each coefficient reflects the marginal impact of the corresponding independent variable on the dependent variable. With the interaction of variables, the coefficient ρ_1 (ρ_2) only captures the effect of aid (policy) on growth when policy (aid) is zero. Now the marginal impact of aid on growth depends on the sign and magnitude of the coefficient of aid (ρ_1), and the sign and magnitude of the coefficient of our interaction variable (ρ_3).

Due to possible heteroscedasticity and serial correlation, we calculate panel corrected standard errors (PCSE) following Beck and Katz (1995). Table 1 presents OLS estimation results for alternative specifications of growth equation (5).

⁵Note that this approach is problematic, since we are dealing with a generated regressor [Wooldridge (2002)]. We dismiss these problems for a better comparability of our results with previous studies.

Table 1: The ‘good policy’ hypothesis reconsidered

	Dependent variable: real GDP growth		
	(1)	(2)	(3)
initial GDP	-0.020 (-1.09)	-0.023 (-1.25)	-0.023 (-1.22)
ethnic fractionalization	-0.018 (-0.48)	-0.019 (-0.46)	-0.019 (-0.47)
assassinations	-0.015 (-0.86)	-0.012 (-0.68)	-0.011 (-0.60)
ethnic x assassinations	0.017 (0.40)	0.010 (0.24)	0.008 (0.17)
institutional quality	0.055*** (3.40)	0.051*** (3.06)	0.051*** (3.07)
log(1+inflation)	-0.069*** (-3.40)		
Sub-Saharan Africa	-0.021 (-0.80)	-0.032 (-1.04)	-0.033 (-1.09)
East-Asia	0.097*** (6.55)	0.090*** (5.44)	0.089*** (5.49)
ODA	-0.860** (-2.59)	-0.778** (-2.13)	1.835 (0.44)
policy		1.467*** (3.52)	1.634*** (3.20)
ODA x policy			-12.092 (-0.62)
period dummies	yes	yes	yes
obs	223 (41)	197 (38)	197 (38)
adj.-R ²	0.32	0.31	0.32

t-statistics are reported in parentheses. Significance levels are reported as follows: * for a 90%-significance-level, ** for 95% and *** for more than 99%.

In column (1) we present estimation results without considering the policy index; in column (2) we added the policy index; and in column (3) we added an interaction term of aid and policy to investigate whether foreign aid effectiveness is affected by policies.

We find a significant negative relationship between aid and growth for our sample of countries. Note, however, that this results is probably biased by endogeneity issues we address below. The aim of these regressions is just to get a first idea on how aid may influence growth. Our policy index has a positive and significant unconditional effect on growth which is not surprising due to the construction of the index. The ‘good policy’ hypothesis would now require a positive coefficient of the interaction term and a significant marginal effect of aid on growth. Both is not the case in our estimations (see the following section on how to calculate marginal effects with continuous interaction variables). We therefore conclude that the ‘good policy’ hypothesis does not hold for our sample of countries, which is in line with Dalgaard and Hansen (2001), Easterly (2003), Easterly et al. (2004) among others. However, our results should not be understood as criticism against the ‘good policy’ hypothesis in general, which may be valid for other countries than ours or other definitions of good policies. Nevertheless, our findings point at other factors than ‘good policy’ which may impact foreign aid effectiveness.

Let us briefly turn to the interpretation of our control variables. The initial per capita GDP as control for the convergence hypothesis is negative but insignificant at conventional confidence levels, consistent with most studies on aid and growth [see, e.g., Burnside and Dollar (2000), Dalgaard and Hansen (2001), and Easterly et al. (2004)]. Also the controls for ethnolinguistic fractionalization and assassinations show no significant coefficients. Our variable for institutional quality has a significant positive impact on growth; the Sub-Saharan Africa dummy is insignificant,

while the East Asia dummy is positive and highly significant. Due to space limitations, we do not report the period dummies. Our regressions explain about 32% of the variance of the dependent variable, which is consistent with the results of existing studies.

3.4 Main estimation results

Following we test our hypothesis that the relationship between foreign aid and growth is conditional on the degree of fiscal decentralization and tax competition. First, we focus on the degree of expenditure decentralization and explain some important details of the regressions and interpretation of the results. Second, we focus on the degree of tax competition as reflected by the degree tax revenue decentralization.

3.4.1 Expenditure decentralization

In Table 2 we present the estimation results of equation (1) considering the degree of expenditure decentralization. In column (1) we show OLS estimations without interaction of aid and the decentralization measure; in column (2) we added the interaction term (expenditure decentralization \times ODA) 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 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 instruments for foreign aid are the share of population speaking a major European language, the distance from the equator, and the one-period (four-year averaged) lagged value.⁶

Our idea of the instruments is based on Hall and Jones (1999) who measure the extent to which an economy is influenced by Western Europe using geographical and linguistic characteristics. We assume that Western European influence is an important determinant of (today's) aid flows. These are characteristics of geography such as distance from the equator and the extent to which the primary languages of Western Europe – English, French, German, Portuguese, and Spanish – are spoken as first languages today. The extent to which the languages of Western Europe are spoken as a mother tongue today is correlated with the extent of Western European influence is perfectly natural. Using the distance from the equator as instrument for aid requires more discussion. As discussed by Hall and Jones we expect Western influence, and therefore aid transfers, to increase with the distance from the equator. This is plausible since Western Europeans were more likely to migrate to and settle regions of the world that were sparsely populated at the start of the 15th century. Moreover, Western Europeans were more likely to settle down in regions which have a similar climate to their home countries pointing again at regions far from the equator. In addition to these two variables we follow Burnside and Dollar (2000) and Clemens et al. (2004) by adding the lagged value of aid to the list of instruments since we need an aid proxy with sufficient variation over time, too.⁷

⁶See Lessmann and Markwardt (2009) for a detailed discussion of the validity of the instruments and a comparison with recent studies as e.g. Rajan and Subramanian (2008) and Angeles and Neanidis (2009).

⁷In section 3.5 we provide results of regressions which are widely similar to our first stage estimations of the TSLS procedure showing the our instruments for aid work quite well. See Lessmann and Markwardt (2009) for more details on the instrumenting strategy.

The estimations without considering the interaction of aid and decentralization (column 1) show 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)]. Importantly, foreign aid has a significant negative impact on growth in the OLS regressions, while the effect disappears considering 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 2: Estimation results: fiscal decentralization and foreign aid effectiveness

	Dependent variable: real GDP growth			
	(1)	(2)	(3)	(4)
	OLS		TOLS	
initial GDP	-0.017 (0.02)	-0.010 (-0.54)	-0.014 (-0.73)	-0.005 (-0.23)
ethnic fractionalization	-0.014 (0.04)	0.001 (0.02)	-0.011 (-0.28)	0.012 (0.33)
assassinations	-0.016 (0.02)	-0.017 (-1.07)	-0.013 (-0.76)	-0.013 (-0.79)
ethnic × assassinations	0.015 (0.04)	0.011 (0.29)	0.007 (0.20)	-0.001 (-0.02)
institutional quality	0.056*** (0.02)	0.053*** (3.40)	0.048*** (4.18)	0.045*** (4.08)
log(1+inflation)	-0.075*** (0.02)	-0.082*** (-4.22)	-0.060*** (-3.88)	-0.070*** (-4.57)
Sub-Saharan Africa	-0.020 (0.03)	-0.017 (-0.65)	-0.058*** (-3.21)	-0.053*** (-3.04)
East-Asia	0.094*** (0.02)	0.093*** (6.34)	0.100*** (6.50)	0.097*** (6.41)
expenditure decentralization	0.001* (0.00)	0.002*** (2.93)	0.001** (2.10)	0.003*** (3.69)
ODA	-0.816** (0.33)	-0.251 (-0.63)	-0.314 (-0.88)	0.331 (0.75)
expenditure decentralization × ODA		-0.036*** (-2.91)		-0.044*** (-3.47)
Period dummies	yes	yes	yes	yes
Obs.	223 (41)	223 (41)	191 (37)	191 (37)
adj.-R ²	0.33	0.34	0.38	0.40

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 positive, the coefficient of aid is insignificant, and the coefficient of the interaction term is significant negative and negative. However, we are not particularly interested in the individual statistical significance of any of these terms. Instead, we want to know about their joint significance or, more correctly, the marginal effect of aid on growth.⁸ The marginal effect can be calculated by derivation of equation (1) with respect to the aid term:

$$\frac{\partial \hat{y}}{\partial aid} = \gamma_1 + \gamma_3 \cdot dec. \quad (6)$$

The interaction model asserts 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

⁸For an excellent overview on does and don’ts in interaction models see Brambor et al. (2006).

using equation (6) and the results obtained in Table 2, it is not possible to do likewise for the standard errors. The standard error of interest is:

$$\hat{\sigma}_{\frac{\partial \hat{y}}{\partial aid}} = \sqrt{var(\gamma_1) + dec^2 \cdot var(\gamma_3) + 2 \cdot dec \cdot cov(\gamma_1 \gamma_3)}. \quad (7)$$

The standard errors are used to calculate the confidence bands around the marginal effects. To help the reader to 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 using the TSLS estimation procedure (column (4)). The figure also includes confidence bands for the 10 percent significance level.

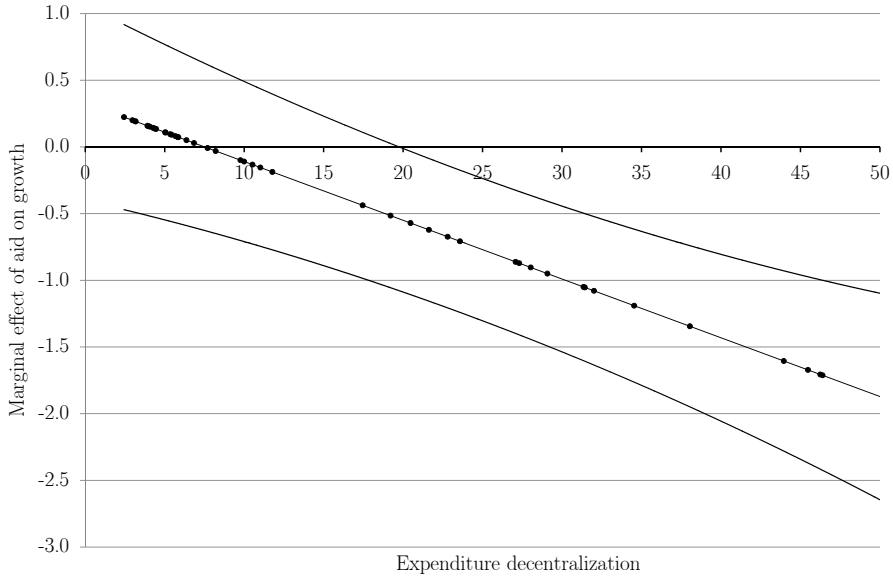


Figure 1: Marginal effect of total net ODA on growth: expenditure decentralization

The cutoff value of decentralization – the value of decentralization for which $\partial \hat{y} / \partial aid = 0$ – is 7.52 in the fully specified regression. Our results imply that for about 40% of countries in our sample, total net ODA is positively associated with economic growth, although this effect is not significant on conventional confidence levels. For the remaining countries, foreign aid has a negative impact on economic growth. The effect is stronger the higher the degree of expenditure decentralization. The marginal effect is statistically different from zero, with more than 90% confidence with a degree of expenditure decentralization exceeding roughly 20%. In other words, the impact of aid on growth is significantly negative in one half of the countries in our sample. The regressions imply that total net ODA is less effective in countries with a high degree of expenditure decentralization. A possible explanation for this finding may be that the efficiency enhancing effect of fiscal decentralization is overcompensated by negative ones as there are coordination problems, excessive regulation, administrative costs, and corruption.

3.4.2 Tax revenue decentralization

The finding on the effects of expenditure decentralization on foreign aid effectiveness is in line with Lessmann and Markwardt (2009). Departing from this study, we now want to analyze a central argument in favor of decentralization which is the effect of tax competition. From a theoretical point of view, inter-jurisdictional competition restricts governments ability to extract private rents and should therefore positively effect foreign aid effectiveness [Brennan and Buchanan (1980) and Weingast (1995)]. To test this hypothesis we estimate a variant of equation (1) considering the degree of tax revenue decentralization as conditioning variable. Since data on sub-national government tax revenues is only available for a fewer number of countries, our sample is restricted to a maximum of 41 countries. Note that we use a consistent sample to the regressions above. The results are presented in Table 3.

Table 3: Estimation results: tax competition and foreign aid effectiveness

	Dependent variable: real GDP growth			
	OLS		TSLS	
	(1)	(2)	(3)	(4)
initial GDP	-0.019 (-1.09)	-0.016 (-0.87)	-0.018 (-0.90)	-0.010 (-0.52)
ethnic fractionalization	-0.019 (-0.50)	-0.008 (-0.22)	-0.018 (-0.49)	0.002 (0.06)
assassinations	-0.016 (-0.94)	-0.020 (-1.16)	-0.014 (-0.79)	-0.019 (-1.07)
ethnic × assassinations	0.019 (0.46)	0.024 (0.60)	0.013 (0.35)	0.020 (0.54)
institutional quality	0.055*** (3.41)	0.058*** (3.72)	0.047*** (4.04)	0.053*** (4.74)
log(1+inflation)	-0.071*** (-3.57)	-0.078*** (-3.86)	-0.056*** (-3.68)	-0.068*** (-4.19)
Sub-Saharan Africa	-0.023 (-0.81)	-0.015 (-0.53)	-0.062*** (-3.40)	-0.050** (-2.54)
East-Asia	0.097*** (6.84)	0.100*** (7.36)	0.105*** (7.39)	0.109*** (7.86)
tax decentralization	0.001 (0.71)	0.002* (1.86)	0.001* (1.86)	0.004*** (3.29)
ODA	-0.855** (-2.57)	-0.622* (-1.68)	-0.376 (-1.09)	-0.019 (-0.05)
tax decentralization × ODA		-0.035* (-1.79)		-0.051*** (-2.79)
Period dummies	yes	yes	yes	yes
Obs.	223 (41)	223 (41)	191 (37)	191 (37)
adj.-R ²	0.32	0.32	0.37	0.38

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%.

The most important finding in this setting is that we are not able to identify any positive effects of foreign aid depending on the degree of tax competition. The results presented in column (4) show a positive and significant coefficient of the tax decentralization measure, a negative coefficient of aid and a negative and significant coefficient of the interaction term. The marginal effect of foreign aid on growth – calculated based on the instrumental variable regression – is illustrated in Figure 2. As can be seen from the figure the effect of foreign aid on growth is negative and significant with a degree of tax decentralization exceeding 10%, which is true for roughly 30% of the countries in our sample. Our estimations imply, that inter-jurisdictional competition approximated by the degree of tax competition has no positive effect on foreign aid effectiveness, quite the contrary. This points

at negative effects of inter-jurisdictional competition – as e.g. through a diminishing tax basis or competition-induced rent-seeking activities – overcompensating the efficiency enhancing effects.

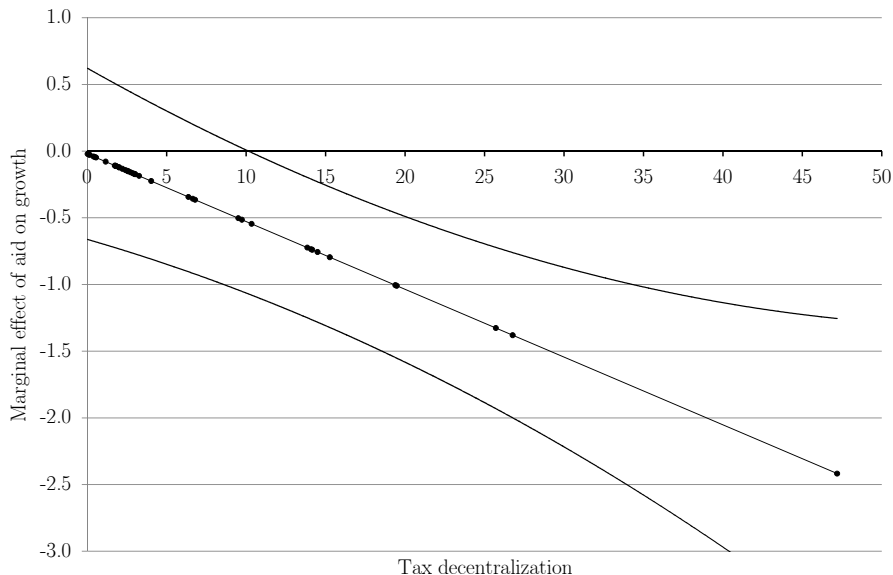


Figure 2: Marginal effect of total net ODA on growth: tax decentralization

3.5 Aid allocation

The estimations of our empirical growth model show that aid is less effective – or even harmful – in decentralized countries. In light of this finding, it is interesting to study whether aid is allocated effectively. For this purpose, we investigate the determinants of the amount of aid received by developing countries by estimating equation (2).

Our set of control variables is inspired by Burnside and Dollar (2000). We include the initial GDP per capita in the regressions since we expect richer countries to receive less foreign aid. Moreover, we consider the logarithm of the population size and the logarithm of the country size in square kilometers as determinants of aid flows to consider the so called ‘small country bias’. Since aid might also react to the distress of the poorest people in developing countries, we also consider infant mortality as a determinant. Furthermore, we add a Sub-Saharan dummy, a dummy for Central America, and a dummy for those countries that are former French colonies, in order to capture donors’ strategic interests. By adding the share of the population speaking a major European language and the distance from the equator we also consider proximity to western European countries. The most important variables are the policy index and the decentralization measures. The results are presented in Table 4.

Table 4: Aid allocation

	Dependent variable: Aid/GDP ratio	
	(1)	(2)
initial GDP	-0.058*** (-7.03)	-0.058*** (-6.63)
population size	-0.022*** (-9.86)	-0.022*** (-9.90)
area	0.005** (2.55)	0.005** (2.36)
infant mortality	0.001 (0.54)	0.001 (0.47)
Sub-Saharan Africa	-0.005 (-0.41)	-0.004 (-0.31)
Central America	-0.022** (-2.44)	-0.021** (-2.30)
Franc Zone	0.018 (1.17)	0.004 (0.18)
European language	0.015* (1.91)	0.013 (1.31)
Distance from equator	0.069*** (2.70)	0.065** (2.25)
expenditure decentralization	0.001 (-0.82)	
tax decentralization		0.001 (0.39)
period dummies	yes	yes
obs.	174 (37)	174 (37)
adj.-R ²	0.54	0.54

t-statistics are reported in parenthesis. Significance levels are reported as follows: * for a 90%-significance-level, ** for 95% and *** for more than 99%.

The regressions show that the amount of aid received by a particular country negatively depends on initial wealth. As expected, we find richer countries to receive a lower amount of aid. Moreover, we find evidence of the ‘small country bias’, since the population size is a negative determinant of aid flows. In contrast, larger countries in terms of area receive more aid. The distress of the poorest people reflected by infant mortality has no significant effect on aid. This is in line with the findings of Boone (1996). We also find Central American countries to receive less aid. Our variables capturing Western European influence positively affect aid flows in line with our expectations. One result should be stressed: the measures of decentralization have no significant impact on aid flows. In light of this, the allocation of aid seems to be compatible with our finding of a negative impact of decentralization on foreign aid effectiveness. However, the estimations are based on a data set ending at the end of the 1990s. Since then, decentralization may very well have been a criterium of aid allocation decisions as the examples in the introduction suggest. A strategy where decentralized countries receive more aid would be not effective in light of our analysis.

4 Summary and conclusions

A growing literature on the effectiveness of foreign aid has not been able to identify a robust direct relationship between aid and growth up to this point. Accordingly, researchers start to focus on the conditions determining the success of aid. The federal structure of aid-receiving countries as determinant of aid effectiveness has surprisingly been neglected so far, although donor countries consider decentralization as an important part of their development strategy. The aim of this paper was to close this gap in the literature and to investigate whether the growth impact of foreign aid

depends on the degree of fiscal decentralization and tax competition.

For this purpose, we estimated the impact of aid on growth considering the interdependency between aid and measures of fiscal decentralization. Our estimations are based on a panel of 41 developing countries covering the period from 1966 to 1997. The results can be summarized as follows: the degree of expenditure decentralization has a negative impact on foreign aid effectiveness. Aid may contribute to economic growth in centralized countries, while it significantly harms growth in decentralized ones. Inter-jurisdictional competition as reflected by the degree of tax revenue decentralization has a negative impact on foreign aid effectiveness in general. However, our estimations also reveal that both kinds of fiscal decentralization have a positive impact on growth in developing countries.

Nevertheless, some additional remarks are necessary. The bottleneck for our research is the poor availability of decentralization data which limits the number of countries in our data set. In particular it is difficult to use time-varying decentralization measures in the given frequency, since this would cost many observations. Hence, our data set is considerably smaller than recent studies as e.g. Angeles and Neanidis (2009) making more sophisticated estimation procedures unapplicable. However, as Lessmann and Markwardt (2009) show, the results concerning the degree of expenditure decentralization are robust to a wide range of estimation procedures and sensitivity analysis.

What do we learn from this study? 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 decentralization has a positive impact on growth in developing countries. But at the same time, some institutional features of decentralization may undermine foreign aid effectiveness. Therefore, it would be ineffective to allocate aid in decentralized countries. In our observation period, decentralization was no significant determinant of aid flows, which is compatible with our finding of a negative impact of decentralization on foreign aid effectiveness. However, recent numbers suggest that this might have changed since the 1990s causing doubt on the effectiveness of foreign aid. Our study suggests that the design of anti-poverty programs should carefully consider how both instruments – foreign aid and decentralization – work together.

References

- Alesina, A., A. Devleeschauwer, W. Easterly, S. Kurlat, and R. Wacziarg (2003). Fractionalization. *Journal of Economic Growth*, 8(2), pp. 155–194.
- Angeles, L. and K. C. Neanidis (2009). Aid effectiveness: the role of the local elite. *Journal of Development Economics*, 90(1), pp. 120–134.
- Arikan, G. G. (2004). Fiscal Decentralization: A Remedy for Corruption? *International Tax and Public Finance*, 11, pp. 175–195.
- Banks, A. (2002). *Cross-National Time-Series Data Archive*. Bronx, NY: Databanks International.
- Bardhan, P. (2002). Decentralization of Governance and Development. *Journal of Economic Perspectives*, 16, pp. 185–205.
- Bardhan, P. and D. Mookherjee (2006). Decentralization and Accountability in Infrastructure Delivery in Developing Countries. *Economic Journal*, 116, pp. 101–127.
- Beck, N. and J. Katz (1995). What to do (and not to do) with time-series cross-section data. *American Political Science Review*, 89(3), pp. 634–647.
- Besley, T. and T. Persson (2010). State Capacity, Conflict, and Development. *Econometrica*, 78(1), pp. 1–34.
- Boone, P. (1996). Politics and the effectiveness of foreign aid. *European Economic Review*, 40(1), pp. 289–329.
- Brambor, T., W. R. Clark, and M. Golder (2006). Understanding interaction models: Improving empirical analyses. *Political Analysis*, 14, pp. 63–82.
- Brennan, G. and J. M. Buchanan (1980). *The Power to Tax: Analytical Foundations of a Constitution*. Cambridge: Cambridge University Press.
- Burnside, C. and D. Dollar (2000). Aid, Policies, and Growth. *American Economic Review*, 90, pp. 847–868.
- Burnside, C. and D. Dollar (2004). Aid, Policies, and Growth: Revisiting the Evidence. World Bank Policy Research Working Paper No. 3251.
- Chang, C., E. Fernandez-Arias, and L. Serven (1998). Measuring aid flows: a new approach. World Bank Policy Research Working Paper No. 2050.
- Clemens, M. A., S. Radelet, and R. Bhavnani (2004). Counting chickens when they hatch: The short-term effect of aid on growth. International Finance 0407010, EconWPA.
- Dalgaard, C.-J. and H. Hansen (2001). On Aid, Growth and Good Politics. *Journal of Development Studies*, 37(6), pp. 17–41.
- Dalgaard, C.-J., H. Hansen, and F. Tarp (2004). On the Empirics of Foreign Aid and Growth. *Economic Journal*, 114(496), pp. 191–216.
- Doucoulagos, H. and M. Paldam (2009). The Aid Effectiveness Literature: The Sad Results Of 40 Years Of Research. *Journal of Economic Surveys*, 23(3), pp. 433–461.
- Easterly, W. (2003). Can Foreign Aid Buy Growth? *Journal of Economic Perspectives*, 17(3), pp. 23–48.

- Easterly, W., R. Levine, and D. Roodman (2004). Aid, Politics, and Growth: Comment. *American Economic Review*, 94(3), pp. 774–780.
- Economides, G., S. Kalyvitis, and A. Philippopoulos (2008). Does Foreign Aid Distort Incentives and Hurt Growth? Theory and Evidence from 75 Aid-Recipient Countries. *Public Choice*, 134(3-4), pp. 463–488.
- Edwards, J. and M. Keen (1996). Tax competition and Leviathan. *European Economic Review*, 40(1), pp. 113–134.
- Gopal, G. (2008). *Decentralization in Client Countries: An Evaluation of the World Bank Support, 1990-2007*. Washington D.C.: Weltbank.
- Hall, R. E. and C. I. Jones (1999). Why Do Some Countries Produce So Much More Output Per Worker Than Others? *Quarterly Journal of Economics*, 114(1), pp. 83–116.
- Iimi, A. (2005). Decentralization and economic growth revisited: an empirical note. *Journal of Urban Economics*, 57(3), pp. 449–461.
- Islam, M. (2005). Regime Changes, Economic Policies and the Effect of Aid on Growth. *Journal of Development Studies*, 41(8), pp. 1467–1492.
- Kaufman, D., A. Kraay, and M. Mastruzzi (2009). Governance Matters VIII: Aggregate and Individual Governance Indicators, 1996-2008. World bank policy research working paper no. 4978.
- Lessmann, C. and G. Markwardt (2009). Aid, Growth, and Devolution. *CEifo Working Paper 2805*.
- Lessmann, C. and G. Markwardt (2010). One Size Fits All? Decentralisation, Corruption and the Monitoring of Bureaucrats. *World Development*, 38(4), pp. 631–646.
- McGillivray, M., S. Feeny, N. Hermes, and R. Lensink (2006). Controversies over the impact of development aid: It works; it doesn't; it can, but that depends... *Journal of International Development*, 18, pp. 1031–1050.
- Oates, W. (1993). Fiscal decentralization and Economic Development. *National Tax Journal*, 46(2), pp. 237–243.
- Oates, W. E. (1972). *Fiscal Federalism*. New York: Harcourt Brace Jovanovich.
- OECD (1999). *Taxing Powers of State and Local Government, OECD Tax Policy Studies No. 1*. Paris: OECD.
- Prud'homme, R. (1995). The Dangers of Decentralization. *World Bank Research Observer*, 10, 2, pp. 201–220.
- Rajan, R. G. and A. Subramanian (2008). Aid and Growth: What does the Cross-Country Evidence really show? *Review of Economics and Statistics*, 90(4), pp. 643–665.
- Rodden, J. (2004). Comparative Federalism and Decentralization: On Meaning and Measurement. *Comparative Politics*, 36(4), pp. 481–500.
- Roodman, D. M. (2007). The Anarchy of Numbers: Aid, Development, and Cross-country Empirics. *World Bank Economic Review*, 21(2), pp. 255–277.

- Sachs, J. D. and A. Warner (1995). Economic Reform and the Process of Global Integration. *Brookings Papers on Economic Activity*, 26(1), pp. 1–118.
- Shleifer, A. and R. W. Vishny (1993). Corruption. *Quarterly Journal of Economics*, 108, pp. 599–611.
- Swaroop, V., S. Jhab, and A. S. Rajkumara (2000). Fiscal effects of foreign aid in a federal system of governance: The case of India. *Journal of Public Economics*, 77, pp. 307–330.
- Tanzi, V. (1996). Fiscal Federalism and Decentralization: A Review of some Efficiency and Macroeconomic Aspects. In *Proceedings of the Annual World Bank Conference on Development Economics 1995*, pp. 295–316. Washington D.C.: The World Bank.
- Treisman, D. (2002). Defining and Measuring Decentralization: A Global Perspective. Working paper university of california.
- Tullock, G. (1975). The Transitional Gains Trap. *The Bell Journal of Economics*, 6(1), pp. 671–678.
- Weingast, B. (1995). The economic role of political institutions: Market-preserving federalism and economic development. *Journal of Law, Economics and Organization*, 11(1), pp. 1–31.
- Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge (MA): MIT Press.
- Worldbank (2006). World Development Indicators 2006. Technical report.
- Zodrow, G. and P. Miezowski (1986). Pigou, Tiebout, Property Taxation, and the Underprovision of Local Public Goods. *Journal of Urban Economics*, 19(3), pp. 356–370.

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.	Worldbank (2006)
Log of initial GDP	Log of initial real GDP per capita in 2000 \$ prices at the start of each period.	Worldbank (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 (Laspeyres)	Worldbank (2006)
expenditure decentralization	The degree of expenditure decentralization relates the sum of sub-national (state & local) government expenditures to total government expenditures.	IMF Government Finance Statistics
tax decentralization	Share of sub-national government tax revenues in total government revenues.	IMF Government Finance Statistics
trade openness	Sachs Warner index of trade openness.	Sachs and Warner (1995)
European language	Population share speaking a major European language (English, French, German, Portuguese, and Spanish).	Hall and Jones (1999)
distance equator	Distance of the capital from the equator in degree rescaled to 0 to 1.	Hall and Jones (1999)
infant mortality	infant mortality rate per 1,000 live births.	Worldbank (2006)
population	Total population (regressions use logarithms).	Worldbank (2006)
area	Total area in square kilometers (regressions use logarithms).	Worldbank (2006)

Table A.2: Summary statistics

	Observations	Mean	Std. Dev.	Maximum	Minimum
real per capita GDP growth	223	0.06	0.14	0.48	-0.53
ODA/GDP	223	0.04	0.06	0.29	0.00
Log of initial GDP	223	3429.73	2520.35	10990.71	520.63
ethnic fractionalization	223	0.59	0.23	0.93	0.00
assassinations	223	0.00	1.05	9.75	0.00
institutional quality	223	2.20	0.51	3.66	1.34
inflation	223	12.53	304.64	3357.53	-0.53
Sub-Saharan dummy	223	0.00	0.39	1.00	0.00
Eadt Asia dummy	223	0.00	0.37	1.00	0.00
expenditure decentralization	223	10.00	13.87	46.39	2.44
tax decentralization	223	2.86	9.73	47.19	0.03
European language	219	0.00	0.40	1.00	0.00
distance from equator	223	0.19	0.13	0.52	0.00
infant mortality	161	65.82	36.80	164.00	8.00
population/1,000,000	197	74.66	194.00	1210.00	0.96
area/100,000	194	1.14	1.78	9.33	0.00

Table A.3: List of countries considered

Albania, Argentina, Azerbaijan, Bolivia, Brazil, Chile, China, Republic of the Congo, Colombia, Costa Rica, Croatia, Ethiopia, Fiji, Indonesia, India, Iran, Jordan, Kazakhstan, Kenya, Malawi, Malaysia, Mauritius, Mexico, Moldova, Morocco, Pakistan, Peru, Philippines, Papua New Guinea, Paraguay, Senegal, South Korea, South Africa, Thailand, Trinidad and Tobago, Tunisia, Uganda, Venezuela, Zambia, Zimbabwe

Table A.4: Estimation of policy indicators

Dependent variable: real GDP growth	
initial GDP	-0.019 (1.41)
ethnic fractionalization	-0.049 (-1.26)
assassinations	-0.002 (-0.15)
ethnic \times assassinations	-0.014 (-0.37)
institutional quality	0.008* (1.75)
Sub-Saharan Africa	-0.078** (-2.44)
East-Asia	0.11*** (6.32)
budget surplus	-0.008 (0.27)
log(1+inflation)	-0.042** (-2.25)
openness	0.016 (0.74)
period dummies	yes
obs.	188 (33)
adj.-R ²	0.32

t-statistics are reported in parenthesis.

Significance levels are reported as follows:

* for a 90%-significance-level, ** for 95%
and *** for more than 99%.

Dresden Discussion Paper Series in Economics

- 14/08 **Lessmann, Christian / Markwardt, Gunther:** One Size fits all? Decentralization, Corruption, and the Monitoring of Bureaucrats
- 15/08 **Farzanegan, Mohammad Reza / Markwardt, Gunther:** The Effects of Oil Price Shocks on the Iranian Economy
- 16/08 **Fuchs, Michaela / Wohlrabe, Klaus:** Institutions, Trade and Integration: What can be expected within the enlarged EU?
- 01/09 **Broll, Udo / Egozcue, Martin / Wong, Wing-Keung:** Prospect Theory and Two Moment Model: the Firm under Price Uncertainty
- 02/09 **Broll, Udo / Eckwert, Bernhard:** Modelling Information and Hedging: the Exporting Firm
- 03/09 **Binswanger, Hans Christoph:** Die Wachstumsspirale in der Krise – Ansätze zu einem nachhaltigem Wachstum
- 04/09 **Brunow, Stefan / Hirte, Georg:** Regional Age Structure and Economic Growth: An Econometric Study for German Regions
- 05/09 **Broll, Udo / Kemnitz, Alexander / Mukherjee, Vivekananda:** Globalization and a Welfare Program for the Marginalized
- 06/09 **Tscharaktschiew, Stefan / Hirte, Georg:** An Urban General Equilibrium Model with Multiple Household Structures and Travel Mode Choice
- 07/09 **Tscharaktschiew, Stefan / Hirte, Georg:** How does the Household Structure Shape the Urban Economy?
- 08/09 **Lessmann, Christian:** Fiscal Decentralization and Regional Disparity: Evidence from Cross-section and Panel Data
- 09/09 **Lessmann, Christian / Markwardt, Gunther:** Aid, Growth and Decentralization
- 10/09 **Broll, Udo / Wahl, Jack E. / Wessel, Christoph:** Export and Benefits of Hedging in Emerging Economies
- 11/09 **Rudolph, Stephan:** The Gravity Equation with Micro-Founded Trade Costs
- 12/09 **Biswas, Amit K.:** Import Tariff Led Export Under-invoicing: A Paradox
- 13/09 **Broll, Udo / Wahl, Jack E.:** Mitigation of Foreign Direct Investment – Risk and Hedging
- 14/09 **Broll, Udo / Wahl, Jack E.:** Güterwirtschaftliches Risikomanagement: - Ein Entscheidungsmodell zur Lagerpolitik bei Unsicherheit
- 15/09 **Lukas, Daniel:** Efficiency Effects of Cross-Border Medical Demand
- 16/09 **Broll, Udo / Bieta, Volker / Milde, Hellmuth / Siebe, Wilfried:** Strategic Pricing of Financial Options
- 16/09 **Broll, Udo / Bieta, Volker / Milde, Hellmuth / Siebe, Wilfried:** Strategic Pricing of Financial Options
- 17/09 **Broll, Udo / Wahl, Jack E.:** Liquidity Constrained Exporters: Trade and Futures Hedging
- 01/10 **Rudolph, Stephan:** Estimating Gravity Equations with Endogenous Trade Costs
- 02/10 **Lukas, Daniel / Werblow, Andreas:** Grenzen der Spezialisierung grenzüberschreitender Gesundheitsversorgung im Rahmen des Heckscher-Ohlin Modells
- 03/10 **Broll, Udo / Roldán-Ponce, Antonio / Wahl, Jack E.:** Spatial Allocation of Capital: The Role of Risk Preferences
- 04/10 **Broll, Udo / Wong, Keith P.:** The Firm under Uncertainty: Capital Structure and Background Risk
- 05/10 **Broll, Udo / Egozcue, Martín:** Prospect Theory and Hedging Risks
- 06/10 **Biswas, Amit K. / Sengupta, Sarbajit:** Tariffs and Imports Mis-invoicing under Oligopoly
- 07/10 **Lukas, Daniel:** Patient Autonomy and Education in Specific Medical Knowledge
- 08/10 **Broll, Udo / Eckwert, Bernhard / Wong, Pong K.:** International Trade and the Role of Market Transparency
- 09/10 **Kemnitz, Alexander:** A Simple Model of Health Insurance Competition