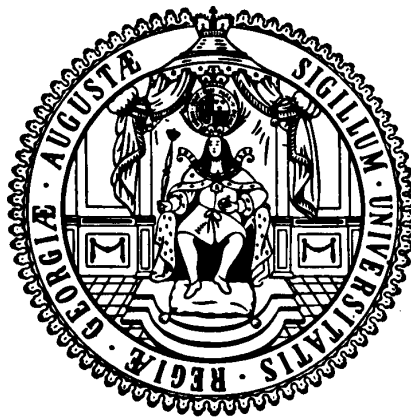# Courant Research Centre
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Do we know what we think we know?
Aid fragmentation and effectiveness revisited

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Aid fragmentation and effectiveness revisited

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Abstract
Aid fragmentation is widely recognized as being detrimental to development outcomes. We re-investigate the impact of fragmentation on aid effectiveness in the context of growth, bureaucratic policy, and education, focusing on a number of conceptually different indicators of fragmentation, and paying attention to potentially heterogeneous effects across countries. Our results demonstrate the lack of robustness and any systematic pattern. This stresses the importance of questioning the sweeping conclusions drawn by much of the previous literature.

JEL codes: F35, O11

Keywords: aid effectiveness, fragmentation

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1. Introduction

The academic literature widely recognizes aid fragmentation as a significant problem for effective development cooperation. With many donors and projects in a given country or sector, transaction costs should rise (Acharya, Fuzzo de Lima, and Moore 2006; Anderson 2012; Lawson 2009), developing country administrative capacities can be overburdened (Kanbur 2003; Roodman 2006), administrations might be deprived of their best staff (Knack and Rahman 2007), so that aid supposedly becomes less effective in terms of its impact on economic development (Annen and Kosempel 2009; Djankov, Montalvo and Reynal-Querol 2009; Kimura, Mori, and Sawada 2012).

To mitigate such problems, donors and recipients committed to reducing fragmentation in the Paris Declaration (PD) and the Accra Agenda for Action (AAA). According to §17 of the AAA,

> "[t]he effectiveness of aid is reduced when there are too many duplicating initiatives, especially at country and sector levels. We will reduce the fragmentation of aid by improving the complementarity of donors' efforts and the division of labour among donors, including through improved allocation of resources within sectors, within countries, and across countries." (OECD 2008: 17)

The consensus that fragmented aid is generally "bad" aid is, however, based on a surprisingly small number of systematic studies. These studies had a remarkable effect on development scientists and practitioners alike. Given the general fragility of results in the aid effectiveness literature (see Docouliagos and Paldam 2009), the unanimous acceptance of the principle "less is more" is quite surprising. Our systematic reexamination – in much more detail than any previous study provides – will shed some light on the general results as well as on the specific conditions under which they may hold.

The first question that needs to be answered when trying to measure the effect of fragmentation is how to measure fragmentation. The indicator most frequently used in the academic literature is the Herfindahl index. Diverging from that, in 2009 the OEDC's Development Assistance Committee (DAC) introduced indicators which emphasize the burden posed by "non-significant aid relations" (OECD 2009, 2011). As we show in Dreher and Michaelowa (2010), the choice of appropriate indicators is not trivial from a theoretical perspective. What is more, sectoral differences can affect the choice of the appropriate indicator and, generally, the relevance of fragmentation for the effectiveness of aid. Finally, their initial investigation based on case study evidence and qualitative interviews suggests that the characteristics of the recipient country (notably in terms of its level of development and bureaucratic effectiveness and capacity) appear to be important for the effect of aid fragmentation.

Since fragmentation indicators are used in donor rankings[1] and DAC peer reviews, both of which include aspects of "naming and shaming" and may be picked up by NGOs and national media, they generate incentives for aid allocation in line with what these indicators

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[1] E.g., rankings by the OECD/DAC itself or rankings by the Center for Global Development.

define to be "good aid." It is unsatisfying from both a scientific and a political point of view, and potentially misleading, to draw such stark and far-reaching conclusions from relatively limited evidence. It is the purpose of our study to systematically reexamine the empirical basis for these underlying assessments, and thus contribute to avoiding potentially misleading policy orientations or at least avoid premature conclusions.

For this purpose, we first provide a theoretical discussion of expected sectoral and country-specific differences, and introduce, describe, and analyze different indicators and their implications (Section 2). Econometrically, we test in section 3 whether there is a robust and significant relation between fragmentation and aid effectiveness, and account for the relevant differentiations with regard to recipient characteristics. Besides the distinction between different fragmentation indicators, we differentiate between countries with different levels of poverty and administrative capacity, and between general economic effects (growth), effects in the social sector (school enrolment) and effects on bureaucratic quality. We find no robust pattern and conclude (in Section 4) that sweeping conclusions on the harmful effects of fragmentation should be avoided.

2. Theoretical considerations

While it is intuitively plausible that a growing number of intervening partners in development cooperation raises transaction costs and represents a burden on developing countries' administrative capacities, it is theoretically much less clear whether these effects must necessarily outweigh other, potentially positive effects on development outcomes and aid effectiveness. A greater number of donors active in a country may, for instance, bring up more innovative ideas, allow the recipient government to benefit from a variety of experiences, and put the recipient government in a more powerful position to take its own decisions, thereby enhancing ownership. This suggests that the question whether positive or negative effects dominate is conditional on a number of criteria and can only be comprehensively assessed with further differentiation. The wide-spread consensus that fragmentation is negative across the board and without any further distinctions is thus rather surprising. At least, we should expect that country and sector characteristics would play a role. What is more, donors may intervene in different ways and it is not clear at the outset whether the sheer number of donors, or rather the lack of coordination in case of missing lead donors is responsible for potentially negative effects.

2.1. Country and sector differences

Let us first turn to differences in recipient country characteristics. Consider two countries with different levels of human capital, which is in turn reflected in different levels of administrative and management capacity. As opposed to the low-capacity country, the high-capacity country might be able to handle a large number of donors relatively easily. In this country, appropriate management processes should be up and running, and lower-level administrative staff is sufficiently trained to carry out the day-to-day business, so that it is not left to the ministers and secretaries of state or other high-level politicians to welcome every donor mission.

The level of economic resources may have a similar effect. Economically developed countries can impose their own rules and procedures without facing much resistance, because donors (and their national constituencies) consider that good standing with such countries implies direct benefits for the donor itself. An extreme example for such a recipient might be China, which for many years benefited from strong donor competition and was able to play off donors against each other. India, in turn, made its own selection among the multiple donors interested in cooperation and sent others off. [2]

But even bureaucrats of much smaller countries such as Vietnam do not consider a fragmented donor landscape to be problematic. Interviews carried out in May 2010 revealed that in Vietnam, the multitude of different donors was not regarded as a disadvantage by the interviewed officials (Dreher and Michaelowa 2010: 28-31). The feedback suggests that local staff is able to be selective about whom they want to meet, and able to set priorities. What is more, they seem to make use of the international contacts established in the field of development cooperation for other purposes, e.g., in the areas of international trade and foreign direct investment. In an interview carried out in December 2010 (Tatrallyay and Stadelmann 2011), the head of the Designated National Authority (DNA)[3] of Vietnam explicitly stated that he would prefer new (additional) donors, rather than more funding from the existing ones.

In contrast, responses to interviews in Burkina Faso were much more in line with the expected problems of fragmentation reported in the academic literature (Dreher and Michaelowa 2010: 22-28). While there may also be some positive effects of fragmentation specific to poor countries (see, e.g., Gutting and Steinwand 2015, who find a stabilizing effect of higher donor numbers in fragile states), overall, the existing literature and some theoretical arguments suggest that the more advanced developing countries benefit from a degree of fragmentation that may be far too high for less advanced countries. Overall, our initial expectation is thus that wealthier countries and countries with greater bureaucratic capacity should be capable and inclined to deal with a higher number of donors. Conditional on whether the suggested benefits of additional donors matter, fragmentation may even show a positive influence there.

Let us now turn to the additional effects that sector characteristics can have. It is well known that aid fragmentation varies considerably across sectors, with many more donors (and individual aid activities) in social sectors than in sectors such as economic infrastructure (Frot and Santiso 2010: 21-22; OECD 2009: 45-52). In health and education, the average project is relatively small, in other areas such as industrial infrastructure or electricity

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[2] It is a different question whether being able to select donors is necessarily beneficial from an economic perspective. If the recipient countries follow policies that are disadvantageous for growth or other important developmental outcomes, it is possible that conditions imposed by donors can lead to better outcomes. For example, Gehring (2013) shows that more economic freedom on average relates to higher subjective well-being, regardless of social class, gender and age. Being able to choose among donors might undermine conditionality. On the other hand, if recipients were aware of the downsides in terms of, for example, increased transaction costs, selecting only the most effective donors could lead to better outcomes.

[3] The DNA is the national body responsible for the examination of climate projects with partners from abroad, notably in the context of the Clean Development Mechanism (CDM).

generation aid interventions are traditionally much larger. This may appear obvious, but this obvious reality so far does not find any reflection in the aid fragmentation literature.

As a consequence, the social sectors are often perceived as sectors in which the need to reduce fragmentation is particularly strong. However, it may also be the case that the natural project size in these sectors is smaller, and that recipient countries have developed certain strategies to deal with the multiplicity of small interventions so that the way they translate into transaction costs differs from other sectors. This is indeed what sector-specific interviews in Burkina Faso suggest (Dreher and Michaelowa 2010: 25-26). In fact, in some sectors, five donors may appear to be many, in others, 15 donors may be a number dealt with easily. For instance, coordination of small projects or their insertion into a national sector level plan may be easier in some sectors than in others. Difficulties for donor coordination can be expected primarily where their own national interests such as trade or investment opportunities are concerned, i.e., notably in fields such as industry, infrastructure, or resource extraction.

2.2. The relevant donor structure

In addition to relevant differentiations related to country and sector characteristics, the effect of aid fragmentation cannot be duly examined without taking into account the different modes of delivery including the degree of donor coordination (see also Aldasoro, Nunnenkamp, and Thiele 2010). While this information is not directly available, the way in which fragmentation is measured is indirectly related to the type of the coordination problem expected in any given context. This is because due to their computational properties each possible fragmentation indicator captures a different facet of what is framed "fragmentation." Some indicators primarily focus on the lack of lead donors – one or a few dominant donors who may become natural leaders and take over responsibility for the bulk of the coordination activities. Others focus on the sheer number of donors, or on marginal donors that provide only little financial support while adding to the overall number of development partners and, arguably, to the needs of coordination.

The most frequently used indicator in the academic literature is based on the Herfindahl index (see, e.g., Djankov et al. 2009; Easterly 2007; Knack and Rahman 2007). It originally stems from the industrial organization literature, where it is used as a measure of the degree of competition among firms in an industry. In our case, it measures the probability that in two random draws of 1 USD from overall aid finance in a country (or sector), one would draw these two dollars from the same donor. Formally, the Herfindahl index (*HI*) can be expressed as:

$$HI = \sum_{i=1}^{N} \pi_i^2 \ , \tag{1}$$

where $i=1,\ldots,N$ indicates the different donors, and π_i indicates the share of donor i in overall aid finance. The Herfindahl index belongs to the larger group of concentration indices, which also include concentration ratios (*CR*). The latter simply add up the shares of a predefined number of largest donors.

$$CR(N) = \sum_{i=1}^{N} \pi_i \ . \tag{2}$$

For an analysis based on CR1 – aid by the single largest donor as a percentage of total aid – see, e.g., Djankov et al. (2009: 227). Concentration indices focus on the existence of one or a few large donors and indicate high fragmentation when no dominant donors exist. As opposed to the Herfindahl index, a shift in proportions among the preselected large donors does not alter concentration ratios. However, any change from other donors towards these large donors will do so. The first few big donors will be considered in tandem. This index may therefore be useful if we consider that up to a small number of additional donors pose no problem, but may be even an advantage. We would then start counting fragmentation only when the number of donors exceeds this predefined threshold.

While high concentration has a negative notation in industrial organization, it has a positive notation when it comes to development assistance and is simply interpreted as the flipside of high fragmentation. This is reflected in the way in which the measure of fragmentation is computed. Based on either of the above measures of concentration, fragmentation indicators *(F)* are computed by subtracting the concentration index from one, i.e., *F(HI)=1-HI*, or *F(CR)=1-CR*. In our empirical analysis below, we include the fragmentation indices based on both HI and CR3.[4]

Compared to fragmentation measures using concentration indices, measures based on a simple count of donors (N) in a given country and year are more straightforward and easier to understand. The DAC has widely used the donor count either directly or in its refined form which only considers "non-significant" aid relationships (OECD 2009). While it introduces a binary distinction between large and small donors, it neglects more precise information on donors' relative shares.

Hence the existence of lead donors remains unconsidered, and the problem is conceived as being reflected in the multitude of those donors that want to be part of all discussions and decision-making processes without delivering any significant input. To ensure that the efforts of small donor countries with correspondingly small aid budgets do not appear as

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[4] The decision to use CR3 rather than, say, CR4 is arbitrary, but since the conceptual idea is the same, we restrict the discussion to only one of these indicators.

"non-significant" and hence potentially undesirably everywhere, "significance" is defined by the DAC not only as a share of the recipients' overall aid inflows, but also in relationship to the individual donor's average aid outflows (OECD 2011, pp. 5f.). We ignore the latter part of the definition here, as it arguably represents a concession necessary to make the indicator acceptable within the donor community, and dilutes the conceptual idea of the indicator. To determine whether a donor's contribution is "significant" for the recipient country, the DAC considers whether the donor is among the largest donors that cumulatively account for at least 90% of aid inflows. We denote the remaining number of donors, i.e., the number of donors that are not significant according to this definition, as N(<10%). We will refer to this measure as the "number of small donors" whereby "small" is defined with respect to other aid to a specific recipient or sector independently of the total aid budget of the donor agency. Hence even the US can be considered as a small donor for certain recipient countries to which they allocate only very limited amounts, e.g., due to ideological differences with the regime in power.

Apart from measures based on concentration ratios and donor counts, some authors have suggested the use of inequality measures such as the Theil index (Acharya et al. 2006). However, like other inequality measures such as the coefficient of variation or the Gini coefficient, the Theil index does not change with a change in population size (here the number of donors) as long as all proportions remain the same. This is a central characteristic that distinguishes inequality measures from measures of concentration (Ray 1998: 184-192), and makes inequality measures less suitable for the measurement of fragmentation.

For our analysis, the Herfindahl index and the concentration ratio for a reasonable number of key donors, as well as the two measures of donor counts appear to be theoretically plausible. However, they reflect different types of potential problems as they give different weights to donors at the high end and the low end of the aid distribution. The DAC index places greater emphasis to donors at the low end of the distribution. Contrary to that, the Herfindahl index and the CR3 value the existence of a few dominant donors and do not (or only marginally) consider the addition of small donors at the tail of the distribution. The latter would be appropriate if, for instance, small donors tended to align themselves more easily with existing procedures or even used delegated cooperation, thus adding very little to existing transaction costs (Dreher and Michaelowa 2010: 23). The former would be appropriate if, even for such small donors, transaction costs for the recipients remain high or at least too high in relation to the donors' small contributions.

We illustrate these differences between the indicators in Figure 1, which provides maps for the most recent period (2002-2005). Table 1 and Figure 2 provide some additional descriptive statistics as well as bivariate correlations for each indicator and for the whole sample period. During the periods observed, the average number of donors in the different recipient countries varies between 10.25 and 41.75 (decimals due to averaging over 4-year periods). As

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expected, the bivariate correlation coefficient between the two indices based on concentration measures is rather high (rho=87%), as is the one between the two DAC indices N(<10%) and N (rho=89%). The latter indicates that the overall number of donors is to a large extent driven by the number of small donors.

The correlation across these two groups of indicators is much smaller, and the number of small donors N(<10%) is hardly related to fragmentation indices based on the concentration of large donors. The correlations with F(HI) and F(CR3) even turn moderately negative. This implies that a strong dominance of a few big donors can coincide with numerous activities of multiple small donors. Whether the activity of small donors as such is a problem, or whether it is the lack of dominant lead donors (or neither of the two) hence appears to be an important question to be examined.

Table 1: Descriptive statistics for the fragmentation indicators

	Obs.	Mean	Std. Dev.	Min	Max	F(HI)	F(CR3)	N	N(<10%)
						Correlation coefficients			
F(HI)	377	0.75	0.14	0.19	0.92	1			
F(CR3)	377	0.33	0.14	0.04	0.63	0.87	1		
N	377	25.56	6.08	10.25	41.75	0.31	0.42	1	
N(<10%)	377	17.42	5.02	4.00	34.00	-0.07	-0.01	0.89	1

Notes: Based on the Burnside-Dollar sample of countries with data averaged over four years, starting in 1970 (cf. Table 2, regression 1, and the more detailed data description in Section 3).

The key additional information in Figure 2 is the distribution of the data. For the Herfindahl-based fragmentation index, the distribution appears quite skewed due to outliers with an unusually high donor concentration. This is due to some cases with just one or two extremely large lead donors since all other indicators including F(CR3) show a much more balanced distribution. The other indicators are more normally distributed and exhibit no clear outliers.

Figure 1: Fragmentation of ODA according to four indicators (2001-2005)
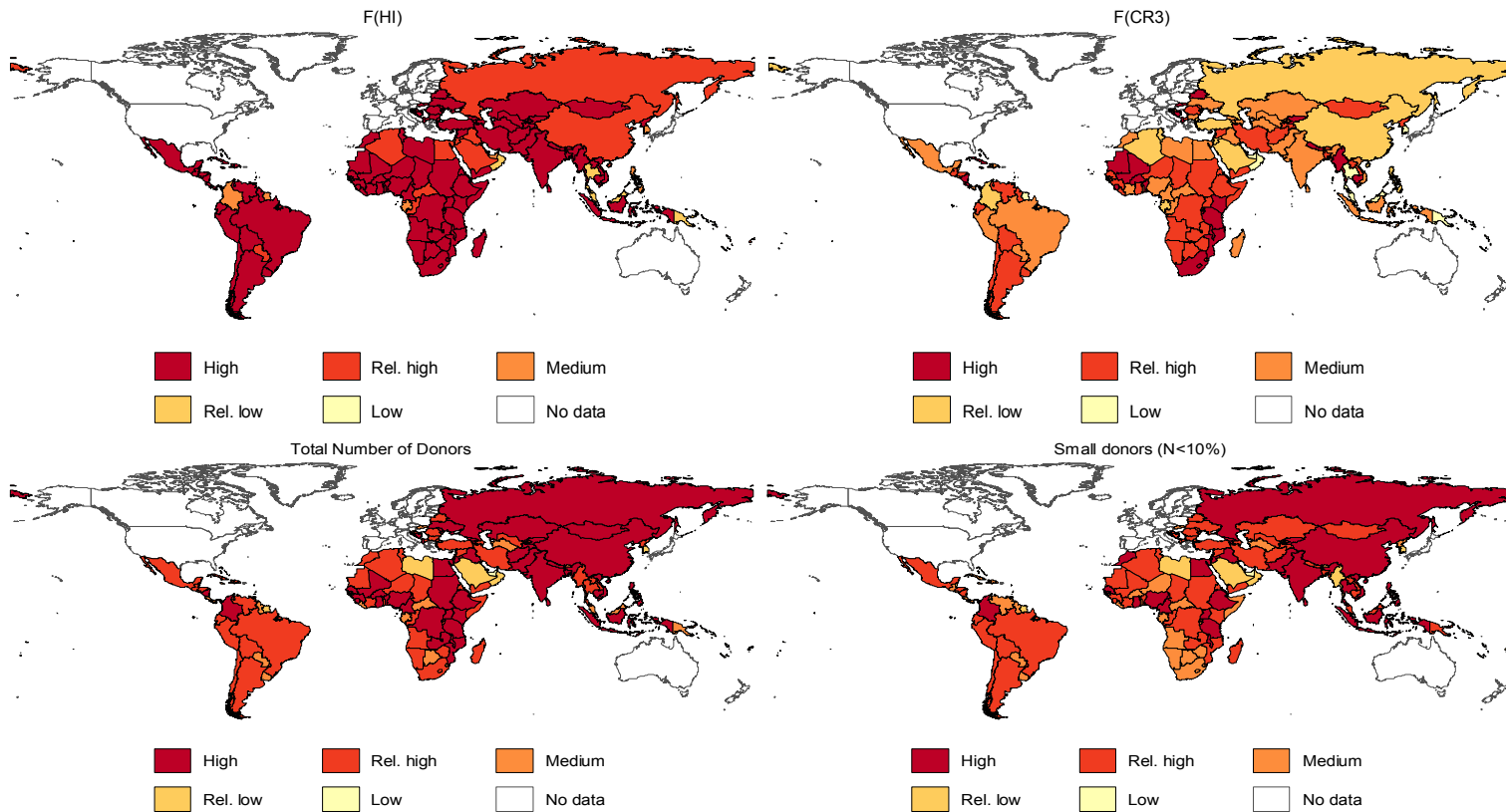
Notes: Differences in the geographical variation of aid fragmentation for different indicators. The five categories were formed in a way that each category covers an identical interval of the range of the respective fragmentation indicator (i.e., 0-20; 21-40;...; 81-100). This more suitable absolute interpretation of the indicators makes it possible to compare the share and severity of countries that are considered to receive fragmented aid according to the different indicators.

Figure 2: Violin plot of fragmentation indices
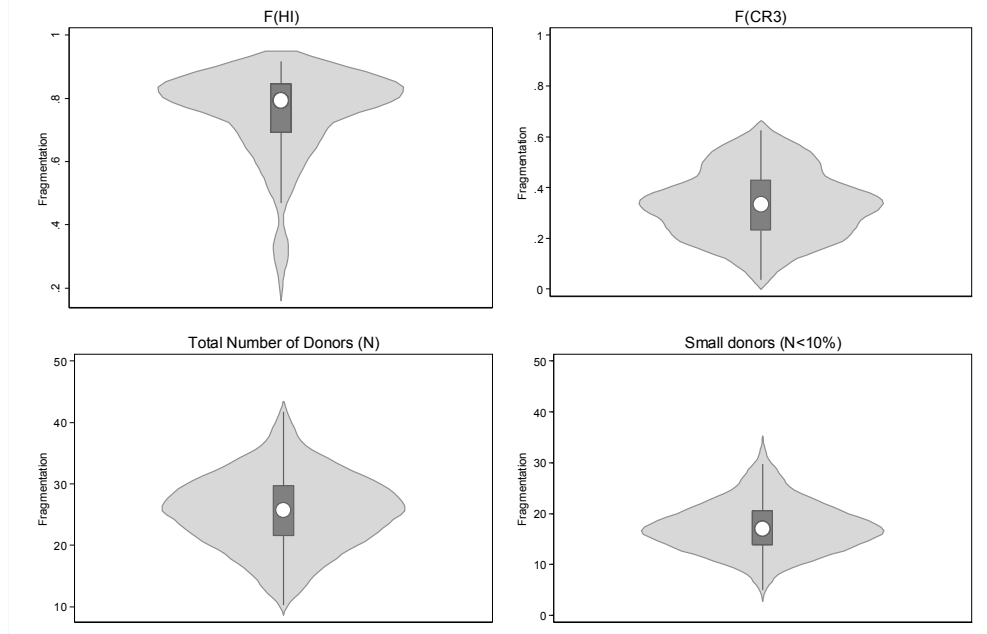
Notes: The violin plots combine a box-plot diagram and a density trace. The white dot indicates the median value, the shaded area the density and the black bar shows the range that contains 50% of the observations. Points beyond the black line constitute potential outliers (data based on the BD sample as in Table 1).[5]

3. The impact of fragmentation on aid effectiveness

As the different indicators of fragmentation measure different types of problems, we should not expect all of them to show a strong impact on development outcomes. The use of different indicators in the empirical analysis will show which of them (if any) are relevant. As mentioned above, existing studies suggest that this should again depend on country characteristics. After some general information on the data and methods, this section then proceeds with the discussion of the results for the relationship between fragmentation and the different outcome variables relating to different sectoral perspectives. In addition, interactions with selected country characteristics will show whether or not the effect of fragmentation is a general one (across all countries) or can be distinguished by the aid recipients' prior level of development and state capacity.

3.1. Data and methods

To distinguish between the effects in different sectors we do not only estimate the relationship to economic growth, but also the relationships to bureaucratic quality, and education. As it is our aim to provide a systematic reappraisal of the existing literature, we

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[5] Let us define x% as the value at the x-percentile of the distribution of the indicator. Violin plots define outliers as values being larger than 75%+1.5*|75%-25%| or smaller than 25%-1.5*|75%-25%|.

want to refrain from suggesting arbitrary new specifications. Instead, we replicate well-known earlier aid effectiveness studies and add the four fragmentation indicators, as well as potentially relevant interaction terms. With respect to the relationship between aid and growth, we replicate the previous studies by Burnside and Dollar (2000) and Rajan and Subramanian (2008), based on the permutations in Clemens et al. (2012). Our baseline regression uses Clemens et al.'s preferred specification dismissing invalid instruments, but differentiating the regression equation (or, equivalent in expectation, using country fixed effects). We also lag aid by one period, so that it can more reasonably be expected to cause growth rather than being its effect. With respect to the relationship of aid to bureaucratic quality, we base our analysis on Knack and Rahman (2007). And finally, with respect to aid effectiveness in the education sector, we follow the analyses by Michaelowa and Weber (2007) and Dreher et al. (2008), based on the update by Birchler and Michaelowa (2013). We describe the corresponding variables and data sources in detail in Table A1 in the appendix.

For both the aid variable and for our computation of the aid fragmentation indices, we use data from the OECD/DAC's Creditor Reporting System (CRS) (OECD/DAC 2012). Following the traditions of the aid effectiveness literature, we use disbursements rather than commitments because only funds that are disbursed can be expected to become effective in terms of development outcomes. Since not all types of Official Development Assistance (ODA) can be expected to have a direct impact on growth, Clemens et al. (2012) suggest to run regressions only on the basis of what they call "early-impact aid" in order to improve the precision of the estimated effect of aid. As our primary intention is to estimate the relationship with fragmentation rather than the effect of aid, however, it appears relevant in our context to capture aid flows in its entirety.[6]

All regressions include the same control variables as the studies they are based on. We do not show their coefficients to reduce clutter, but list them in a table in the appendix. For all

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[6] What is more, early impact aid has been shown not to be a robust predictor of growth (Rajan and Subramanian 2008; Bjørnskov 2013; Roodman 2015). A major drawback with this measure is that disaggregated aid disbursements are not available for the entire period, so that disbursements have to be estimated based on commitments. Data on commitments in the earlier periods also suffer from severe underreporting, which is not addressed in Clemens et al. (2012) (see OECD/DAC 2014). DAC statisticians caution, however, that not all ODA actually flows into recipient countries. They hence suggest Country Programmable Aid (CPA) as yet another measure of aid that excludes all categories such as financial support for students and refugees in donor countries, debt relief, and administrative costs. CPA is clearly preferable to ODA for the purpose of computing fragmentation indicators (see also Mürle 2007; OECD 2009). However, CPA data are only available for the last decade, which would have greatly reduced the number of observations for our analysis. This problem is aggravated in the present analytical setting as sensible panel regressions in models with large fluctuations in the dependent variable (such as growth) and / or very limited change in the explanatory variables (aid disbursements and fractionalization) need to combine the information over several years by taking averages. Following the above-mentioned econometric studies, we therefore accept the lack of precision in the ODA data in order to obtain longer time-series.

variables, descriptive statistics and a more detailed definition are provided in Table A1 in the appendix.[7] Our tables display estimation results for the key explanatory variables, namely the amount of aid per capita (ODA), the fragmentation indices, the fragmentation indices interacted with ODA, and the other potentially relevant interaction terms (with initial GDP per capita, absence of corruption, and bureaucratic quality). In all cases, variables included in the interaction terms are also included separately in the regression, though only the interaction terms are shown. Due to the omission of coefficients for the base variables and due to multiple interactions, in most regressions the interpretations must be drawn from the marginal effects computed separately or from the graphs presented thereafter, rather than from the regression coefficients themselves.

We do not claim to necessarily estimate causal effects of aid and fragmentation with the regressions in this paper. Readers who are convinced of the identification strategies in the existing papers that we review and re-estimate, could confidently interpret the results of our paper as causal effects as well.[8] Others might be more skeptical. Results for our main variable of interest – the interaction of aid with fragmentation – are however identified based on a difference-in-difference approach, which we hope will convince some of these more skeptical readers as well. Specifically, our regressions compare the effect of high versus low fragmentation in countries receiving small amounts of aid compared to countries receiving large amounts. The identifying assumption for the effect of fragmentation on how aid impacts the outcome variable of interest is that no omitted variables are systematically correlated with the difference in how fragmentation affects the outcome in countries receiving low amounts of aid, compared to countries receiving large amounts, controlled for the level of aid and fragmentation themselves. All panel specifications also use recipient country fixed effects, period fixed effects and cluster standard errors at the country level.

3.2. The effect of aid fragmentation on growth

We first show the results for the extended Burnside and Dollar regressions (following Clemens et al. 2012), covering the 1970-2005 period. All data are averaged over four years. The dependent variable is the growth rate of real GDP per capita.[9]

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[7] Full regression results are available on request.

[8] See Dreher and Langlotz (2015) and Dreher and Lohmann (2015) for recent attempts to identify causal effects of aid on growth.

[9] The regression we build upon is presented by Clemens et al. (2012) in Table 7, column 7.

Table 2: Aid, Fragmentation and GDP p.c. growth, Burnside and Dollar specification (1970-2005), 4-year periods

Fragmentation index		F(HI)				F(CR3)				Total number of donors				Small donors (N<10%)			
Dependent variable: GDP p.c. growth								Sample: Burnside & Dollar									
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Aid		0.406	0.472	0.012	-10.208	0.278	0.161	-0.164	-3.715	0.313	-0.840**	-0.618	-9.708	0.169	-0.700**	-0.329	-7.249
		[0.570]	[0.329]	[1.259]	[9.756]	[0.222]	[0.137]	[0.698]	[4.011]	[0.434]	[0.408]	[0.908]	[6.604]	[0.348]	[0.341]	[0.517]	[4.898]
Aid^2		-0.002	0.002	0.001	-0.001	-0.002	0.002	0.002	0.001	-0.005*	0.003	0.000	0.000	-0.004	0.005*	0.003	-0.002
		[0.002]	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.004]	[0.003]	[0.003]	[0.002]	[0.003]	[0.002]	[0.004]	[0.003]	[0.004]	[0.003]
Fragmentation		-1.980	2.433	0.495	2.840	-1.274	2.386	-0.981	13.033	-0.005	-0.032	0.062	0.733	0.061	-0.035	0.158	1.267
		[3.254]	[3.992]	[7.346]	[52.323]	[2.650]	[3.430]	[8.439]	[41.409]	[0.072]	[0.132]	[0.223]	[0.945]	[0.067]	[0.145]	[0.245]	[1.099]
Aid x Fragmentation		-0.372	-0.578	-0.261	11.393	-0.403	-0.414	-0.137	6.317	-0.004	0.028*	0.020	0.310	-0.001	0.034**	0.007	0.390
		[0.650]	[0.413]	[1.523]	[11.333]	[0.410]	[0.290]	[1.416]	[7.604]	[0.012]	[0.014]	[0.033]	[0.225]	[0.012]	[0.016]	[0.029]	[0.280]
Aid x Fragmentation x Bureaucratic Quality			0.062				0.071				-0.002				-0.003		
			[0.294]				[0.232]				[0.011]				[0.012]		
Aid x Fragmentation x Absence of Corruption				-0.269				-0.201				-0.001				0.007	
				[0.584]				[0.511]				[0.010]				[0.011]	
Aid x Fragmentation x Initial GDP					-5.901				-3.412				-0.161				-0.201
					[5.675]				[3.874]				[0.116]				[0.144]
Adj. R-Squared		0.49	0.34	0.58	0.33	0.49	0.34	0.58	0.32	0.48	0.37	0.57	0.34	0.48	0.37	0.58	0.33
Number of observations		377	239	239	377	377	239	239	377	377	239	239	377	377	239	239	377
Number of countries		54	53	53	54	54	53	53	54	54	53	53	54	54	53	53	54
ME of Fragmentation at	Aid 20% perc.	-2.160	3.107	1.906	1.482	-1.468	3.208	0.001	2.653	-0.008	0.024	-0.037	0.054	0.060	-0.008	0.021	0.107
		[2.987]	[2.141]	[2.621]	[3.436]	[2.494]	[2.179]	[2.888]	[2.915]	[0.069]	[0.058]	[0.105]	[0.075]	[0.065]	[0.054]	[0.096]	[0.072]
	Aid 50% perc.	-2.755	2.233	0.064	0.150	-2.112	2.664	-1.269	1.452	-0.015	0.069	-0.003	0.016	0.059	0.044	0.068	0.065
		[2.191]	[1.877]	[2.417]	[2.883]	[2.030]	[1.868]	[2.689]	[2.400]	[0.057]	[0.057]	[0.113]	[0.074]	[0.063]	[0.057]	[0.101]	[0.070]
	Aid 80% perc.	-4.721*	-1.191	-7.156*	-4.249	-4.241**	0.534	-6.245	-2.516	-0.038	0.245**	0.128	-0.108	0.056	0.244*	0.252	-0.074
		[2.559]	[2.881]	[4.168]	[2.985]	[1.816]	[2.095]	[4.116]	[2.737]	[0.083]	[0.103]	[0.173]	[0.124]	[0.093]	[0.139]	[0.166]	[0.149]
ME of Aid at	Frag. 20% perc.	0.147	0.177	0.122	0.220	0.186	0.109	0.107	0.301	0.192	-0.118	-0.081	0.476*	0.127	-0.183	-0.159	0.368
		[0.168]	[0.114]	[0.088]	[0.155]	[0.151]	[0.107]	[0.104]	[0.220]	[0.200]	[0.159]	[0.135]	[0.239]	[0.181]	[0.159]	[0.148]	[0.239]
	Frag. 50% perc.	0.092	0.006	-0.018	0.175*	0.139	0.027	0.014	0.242	0.168	-0.036	-0.013	0.308*	0.125	-0.092	-0.083	0.244
		[0.095]	[0.103]	[0.093]	[0.095]	[0.118]	[0.102]	[0.093]	[0.153]	[0.139]	[0.114]	[0.103]	[0.140]	[0.142]	[0.123]	[0.115]	[0.158]
	Frag. 80% perc.	0.068	-0.081	-0.090	0.154*	0.086	-0.062	-0.085	0.177*	0.146	0.041	0.050	0.156*	0.122	0.013	0.006	0.112
		[0.079]	[0.120]	[0.113]	[0.092]	[0.097]	[0.132]	[0.123]	[0.105]	[0.092]	[0.090]	[0.086]	[0.085]	[0.105]	[0.095]	[0.089]	[0.098]
ME of Fragmentation at	Capacity Proxy 20% perc.		-2.420	-2.366	-6.407*		-2.304	-2.887	-5.038		0.076	0.081	-0.043		0.138	0.157	0.065
			[3.000]	[2.997]	[3.285]		[3.233]	[3.410]	[3.948]		[0.149]	[0.138]	[0.089]		[0.113]	[0.120]	[0.099]
	Capacity Proxy 50% perc.		-4.251	-3.120	-6.279***		-2.993	-3.484	-4.571**		0.105	0.04	-0.186*		0.183	0.139	-0.098
			[3.282]	[2.857]	[2.185]		[2.992]	[2.935]	[1.995]		[0.170]	[0.135]	[0.109]		[0.129]	[0.127]	[0.116]
	Capacity Proxy 80% perc.		-5.701	-3.277	-6.187		-3.538	-3.609	-4.237		0.129	0.031	-0.289*		0.219	0.136	-0.215
			[4.137]	[2.998]	[3.827]		[3.819]	[3.023]	[3.361]		[0.196]	[0.138]	[0.147]		[0.159]	[0.133]	[0.159]
ME of Interaction at	Capacity Proxy 20% perc.		-0.516*	-0.799	-0.217		-0.343	-0.539	-0.360		0.026***	0.019	-0.008		0.03**	0.020	-0.007
			[0.300]	[0.542]	[0.402]		[0.221]	[0.558]	[0.342]		[0.008]	[0.016]	[0.009]		[0.012]	[0.014]	[0.012]
	Capacity Proxy 50% perc.		-0.454	-1.068*	-1.123		-0.272	-0.741	-0.888		0.024*	0.018	-0.032		0.027	0.027	-0.037
			[0.425]	[0.553]	[0.830]		[0.349]	[0.497]	[0.721]		[0.013]	[0.012]	[0.023]		[0.017]	[0.016]	[0.029]
	Capacity Proxy 80% perc.		-0.391	-1.394	-1.925		-0.201	-0.984	-1.355		0.022	0.017	-0.053		0.023	0.035	-0.064
			[0.667]	[1.110]	[1.548]		[0.550]	[0.930]	[1.213]		[0.023]	[0.018]	[0.037]		[0.028]	[0.025]	[0.047]

Notes: The control variables are defined in the appendix, Table A1. All regressions include period- and country-fixed effects, and use the Anderson-Hsiao correction for initial GDP per capita to adjust for the Nickell Bias (Anderson and Hsiao 1982). For all marginal effects presented in the tables, the other explanatory variables are kept at their mean, except for the specific variable indicated to vary between the 20th and the 80th percentile. The marginal effect (ME) of fragmentation refers to the change in the outcome variable for a one-unit change in the fragmentation index for different levels of aid (first three rows below the main table) and for different levels of capacity (third group of rows below the main table). The ME of aid refers to the change in the outcome variable for a one-unit change in aid for different levels of the fragmentation index. Finally, the ME of the interaction refers to the interaction effect for different levels of capacity. Standard errors clustered at the country level are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

Table 2 shows four sets of regressions, one for each of the four fragmentation indices discussed above. In each set, the first regression includes only a single interaction term, namely the interaction between aid and the respective fragmentation index. The coefficient of the interaction term and its significance indicate whether, across all aid recipients, fragmentation shows the negative relationship on any additional aid dollar disbursed that we would expect given the existing consensus on its negative consequences. Accordingly, the marginal effect of aid would be more positive (or, equivalently, less negative) at small levels of fragmentation than at high levels of fragmentation (marginal effects are shown in the lower part of the table).

In contrast to the influence that fragmentation may exert via a possibly reduced effect of aid inflows, the marginal effect of fragmentation shows the relationship with fragmentation as such, i.e., the direct effect the donor structure has on growth. It is usually expected that this relationship, too, should be negative (e.g., Knack and Rahman 2007).

The other three regressions in each set further multiply the interaction term of aid and fragmentation with bureaucratic quality (second regression), absence of corruption (third regression) and initial GDP per capita (forth regression). This allows to differentiate the effect of fragmentation on aid effectiveness between countries at different levels of development and corresponding administrative capacities, which could help them to deal with (or even benefit from) multiple donors. The sign and significance of the double-interactions show whether and in which direction the initial interaction term between aid and fragmentation is influenced by the additional variables. Based on the existing prevailing state of knowledge, we would expect any negative interaction between aid and fragmentation to become more negative for countries with low capacity (i.e., the coefficient of the double-interaction should be positive). In these regressions, the marginal effects of fragmentation itself as well as the marginal effect of ODA can also be distinguished between the different levels of capacity. While the marginal effect of ODA by level of development is not the focus of our study, the information can be used to check the plausibility of our overall specification.

A first glance at Table 2 shows that there are few significant coefficients. Adopting a significance level of 10% as we do, on average, coefficients will be significant in 1 out of 10 regression specifications by pure coincidence, even if the actual effect of the other variables of interest is zero. The overall impression is that this is an accurate description of what we find. Specifically, the coefficient of the interaction term between aid and fragmentation, which we can directly interpret in the models without further double-interactions (1), (5), (9), and (13), is never significant. This can also be seen in the almost horizontal slopes of most of the marginal effects of aid at different levels of fragmentation in Figure 3.

Figure 3: Marginal effects of aid at different levels of fragmentation,
Burnside and Dollar specification (1970-2005), 4-year periods
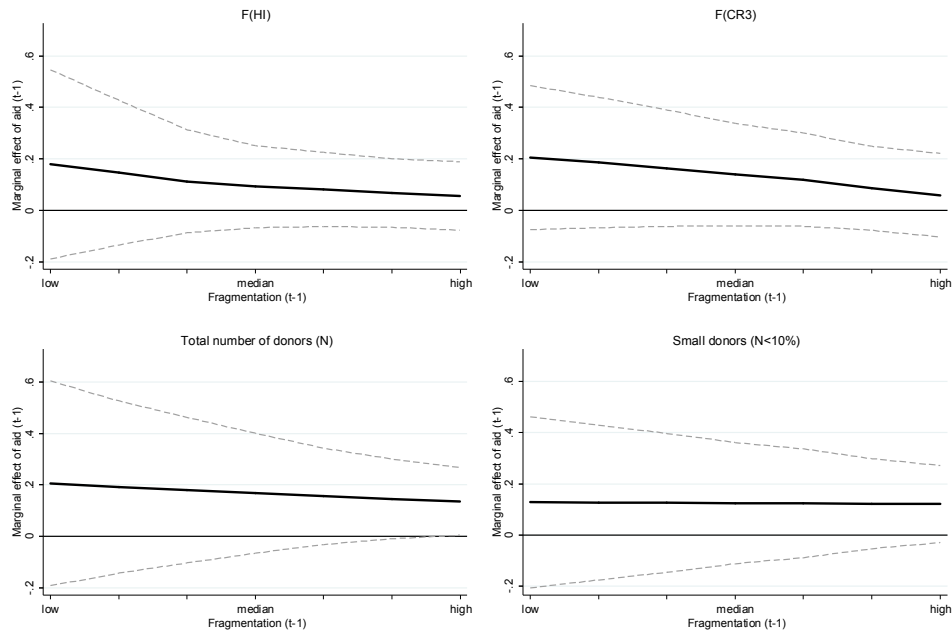
Notes: The graphs are based on Table 2, regressions (1), (5), (9) and (11). The dotted lines correspond to the 90% confidence interval of the marginal effects.

Figure 4: Marginal effects of fragmentation at different levels of ODA,

Burnside and Dollar specification (1970-2005), 4-year periods
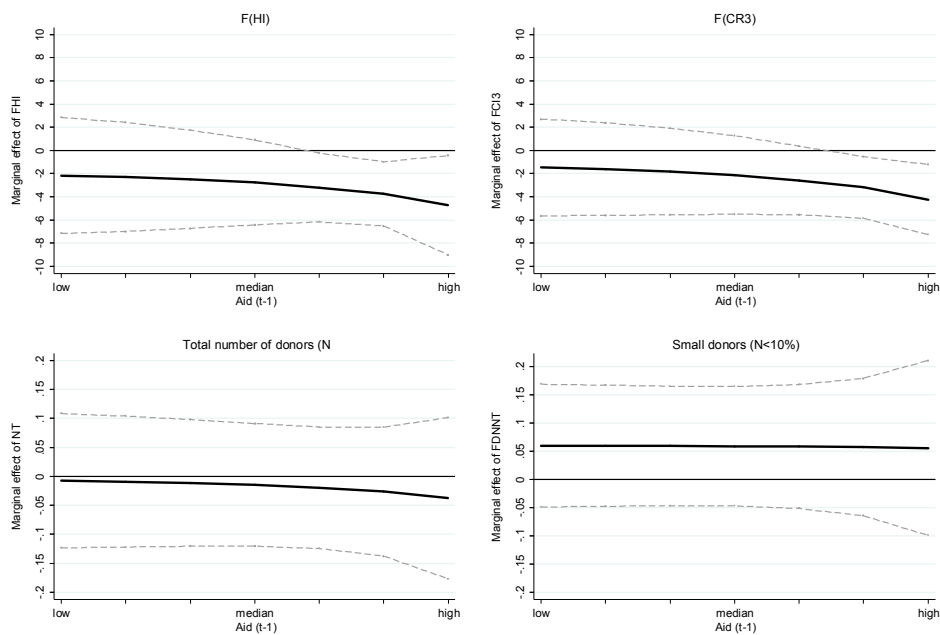
Notes: The graphs are based on Table 2, regressions (1), (5), (9) and (11). The dotted lines correspond to the 90% confidence interval of the marginal effects.

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The results that come closest to the general expectation in the literature are those for the first two sets of regressions, when we use fragmentation indices based on the Herfindahl index F(HI), or on the concentration ratio F(CR3). Regressions (1), (3), and (5) suggest that fragmentation may be detrimental to growth at very high levels of ODA (measured at the 80th percentile of aid received) (see also Figure 4). The distinction between different levels of ODA is important since small amounts of aid (and the related disbursement procedures and characteristics like fragmentation) cannot be expected to have an equally visible effect on broad macroeconomic variables compared to aid volumes that amount to a significant share of GDP (Knack and Rahman 2007). What is more, high levels of ODA per capita are typically disbursed to recipient countries with a low level of development and hence capacity, which is consistent with a possibly greater need for some large donors that can take the lead in coordinating aid activities. When we look at the marginal effect at different levels of capacity measured in terms of initial GDP per capita, we find similar results (regressions (4) and (8)). The marginal effect of aid is positively significant in these regressions as well but surprisingly, only for the higher, rather than for the lower levels of fragmentation. As expected, the point estimates are smaller for countries with higher fragmentation, but the differences are not significant. While the interaction term between aid and fragmentation is never significant on average, it shows the expected negative and significant coefficient for small (regression 2) and medium (regression 3) levels of capacity.

For the other two sets of regressions, i.e., the regressions using the number of donors and the number of small donors as indicators of fragmentation, the relevant estimates are mostly insignificant or point to a direction of the effect that is inconsistent with the common theoretical arguments. According to regressions (10) and (14), for instance, the number of (insignificant) donors seems to be positively related to growth when ODA is high. In regression (12) the marginal effect of fragmentation is negative and significant, but only for high (rather than for low) levels of capacity. According to the size of the marginal effects, the richest recipient countries would suffer most from any increase in donor numbers. These results seem implausible and lack theoretical foundation. We refrain from interpreting them in more detail as they may simply reflect statistical noise and thus be spurious. Finally, the interaction between fragmentation and aid turns significantly positive (rather than negative) when looking at low-capacity countries – an outcome that equally runs against theoretical expectations. It is interesting to observe these unexpected signs. While insignificant coefficients with the expected signs could simply reflect a lack of statistical power or variation that does not allow precise identification, the lack of any systematic structure casts doubt on this interpretation.

Table 3: Aid, fragmentation and GDP p.c. growth, Rajan and Subramanian specification (1971-2005), 5 year periods

Fragmentation index		F(HI)				F(CR3)				Total number of donors (N)				Small donors (N<10%)			
Dependent variable: GDP p.c. growth								Sample: Rajan & Subramanian									
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Aid		0.324**	-0.064	-0.303	-5.811	0.162	-0.073	-0.379	-5.671**	0.349**	-0.007	-0.857	-8.491***	0.346**	0.630	-0.440	-7.682**
		[0.151]	[0.822]	[0.811]	[4.619]	[0.127]	[0.338]	[0.365]	[2.723]	[0.158]	[0.725]	[1.116]	[2.993]	[0.167]	[0.713]	[0.820]	[3.133]
Aid^2		-0.001	-0.003	-0.004	-0.002	0.001	-0.003	-0.001	-0.002	-0.001	-0.002	-0.004	0.001	-0.002	-0.002	-0.002	0.000
		[0.003]	[0.004]	[0.003]	[0.003]	[0.003]	[0.006]	[0.004]	[0.004]	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]	[0.004]	[0.003]	[0.003]
Fragmentation		0.985	2.862	-0.561	-4.799	0.774	5.779	-2.466	-21.475	0.099**	0.24	0.262	0.515	0.115**	0.159	0.286	0.500
		[1.772]	[6.741]	[5.089]	[32.868]	[1.985]	[5.684]	[7.382]	[34.418]	[0.047]	[0.263]	[0.188]	[0.869]	[0.056]	[0.242]	[0.210]	[1.331]
Aid x Fragmentation		-0.415***	0.051	0.171	6.056	-0.490***	0.012	0.274	10.507**	-0.014***	-0.004	0.021	0.248**	-0.019***	-0.037	0.007	0.353**
		[0.139]	[1.094]	[1.027]	[5.228]	[0.169]	[0.961]	[0.862]	[5.182]	[0.004]	[0.025]	[0.036]	[0.105]	[0.006]	[0.035]	[0.038]	[0.175]
Aid x Fragmentation x Bureaucratic Quality		-	-0.041	-	-	-	-0.138	-	-	-	0.010	-	-	-	0.032	-	-
			[0.381]				[0.409]				[0.014]				[0.020]		
Aid x Fragmentation x Absence of Corruption		-	-	-0.105	-	-	-	-0.244	-	-	-	-0.002	-	-	-	0.003	-
				[0.295]				[0.266]				[0.009]				[0.010]	
Aid x Fragmentation x Initial GDP		-	-	-	-3.118	-	-	-	-5.311**	-	-	-	-0.128**	-	-	-	-0.182**
					[2.497]				[2.448]				[0.050]				[0.084]
Adj. R-Squared		0.57	0.61	0.62	0.56	0.57	0.61	0.62	0.57	0.58	0.62	0.63	0.57	0.57	0.62	0.62	0.57
Number of observations		382	229	229	376	382	229	229	376	382	229	229	376	382	229	229	376
Number of countries		63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
ME of Fragmentation at	Aid 20% perc.	0.810	1.918	2.114	0.791	0.567	0.172	0.918	0.388	0.093**	0.128	0.130	0.081	0.107*	0.095	0.092	0.103
		[1.736]	[3.206]	[3.125]	[1.851]	[1.938]	[3.650]	[3.761]	[2.070]	[0.047]	[0.143]	[0.115]	[0.050]	[0.054]	[0.109]	[0.098]	[0.063]
	Aid 50% perc.	0.163	1.877	1.892	0.124	-0.197	-0.226	0.210	-0.448	0.072	0.154	0.155	0.053	0.078	0.133	0.118	0.065
		[1.615]	[2.920]	[2.926]	[1.661]	[1.779]	[3.320]	[3.415]	[1.832]	[0.043]	[0.141]	[0.112]	[0.047]	[0.051]	[0.104]	[0.092]	[0.060]
	Aid 80% perc.	-2.038	1.721	1.028	-2.127	-2.796*	-1.776	-2.546	-3.272**	0.000	0.253	0.249*	-0.039	-0.021	0.279**	0.218*	-0.064
		[1.392]	[4.242]	[4.088]	[1.299]	[1.483]	[4.221]	[3.749]	[1.405]	[0.040]	[0.166]	[0.140]	[0.043]	[0.053]	[0.135]	[0.128]	[0.068]
ME of Aid at	Frag. 20% perc.	0.078	0.022	0.008	0.100	0.104	0.074	0.040	0.174*	0.152	-0.130	-0.171	0.164	0.148	-0.127	-0.168	0.141
		[0.102]	[0.144]	[0.133]	[0.095]	[0.102]	[0.161]	[0.146]	[0.095]	[0.105]	[0.163]	[0.180]	[0.099]	[0.108]	[0.145]	[0.164]	[0.109]
	Frag. 50% perc.	0.012	0.018	-0.015	0.032	0.043	0.041	-0.018	0.108	0.051	-0.061	-0.105	0.033	0.058	-0.058	-0.120	0.021
		[0.102]	[0.114]	[0.116]	[0.099]	[0.101]	[0.125]	[0.119]	[0.093]	[0.097]	[0.121]	[0.135]	[0.085]	[0.099]	[0.120]	[0.132]	[0.094]
	Frag. 80% perc.	-0.026	0.017	-0.024	-0.007	-0.024	0.009	-0.076	0.034	-0.030	0.002	-0.045	-0.070	-0.016	0.021	-0.066	-0.080
		[0.105]	[0.122]	[0.125]	[0.106]	[0.104]	[0.128]	[0.125]	[0.101]	[0.097]	[0.103]	[0.109]	[0.085]	[0.098]	[0.108]	[0.109]	[0.094]
ME of Fragmentation at	Capacity Proxy 20% perc.	2.406	1.122	0.213		2.256	-0.999	-0.49		0.207	0.244**	0.089		0.101	0.208**	0.106	
		[3.505]	[3.430]	[1.896]		[3.206]	[3.797]	[1.896]		[0.165]	[0.120]	[0.056]		[0.133]	[0.096]	[0.079]	
	Capacity Proxy 50% perc.	1.724	1.589	-0.898		-1.319	-0.868	-1.711		0.191	0.187	0.007		0.204*	0.153	0.002	
		[3.067]	[3.041]	[1.444]		[3.417]	[3.186]	[1.584]		[0.143]	[0.116]	[0.043]		[0.107]	[0.097]	[0.059]	
	Capacity Proxy 80% perc.	1.042	1.994	-1.662		-4.894	-0.753	-2.551		0.175	0.139	-0.049		0.307**	0.106	-0.070	
		[4.156]	[3.068]	[1.649]		[5.135]	[3.192]	[1.873]		[0.147]	[0.120]	[0.046]		[0.143]	[0.110]	[0.067]	
ME of Interaction at	Capacity Proxy 20% perc.		0.010	-0.040	-0.093		-0.126	-0.213	0.035		0.007	0.017	-0.004		-0.005	0.013	-0.005
			[0.777]	[0.590]	[0.352]		[0.673]	[0.518]	[0.407]		[0.014]	[0.020]	[0.012]		[0.019]	[0.021]	[0.012]
	Capacity Proxy 50% perc.		-0.030	-0.146	-0.541**		-0.264	-0.457	-0.728***		0.017	0.015	-0.022***		0.027	0.016	-0.031***
			[0.549]	[0.505]	[0.189]		[0.562]	[0.494]	[0.206]		[0.015]	[0.014]	[0.005]		[0.017]	[0.015]	[0.009]
	Capacity Proxy 80% perc.		-0.074	-0.273	-0.944**		-0.413	-0.752	-1.414***		0.028	0.012	-0.039***		0.062	0.020	-0.054***
			[0.548]	[0.613]	[0.420]		[0.736]	[0.636]	[0.378]		[0.026]	[0.012]	[0.008]		[0.034]	[0.016]	[0.016]

Notes: The control variables are defined in the appendix, Table A1. All regressions include period- and country-fixed effects, and use the Anderson-Hsiao correction for initial GDP per capita to adjust for the Nickell Bias (Anderson and Hsiao 1982). For all marginal effects presented in the tables, the other explanatory variables are kept at their mean, except for the specific variable indicated to vary between the 20th and the 80th percentile. The marginal effect (ME) of fragmentation refers to the change in the outcome variable for a one-unit change in the fragmentation index for different levels of aid (first three rows below the main table) and for different levels of capacity (third group of rows below the main table). The ME of aid refers to the change in the outcome variable for a one-unit change in aid for different levels of the fragmentation index. Finally, the ME of the interaction refers to the interaction effect for different levels of capacity. Standard errors clustered at the country level are reported in parentheses.

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

Figure 5: Marginal effects of aid at different levels of fragmentation, Rajan and Subramanian specification (1971-2005), 5 year periods
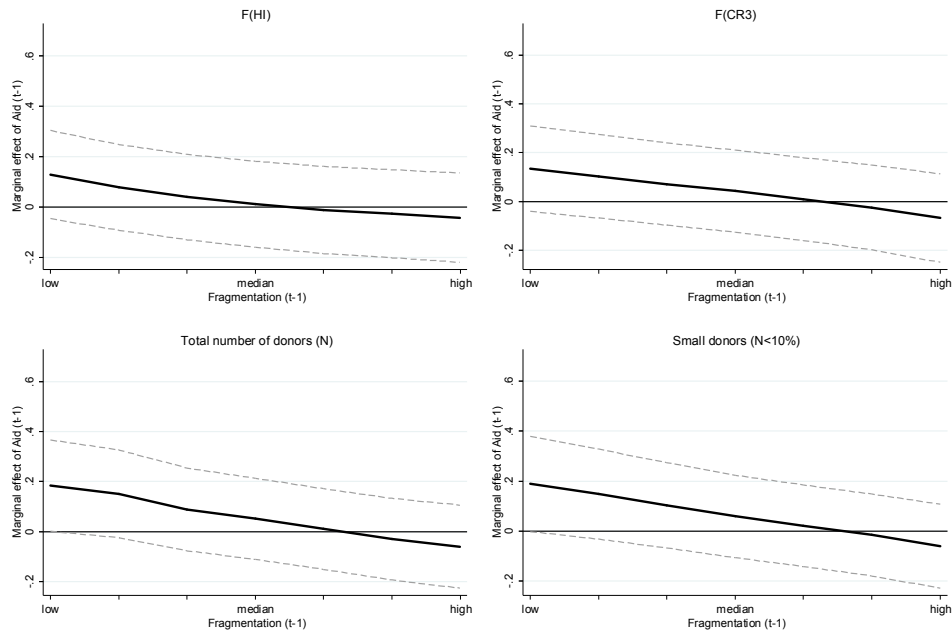
Notes: The graphs are based on Table 3, regressions (1), (5), (9) and (11). The dotted lines correspond to the 90% confidence interval of the marginal effects.

Figure 6: Marginal effects of fragmentation at different levels of ODA, Rajan and Subramanian specification (1971-2005), 5 year periods
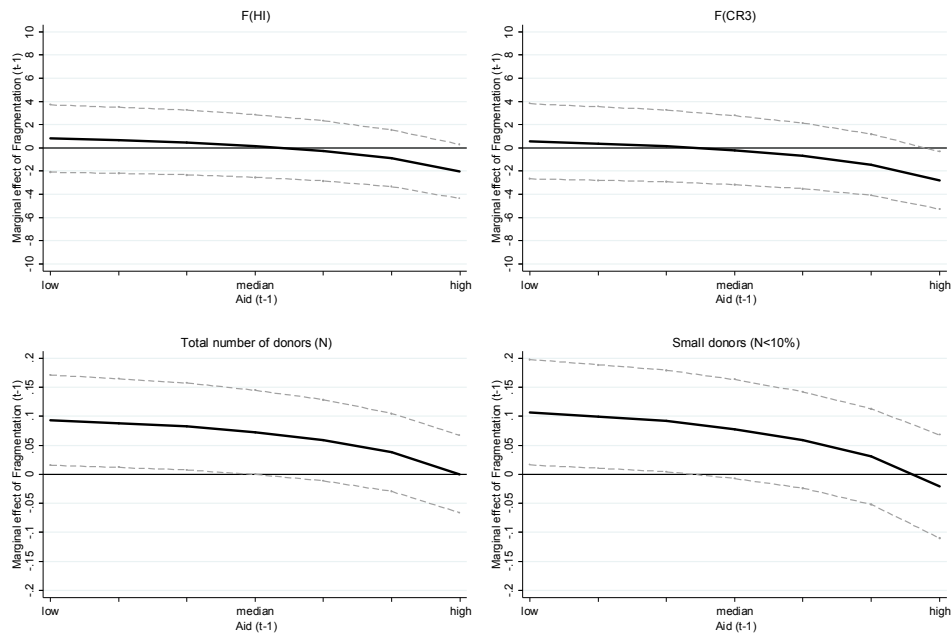
Notes: The graphs are based on Table 3, regressions (1), (5), (9) and (11). The dotted lines correspond to the 90% confidence interval of the marginal effects.

In summary, while the results based on the Herfindahl index and the concentration index are not overly robust, but generally in line with the expected negative effect of fragmentation – notably under conditions of low capacity – the two indices based on donor numbers deliver results opposed to those expected in the literature. For the latter two, the few significant results might be an artifact of testing a multitude of different hypotheses. If we were to interpret them as evidence, the outcomes would broadly indicate that more, rather than less donors are beneficial for recipient countries. Comparing the four indicators provides a first indication that the first two indices in this setting seem to rather capture the proclaimed negative effects of a lack of concentration and lead donors. The more positive relation with the latter two could supposedly capture the potential benefits of being able to choose among donors, donor competition, and knowledge transfers. Still, the main result is that there is no clear, homogenous effect of what is commonly referred to as fragmentation, and also no clear statistical evidence for a positive effect of "pluralism."

We now turn to Clemens et al.'s permutation of Rajan and Subramanian (2008) to test whether our results are due to the specific setup of the Burnside and Dollar specifications. These regressions use data averaged over five years and cover about the same period as before (1971-2005).[10] Our results are presented in Table 3.

Regarding the negative interaction between aid and fragmentation, the regression results are more in line with expectations than those based on the Burnside and Dollar specifications. Indeed, the coefficient of the interaction term is negative and significant in all four regressions in which it can be interpreted directly (i.e., columns (1), (5), (9), and (13), where no triple interactions are included). Correspondingly, all the graphs included in Figures 5 and 6 show clear negative slopes. The triple-interaction terms with the absorption capacity proxies reveal no clear conditional differences overall. There are some surprising exceptions, however. The overall negatively significant interaction term between aid disbursements and fragmentation seems to be driven mostly by countries with higher capacity when measured in terms of initial income, i.e., columns (4), (8), (12), and (16). As can be seen in the lowest quarter of the marginal effects being displayed, the interaction term turns negative and becomes significant for recipient country groups with higher initial income, while it is insignificant for countries with lower income.

In other respects, regression outcomes resemble the heterogeneous results of the Burnside-Dollar specifications. In particular, just as in Table 2 above, Table 3 and Figure 5 show that the direct effect of fragmentation is only rarely negative and significant. As before, this is the case only when ODA is very high (at the 80th percentile), and even in this context of high aid, we obtain a significant result only in 2 out of 16 different specifications for this marginal effect (columns (5) and (8), both based on fragmentation measured on the basis of the F(CR3) concentration index). Moreover, whenever the marginal effects of fragmentation refer to the simple donor count (N) or to the DAC number of small donors, all significant coefficients are positive, rather than negative, which is inconsistent with a negative effect of additional

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[10] The base regression we build upon is presented by Clemens et al. (2012) in Table 9, column 7.

donors on aid effectiveness. In fact, the number of counter-intuitive, positively significant coefficients is remarkably high. We find them in columns (9) and (13) for low levels of aid, in columns (11), (14) and (15) for high aid levels, and, equally in columns (11), (14) and (15), for low and medium levels of capacity.[11]

Taken together, the evidence examined so far suggests that, if at all, only F(HI) or F(CR3) systematically reflect problems related to the fragmentation of bilateral aid, and generally, this is more visible in recipient countries with high aid inflows and (surprisingly) high capacity. It seems that the presence of a few strong donors can protect from a possible negative effect of fragmentation, so that the overall number of donors or the number of small donors is less relevant in this respect. In fact, if we were to take the results for the latter two indicators at face value, rather than to discard them as a statistical artifact, a greater number of donors would appear conducive, rather than harmful to growth. Generally, the evidence for a negative effect of fragmentation is limited. Most of the marginal effects we computed remain insignificant, and most of the results do not provide systematic evidence indicating an effect of fragmentation.

3.3. The effect of aid fragmentation on bureaucratic quality

To assess whether we find similar (non-)results for different outcome variables we next turn to bureaucratic quality. This is the area in which fragmentation is usually expected to have the most direct negative effect. The reason is that the transaction costs supposedly induced by fragmentation should primarily hit the overburdened recipient country's bureaucracy in charge of coordinating the different aid inflows and donor demands. The most influential and widely cited study investigating the role of fragmentation on bureaucratic quality is the cross-sectional analysis in Knack and Rahman (2007), who use the ICRG's bureaucratic quality index in 2001 as their dependent variable. They then estimate how the average donor fragmentation over the last 20 years relates to bureaucratic quality in 2001.

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[11] Regression (14) also shows a positive and significant marginal effect of fragmentation for high levels of capacity (here bureaucratic quality), but this seems more plausible than at lower levels.

Table 4: Aid, fragmentation, and bureaucratic quality

Fragmentation index		F(HI)				F(CR3)				Total number of donors (N)				Small donors (N<10%)			
ICRG bureaucratic quality rating									Sample: Knack & Rahman								
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Aid		0.019	0.077	-0.498	0.378**	-0.001	0.048	-0.174	0.116	0.103	0.389**	0.250	0.345***	0.099	0.421**	0.352	0.179
		[0.121]	[0.278]	[0.490]	[0.161]	[0.058]	[0.111]	[0.233]	[0.074]	[0.073]	[0.169]	[0.269]	[0.080]	[0.080]	[0.186]	[0.245]	[0.122]
Fragmentation		-0.070	-0.117	-3.997	2.071	0.094	-0.459	-3.159	2.072	-0.016	0.172**	0.112	0.147***	-0.021	0.239***	0.153*	0.165**
		[0.993]	[2.130]	[3.320]	[1.547]	[1.194]	[2.245]	[3.150]	[1.516]	[0.031]	[0.083]	[0.090]	[0.046]	[0.042]	[0.088]	[0.081]	[0.065]
Aid x Fragmentation		-0.065	-0.067	0.570	-0.476**	-0.073	-0.054	0.337	-0.306**	-0.005*	-0.015**	-0.011	-0.014***	-0.009	-0.026**	-0.025	-0.013
		[0.143]	[0.329]	[0.567]	[0.191]	[0.124]	[0.240]	[0.474]	[0.150]	[0.003]	[0.006]	[0.010]	[0.003]	[0.005]	[0.011]	[0.015]	[0.008]
Aid x Fragmentation x Bureaucratic Quality		-	-0.010	-	-	-	-0.011	-	-	-	0.004	-	-	-	0.007	-	-
		-	[0.114]	-	-	-	[0.097]	-	-	-	[0.002]	-	-	-	[0.005]	-	-
Aid x Fragmentation x Absence of Corruption		-	-	-0.200	-	-	-	-0.129	-	-	-	0.002	-	-	-	0.006	-
		-	-	[0.172]	-	-	-	[0.136]	-	-	-	[0.003]	-	-	-	[0.006]	-
Aid x Fragmentation x Initial GDP		-	-	-	0.000**	-	-	-	0.000	-	-	-	0.000	-	-	-	0.000
		-	-	-	[0.000]	-	-	-	[0.000]	-	-	-	[0.000]	-	-	-	[0.000]
Adj. R-Squared		0.220	0.240	0.210	0.360	0.220	0.240	0.210	0.360	0.280	0.360	0.270	0.440	0.270	0.350	0.280	0.400
Number of observations		89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
Number of countries		89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
ME of Fragmentation at	Aid 20% perc.	-0.111	-0.181	-0.665	0.834	0.048	-0.214	-0.250	1.060	-0.020	-0.002	-0.027	0.093***	-0.027	0.013	-0.036	0.094**
		[0.928]	[0.943]	[1.013]	[1.092]	[1.141]	[1.085]	[1.218]	[1.089]	[0.030]	[0.028]	[0.030]	[0.034]	[0.040]	[0.035]	[0.035]	[0.045]
	Aid 50% perc.	-0.303	-0.446	-0.586	1.303	-0.169	-0.443	-0.292	1.261	-0.035	-0.022	-0.044*	0.067**	-0.052	-0.019	-0.061*	0.033
		[0.700]	[0.700]	[0.737]	[0.814]	[0.939]	[0.912]	[0.978]	[0.877]	[0.026]	[0.024]	[0.025]	[0.029]	[0.034]	[0.031]	[0.032]	[0.036]
	Aid 80% perc.	-0.826	-1.168	-0.371	2.582	-0.759	-1.070	-0.405	1.812	-0.076***	-0.076***	-0.091***	-0.003	-0.123**	-0.108*	-0.132**	-0.133
		[1.150]	[1.206]	[1.199]	[1.583]	[1.054]	[1.044]	[1.218]	[1.821]	[0.028]	[0.022]	[0.029]	[0.061]	[0.051]	[0.055]	[0.053]	[0.103]
ME of Aid at	Frag. 20% perc.	-0.023	-0.020	-0.038	0.007	-0.016	-0.016	-0.029	0.020	-0.005	0.000	0.001	0.058	-0.026*	-0.024*	-0.027*	0.078
		[0.031]	[0.033]	[0.036]	[0.043]	[0.034]	[0.034]	[0.042]	[0.048]	[0.017]	[0.015]	[0.017]	[0.047]	[0.014]	[0.014]	[0.015]	[0.050]
	Frag. 50% perc.	-0.032*	-0.033**	-0.035**	0.029	-0.025	-0.026	-0.031	0.029	-0.030***	-0.032***	-0.027**	0.015	-0.049***	-0.054***	-0.050***	0.022
		[0.017]	[0.016]	[0.017]	[0.035]	[0.021]	[0.021]	[0.025]	[0.037]	[0.011]	[0.010]	[0.011]	[0.031]	[0.017]	[0.015]	[0.016]	[0.034]
	Frag. 80% perc.	-0.036**	-0.039***	-0.033**	0.041	-0.036**	-0.037***	-0.033**	0.039	-0.048***	-0.055***	-0.047***	-0.015	-0.073**	-0.083***	-0.074***	-0.033
		[0.016]	[0.014]	[0.013]	[0.039]	[0.015]	[0.013]	[0.012]	[0.042]	[0.015]	[0.013]	[0.017]	[0.036]	[0.028]	[0.027]	[0.027]	[0.040]
ME of Fragmentation at	Capacity Proxy 20% perc.		-0.653	-0.376	-0.653		-0.773	-0.465	0.237		0.019	-0.038	0.049		0.008	-0.071*	0.054
			[1.088]	[1.006]	[1.107]		[1.128]	[1.208]	[1.175]		[0.035]	[0.026]	[0.036]		[0.044]	[0.038]	[0.053]
	Capacity Proxy 50% perc.		-0.725	-0.544	0.605		-0.715	-0.289	0.871		-0.032	-0.073***	0.043		-0.043	-0.098**	0.009
			[0.753]	[0.754]	[0.808]		[0.865]	[0.887]	[0.879]		[0.023]	[0.025]	[0.029]		[0.035]	[0.040]	[0.036]
	Capacity Proxy 80% perc.		-0.798	-0.713	3.832**		-0.658	-0.113	2.498		-0.082***	-0.109***	0.030		-0.095*	-0.125*	-0.106
			[0.813]	[1.363]	[1.648]		[0.952]	[1.263]	[1.975]		[0.022]	[0.038]	[0.065]		[0.048]	[0.065]	[0.115]
ME of Interaction at	Capacity Proxy 20% perc.		-0.077	0.171	-0.271**		-0.064	0.079	-0.185		-0.011***	-0.007	-0.012***		-0.019***	-0.013**	-0.016***
			[0.232]	[0.246]	[0.138]		[0.162]	[0.221]	[0.114]		[0.004]	[0.005]	[0.003]		[0.007]	[0.006]	[0.006]
	Capacity Proxy 50% perc.		-0.093	-0.029	0.327		-0.081	-0.050	0.168		-0.005**	-0.005*	-0.007		-0.009	-0.007	-0.022
			[0.146]	[0.138]	[0.252]		[0.124]	[0.128]	[0.265]		[0.002]	[0.003]	[0.008]		[0.006]	[0.006]	[0.015]
	Capacity Proxy 80% perc.		-0.106	-0.362	4.313**		-0.095	-0.265	2.523		-0.001	-0.002	0.024		0.000	0.003	-0.069
			[0.213]	[0.284]	[2.001]		[0.207]	[0.210]	[1.924]		[0.004]	[0.005]	[0.057]		[0.012]	[0.013]	[0.108]

Notes: The control variables are defined in the appendix, Table A1. All regressions include period- and country-fixed effects, and use the Anderson-Hsiao correction for initial GDP per capita to adjust for the Nickell Bias (Anderson and Hsiao 1982). For all marginal effects presented in the tables, the other explanatory variables are kept at their mean, except for the specific variable indicated to vary between the 20th and the 80th percentile. The marginal effect (ME) of fragmentation refers to the change in the outcome variable for a one-unit change in the fragmentation index for different levels of aid (first three rows below the main table) and for different levels of capacity (third group of rows below the main table). The ME of aid refers to the change in the outcome variable for a one-unit change in aid for different levels of the fragmentation index. Finally, the ME of the interaction refers to the interaction effect for different levels of capacity. Standard errors clustered at the country level are reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

We replicate their cross-section results for the 1982-2001 period in Table 4, where we use their regression specification for the full set of recipients (Knack and Rahman 2007, Table 1, equation 1) as basis of our analysis. While Knack and Rahman separately discuss results for aid volumes and project numbers,[12] we only look at aid volumes based on DAC data – as in the aid and growth regressions considered previously. The only conceptual difference between the original regression and column (1) in Table 4 is that we add an interaction term between aid and fragmentation. Just as in Tables 2 and 3 above, this allows us to assess not only the direct effect of fragmentation, but also the influence of fragmentation on the effect of an increased volume in ODA disbursements.

To be consistent with our prior replications, we use the same proxies for capacity as before: initial bureaucratic quality, corruption and GDP. In addition, following the original paper, we control for initial buraucratic quality in all regressions (including those where we use other capacity proxies). All these variables are strongly positively correlated with bureaucratic quality in 2001 and the risk of omitted variable bias driving some of the results is stronger than in the other areas we examine.

As shown in Table 4, regarding bureaucratic quality we find many more significant coefficients in line with a negative effect of fragmentation than in the previous section. But even here, the picture is not as clear as one might expect. The structure of Table 4 corresponds to those of our earlier regression tables. Hence, the simple regression with a single interaction term between aid and fragmentation measured using F(HI) (column (1)) is repeated in columns (5), (9), and (13) using the three alternative fragmentation indicators. In line with expectations, the coefficient estimate of the interaction is always negative in these regressions. However, this relationship is significantly different from zero only in a single case (column (9) for the total number of donors), and even there only at the 10% significance level. This is surprising since it indicates that there is no robust, statistically significant difference between the effect of aid at low levels versus high levels of fragmentation.

When looking at the marginal effect of aid, we do find that at high levels of fragmentation, it is negatively associated with bureaucratic quality, and remarkably robust across all indicators of fragmentation. But for a number of specifications, it is equally negative for low levels of fragmentation. In sum, the role that fragmentation plays regarding the relationship between aid and bureaucratic quality is much less clear than anticipated. One implication for donors might be to generally design their interventions more carefully to avoid such

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[12] As discussed in Knack and Rahman (2007: 186f.), but also, for instance, in Kilby (2011) and Dreher and Michaelowa (2010), measuring project level fragmentation has several advantages, but also disadvantages, notably the severely reduced data availability for early years. Results with the two other measures are available on request; however, there is no clear pattern. Some interactions of fragmentation with aid turn out to be significant, and fragmentation seems to be more negative at higher aid levels. There is no systemically relevant and consistent relationship between fragmentation and bureaucratic quality.

negative effects, independently of the level of fragmentation. There might be some need to further study where the negative relationship with bureaucratic quality actually comes from: Is it only the increased administrative burden or a problem of aid facilitating corruption and reducing bureaucratic accountability? So far, this is theoretically and empirically unclear.

Turning to the direct effect of fragmentation, which is the focus of Knack and Rahman's paper, we were able to recover their results, but only for two of the four fragmentation indicators we considered and for high levels of aid: When looking at the total number of donors or at the number of small donors, fragmentation at high aid shows a significant negative relationship with bureaucratic quality in the majority of our regression specification (columns (9)-(11) and (13)-(15)). The non-significant results for small aid recipients is plausible: If aid does not play an important role, its management only requires limited administrative resources, and, as a consequence, bureaucratic quality is not much affected by some additional donors. This difference is generally consistent with Knack and Rahman's approach to select just the major aid recipients for their preferred regressions: They already imply that only after a certain point does the addition of further donors affect bureaucratic quality in a negative way.

Even with respect to the direct effect of fragmentation, however, some of the results are difficult to reconcile with theoretical conjectures. It seems that the negative marginal effects of fragmentation for the two indicators based on donor numbers is driven by countries with high levels of capacity (see columns (10), (11), (14) and (15)), the opposite of what we would expect. In contrast, when looking at the interaction term for different levels of capacity, results seem broadly in line with expectations. They indicate that at low capacity, the detrimental effect of fragmentation on aid effectiveness is higher.

In sum, once again, we find that the results are ambiguous and only partially in line with theoretical expectations. This is remarkable as bureaucratic quality is the area that is most directly linked with the problems typically evoked in the context of aid fragmentation.

In addition, it should be emphasized that the evidence we find in support of a negative effect of fragmentation on bureaucratic quality is all based on those two indicators that appeared least appropriate to show a potentially negative association with economic growth, i.e., the number of donors and the number of small donors. While Knack and Rahman themselves start their analysis with F(HI), they also find that this measure is not ideal to capture the negative relationship they intend to show. While their alternative is to use project counts, we use donor counts, and both seem to work equally well.

This result suggests that additional donors can add to the administrative burden of developing country bureaucracies, even if they are insignificant in terms of the funding they provide. In contrast, regarding the correlation of fragmentation with growth, if anything, it

was the existance of lead donors that seemed to matter. Thus, if we assume that these results can be meaningfully interpreted, we are left with a puzzle. Lead donors might matter for growth, but not for bureaucratic quality. If their existence is related to growth, it must be via other channels. One could imagine that the existance of lead donors allows the donor community to stear the economy directly. This may lead to improved economic policy, but without real involvement or ownership of the recipient country administration.

Yet, even if this is true, the other part of the puzzle remains to be resolved. If the generally expected negative effect of fragmentation on growth works – indirectly – through increased bureaucratic burdens, then the same indicators relevant in the context of bureaucratic quality should also be relevant for growth. Why, then, do we not observe any clear relationship of the donor count or the number of small donors with economic growth? As stated above, there is some evidence that it is related to deteriorations in bureaucratic quality, at least under certain conditions. By adding more donors, there could be a shift from time spent on substantive decision-making and public sector administration to time spent on meeting donor delegations, attending receptions, and donor-related paper work. However, this negative relation is either not sufficiently strong or too noisy in a statistical sense to lead to measurable negative correlations with growth.

This strongly supports our argument that the way we measure fragmentation has a substantial influence on the empirical results we obtain. Given the important implications for donor policies, there should be both more theoretical work on the measurement and the channels via which fragmentation can have direct and indirect effects as well as more thorough empirical investigations.

We continue our re-examination with an analysis of a specific sector of intervention – education policies and outcomes.

3.4. The effect of aid fragmentation on education

The education sector is one of the social sectors which were characterized above as typically accommodating for a much higher number of donors than other sectors. According to Frot and Santiso (2010: 22) the education sector is the most fragmented of all sectors. We are thus interested to test what effect fragmentation has on outcomes in this sector, and how it affects the relationship between aid and educational outcomes. The first studies investigating the effectiveness of education aid were Michaelowa and Weber (2007) and Dreher et al. (2008). Both studies find a generally positive relationship between aid and primary school enrolment, albeit their interpretation somewhat differs with respect to the size and robustness of the effect. In a recent update, Birchler and Michaelowa (2013) confirm these results based on the more comprehensive sectoral DAC disbursement data now available. In their Table 1, regression 2 (Birchler and Michaelowa 2013: 6) they use a regression

specification of aid on education similar to the work of Clemens et al. (2012), and hence most easily comparable to the analysis in section 3.2. We build on this specification by adding the variables related to fragmentation and, where necessary, the variables relevant for the different interaction terms. The data cover the 1996-2010 period, and are aggregated to three periods covering five years each. The dependent variable is the net primary enrolment rate (in percent). Results are presented in Table 5, which is again structured in the way as those in the previous sections.

Overall the outcomes are clear: There is no evidence for a negative effect of fragmentation on education either directly or indirectly through reduced aid effectiveness. The interaction term between aid and fragmentation is never significant at conventional levels, independently of the indicator used. This is visible for the four columns (1), (5), (9) and (13), in which the interaction term can be interpreted directly, and also for the other regressions when examining the interaction effect for different levels of capacity. None of these interactions is significant at conventional levels, and in about half of the specifications their sign is positive, rather than negative.

Similarly, except for column (3) – measuring the effect of the Herfindahl index – we do not observe any significant negative marginal effect of fragmentation on enrolment, and in some regressions based on the number of donors or small donors, the estimates even turn positive, sometimes significantly so (see column (9)). In column (3), the one case where we find a significant negative relationship, it does not appear where it would be expected. In fact, the marginal effect of fragmentation is significant only for low and medium aid levels, and, again surprisingly, at low levels of corruption.

In addition, the marginal effect of aid is generally positive and sometimes significant at high levels of fragmentation, while it is insignificant (except for column (16)) when fragmentation is low.[13] This is the opposite of what is widely expected and suggests that in the education sector, fragmentation may even have a positive side. Thus we cannot reject the hypothesis that in sectors with particularly strong fragmentation, recipients also adjust relatively well to the situation, or that aid activities are such that they are more easy to manage. The result may also be related to the numerous NGOs active in the social sectors. As compared to their numbers and activities, the number of official donors considered here is generally negligible.

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[13] Note that overall, the effect of aid on education is mostly positive and sometimes significant just as in the original papers by Michaelowa and Weber (2007) or Dreher et al. (2008). Furthermore, the size of the coefficient estimate is comparable to the one in the base regression by Birchler and Michaelowa (2013, Table 1, regression 2). Hence, the addition of the fragmentation variables does not affect the original results in a substantive way.

Table 5: Education aid, fragmentation, and primary enrolment

Fragmentation index		F(HI)				F(CR3)				Total number of donors (N)				Small donors (N<10%)			
Net enrolment rate (%)							Sample: Birchler & Michaelowa										
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Aid		-0.045	-0.056	-0.304	-0.042	0.024	0.118	-0.139	0.081	0.015	-0.060	-0.382	0.121	0.126	0.010	-0.205	0.252**
		[0.068]	[0.382]	[0.230]	[0.154]	[0.034]	[0.140]	[0.125]	[0.065]	[0.087]	[0.409]	[0.274]	[0.159]	[0.100]	[0.239]	[0.443]	[0.127]
Fragmentation		-2.637	-9.041	-19.550	3.088	8.621	1.663	5.225	16.271	1.001	0.983	0.739	0.991	0.859	2.022	0.993	1.151
		[8.690]	[32.591]	[23.004]	[10.592]	[15.860]	[56.220]	[44.146]	[18.603]	[0.614]	[1.027]	[1.134]	[0.603]	[0.756]	[1.343]	[1.704]	[0.747]
Aid x Fragmentation		0.142	0.253	0.397	0.216	0.125	0.085	0.420	0.121	0.001	0.006	0.016	-0.002	-0.006	0.002	0.013	-0.011
		[0.109]	[0.578]	[0.312]	[0.216]	[0.159]	[0.639]	[0.357]	[0.208]	[0.005]	[0.018]	[0.013]	[0.007]	[0.006]	[0.015]	[0.028]	[0.008]
Aid x Fragmentation x Bureaucratic Quality			-0.104				-0.044				-0.003				-0.002		
			[0.304]				[0.334]				[0.010]				[0.007]		
Aid x Fragmentation x Corruption				-0.135				-0.143				-0.006				-0.007	
				[0.130]				[0.157]				[0.005]				[0.011]	
Aid x Fragmentation x Initial GDP					0.000				0.000				0.000				0.000
					[0.000]				[0.000]				[0.000]				[0.000]
Adj. R-Squared		0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990
Number of observations		258	166	166	254	258	166	166	254	258	166	166	254	258	166	166	254
Number of countries		110	75	75	107	110	75	75	107	110	75	75	107	110	75	75	107
ME of Fragmentation at	Aid 20% perc.	-2.102	-12.939	-19.874*	1.502	9.093	-9.489	-14.562	10.432	1.003	-0.309	-0.290	0.636	0.836	-0.283	-0.223	0.574
		[8.535]	[11.318]	[10.296]	[8.587]	[15.522]	[21.721]	[20.143]	[14.158]	[0.611]	[0.712]	[0.922]	[0.603]	[0.755]	[0.852]	[0.990]	[0.669]
	Aid 50% perc.	-0.501	-11.730	-19.051*	1.583	10.506	-9.316	-13.695	8.173	1.009*	-0.295	-0.296	0.575	0.767	-0.297	-0.311	0.470
		[8.179]	[10.465]	[9.660]	[8.064]	[14.611]	[20.308]	[18.795]	[12.993]	[0.605]	[0.717]	[0.921]	[0.589]	[0.756]	[0.842]	[0.975]	[0.650]
	Aid 80% perc.	5.551	-6.721	-15.641	1.884	15.849	-8.599	-10.105	-0.211	1.032*	-0.239	-0.323	0.348	0.508	-0.353	-0.676	0.083
		[8.456]	[10.657]	[9.746]	[7.387]	[12.946]	[17.109]	[16.550]	[13.125]	[0.620]	[0.810]	[0.977]	[0.581]	[0.817]	[0.951]	[1.009]	[0.635]
ME of Aid at	Frag. 20% perc.	0.003	0.024	0.017	-0.002	0.026	0.054	0.025	0.033	0.017	0.037	0.052	0.073	0.116	0.067	0.127	0.124*
		[0.036]	[0.044]	[0.026]	[0.033]	[0.032]	[0.042]	[0.031]	[0.034]	[0.071]	[0.084]	[0.086]	[0.067]	[0.090]	[0.093]	[0.094]	[0.071]
	Frag. 50% perc.	0.039*	0.041*	0.029*	-0.001	0.036	0.055*	0.030	0.016	0.019	0.042	0.050	0.049	0.098	0.064	0.105	0.095*
		[0.023]	[0.024]	[0.017]	[0.024]	[0.024]	[0.032]	[0.022]	[0.025]	[0.052]	[0.062]	[0.063]	[0.048]	[0.073]	[0.067]	[0.072]	[0.054]
	Frag. 80% perc.	0.062**	0.051**	0.036	0.000	0.056**	0.057**	0.038	-0.015	0.023	0.048	0.047	0.012	0.068	0.060	0.079*	0.051
		[0.029]	[0.024]	[0.024]	[0.030]	[0.026]	[0.024]	[0.026]	[0.039]	[0.028]	[0.035]	[0.036]	[0.028]	[0.045]	[0.039]	[0.046]	[0.031]
ME of Fragmentation at	Capacity Proxy 20% perc.		-4.604	-13.982	9.614		-1.955	-3.265	17.281		0.402	0.135	0.817		0.721	0.022	0.606
			[12.975]	[9.000]	[10.165]		[19.763]	[18.254]	[15.261]		[0.869]	[0.856]	[0.656]		[0.942]	[0.993]	[0.778]
	Capacity Proxy 50% perc.		-12.473	-17.480*	6.348		-10.597	-10.508	11.463		-0.546	-0.223	0.661		-0.791	-0.397	0.455
			[9.348]	[8.903]	[8.807]		[18.105]	[16.681]	[13.372]		[0.759]	[0.888]	[0.612]		[0.884]	[0.906]	[0.701]
	Capacity Proxy 80% perc.		-12.473	-20.979*	-5.435		-10.597	-17.751	-9.532		-0.546	-0.581	0.100		-0.791	-0.817	-0.087
			[9.348]	[11.031]	[7.104]		[18.105]	[17.685]	[14.295]		[0.759]	[0.973]	[0.593]		[0.884]	[1.065]	[0.630]
ME of Interaction at	Capacity Proxy 20% perc.		0.149	0.161	0.168		0.041	0.170	0.048		0.003	0.005	-0.003		0.000	0.000	-0.011
			[0.287]	[0.121]	[0.184]		[0.324]	[0.161]	[0.173]		[0.009]	[0.005]	[0.006]		[0.010]	[0.010]	[0.007]
	Capacity Proxy 50% perc.		0.045	0.060	0.094		-0.004	0.063	-0.065		0.000	0.000	-0.004		-0.002	-0.006	-0.010
			[0.120]	[0.105]	[0.137]		[0.154]	[0.168]	[0.166]		[0.005]	[0.005]	[0.005]		[0.007]	[0.006]	[0.006]
	Capacity Proxy 80% perc.		0.045	-0.008	-0.164		-0.004	-0.008	-0.457		0.000	-0.003	-0.008		-0.002	-0.009	-0.007
			[0.120]	[0.139]	[0.128]		[0.154]	[0.213]	[0.435]		[0.005]	[0.006]	[0.007]		[0.007]	[0.009]	[0.007]

Notes: The control variables are defined in the appendix, Table A1. All regressions include period and country fixed effects, and use the Anderson-Hsiao correction for initial GDP per capita to adjust for the Nickel Bias (Anderson and Hsiao 1982). For all marginal effects presented in the tables, the other explanatory variables are kept at their mean, except for the specific variable indicated to vary between the 20th and the 80th percentile. The marginal effect (ME) of fragmentation refers to the change in the outcome variable for a one-unit change in the fragmentation index for different levels of aid (first three rows below the main table) and for different levels of capacity (third group of rows below the main table). The ME of aid refers to the change in the outcome variable for a one-unit change in the aid for different levels of the fragmentation index. Finally, the ME of the interaction refers to the interaction effect for different levels of capacity. Standard errors clustered at the country level are reported in parentheses.

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

Taken together, the results for the education sector do not suggest any negative effect of fragmentation. Overall, the results support our earlier skeptical and cautious conclusions. There is no systematic pattern that supports a generally negative effect of fragmentation, and the results differ depending on the sector and the choice of the respective indicator. If we take these results at face value, they imply the need to differentiate much more when discussing fragmentation. However, given the frequency of insignificant results and the lack of a systematic pattern, we cannot rule out the possibility that they represent artefacts of multiple testing rather than indicating true effects. In this case, the conclusion would be that – on the basis of the empirical evidence currently available – any judgements on the effect of fragmentation made on this basis so far were premature.

4. Conclusions

This paper set out to question the apparent consensus that fragmented aid is generally "bad" aid. Our systematic and detailed reexamination of the literature shows that theoretically, we should expect differences related to (i) the different concepts of fragmentation when using different indicators, (ii) the different outcomes under consideration, and (iii) the different recipient country contexts in terms of poverty and administrative capacity. The relevance of this differentiation finds some support in our empirical analysis. More specifically, the econometric analysis yields the following results: First, the generally expected negative effect of fragmentation is much less robust than common wisdom suggests. The results mostly in line with the existing literature are obtained with respect to bureaucratic quality, but even there, they are ambiguous. This is surprising as the channel through which fragmentation is usually expected to exert its negative effect, i.e., the strong bureaucratic burden it implies, should become directly visible here.

Second, the indicator that captures a negative effect of fragmentation (if any) differs between the different areas of analysis. To avoid a negative effect on growth, lead donorship might be of some importance, as the significant relationships in line with expectations are limited to the fragmentation indices based on the Herfindahl index and the concentration ratio taking into account the three major donors. By contrast, we observe a negative and significant relationship of fragmentation with bureaucratic quality only when we use the total number of donors or the DAC's measure of insignificant donors.

Third, the concerns about fragmentation do not appear to be equally founded in all areas. Despite the notoriously high number of donors in the education sector, we do not find any evidence of a negative effect there. One limitation is that we focus on official development assistance and ignore the multiple NGOs also active in the sector. For official development assistance, some coefficients even suggest that under certain conditions, more donors and lower, rather than higher donor concentration may be beneficial.

Fourth, the level of recipient capacity matters in some specifications, but not always in line with expectations. In some of the regressions of bureaucratic quality, for instance, the interaction term between aid and fragmentation becomes (more strongly) negative for low levels of capacity. However, we also find opposing effects, notably with respect to growth,

but even with respect to bureaucratic quality. Overall, the influence of different levels of capacity is much less clear than expected.

Finally, given the high number of insignificant results and the lack of a systematic pattern (even within individual areas and based on similar indicators) there is also the possibility that some of the significant relationships we observe represent artefacts of multiple testing. While the initial four results suggest the need for a generally more careful differentiation, this lack of robustness could also lead us to an even more cautious interpretation: The reason for the lack of systematic evidence for any effect of fragmentation could be the inadequacy of the currently available data. In both cases, we can conclude that on the basis of what we currently know, any general judgements about the effect of aid fragmentation are premature.

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Appendix

Table A1: Definition of variables and descriptive statistics

Variable name	Obs.	Mean	Std. Dev.	Min	Max	Definition	Sources
Burnside & Dollar (Table 2)							
GDP p.c. growth	377	1.23	3.35	-12.96	17.05	Average over annual growth rates of real GDP p.c. based on constant local currency.	World Bank (2007)*
Net ODA (% of GDP)	377	4.68	6.39	-0.13	42.52	ODA (OA) total net in % of GDP.	OECD/DAC (2012)
F(HI)	377	0.75	0.14	0.19	0.92	Fragmentation index based on Herfindahl Index for disbursements, calculated only for donor countries (1-Herfindahl).	OECD/DAC 2012
F(CR3)	377	0.33	0.14	0.04	0.63	Fragmentation index based on concentration ratio of disbursements for the 3 largest donors = 1- Sum of the share of largest three donors.	OECD/DAC (2012)
Total number of donors (N)	377	25.56	6.08	10.25	41.75	Number of donors active in one recipient country (bi- and multilateral).	OECD/DAC (2012)
Small donors (N<10%)	377	17.42	5.02	4.00	34.00	Number of insignificant donors. OECD definition: "Is the donor among the largest donors that cumulatively account for at least 90% of the partner country's aid."	OECD/DAC (2012)
Bureaucratic quality	288	1.72	0.95	0.00	3.50	Bureaucracy quality indicator, higher scores indicate better quality.	ICRG (2012)
Absence of Corruption	288	2.65	0.95	0.00	5.00	Corruption indicator, higher values indicate less corruption.	ICRG (2012)

Log initial GDP/capita	377	2.08	0.10	1.82	2.31	Logarithm of initial GDP p.c. in international prices.	Penn World Tables 6.2*
Policy Index	377	1.23	1.38	-5.57	3.20	Good Policy Index based on budget balance, inflation and trade openness (cf. Burnside and Dollar 2000). Components not included separately in regression.	Clemens et al. (2012)
Budget Balance	377	-0.08	0.64	-7.25	4.71	Overall budget balance, including grants. Measured as cash surplus/deficit in % of GDP.	World Bank (2005, 2007), IMF (2005)*
Inflation	377	0.26	0.53	-0.03	4.15	Natural log of (1+ consumer price inflation).	World Bank (2005, 2007), IMF (2005)*
Openness	377	0.46	0.48	0.00	1.00	Wacziarg-Welch (2008) extension of the initial Sachs and Warner (1995) Openness Index.	Wacziarg and Welch (2008), updated by Clemens et al. (2012)*
Institutional Quality	377	4.36	1.48	1.58	8.14	First non-missing value of the ICRG composite index [0, 10].	ICRG (2012)*
Assassinations	377	0.49	1.34	0.00	11.50	Average number of assassinations in a given phase.	Banks (2012, 2007)*
Ethnolinguistic Fractionalization	377	0.46	0.30	0.00	0.93	Ethnolinguistic fractionalization in a country in a given period.	Easterly and Levine (1997), Roeder (2001)*
Assassinations x Ethnolinguistic Fractionalization	377	0.16	0.55	0.00	7.36	Interaction between assassinations and ethnolinguistic fractionalization.	Banks (2012, 2007), Easterly and Levine (1997), Roeder (2001)*
M2 (% of GDP)	377	0.28	0.14	0.02	1.02	Money and quasi-money (M2) in % of GDP.	World Bank (2007)*

Rajan & Subramanian (Table 3)							
GDP p.c. growth	382	1.63	3.25	-12.30	13.12	Average annual growth rate of real GDP p.c. in constant international Dollars.	Penn World Tables 6.2 and World Bank (2007) for the year 2005*
Net ODA (% of GDP)	382	4.30	5.92	-0.06	40.27	ODA total net disbursement in % of GDP.	OECD/DAC (2012)
F(HI)	382	0.72	0.16	0.08	0.92	Fragmentation index based on Herfindahl Index for disbursements, calculated only for donor countries (1- Herfindahl).	OECD/DAC (2012)
F(CR3)	382	0.30	0.14	0.00	0.62	Fragmentation index based on concentration ratio of disbursements for the 3 largest donors = 1- Sum of the share of largest three donors.	OECD/DAC (2012)
Total number of donors	382	24.11	6.83	9.00	41.20	Number of donors active in one recipient country (bi- and multilateral).	OECD/DAC (2012)
Small donors (N<10%)	382	16.64	5.35	5.20	33.80	Number of insignificant donors. OECD definition: "Is the donor among the largest donors that cumulatively account for at least 90% of the partner country's aid."	OECD/DAC (2012)
Bureaucratic quality	284	1.87	0.96	0.00	4.00	Bureaucracy Quality Indicator, higher scores indicate better quality.	ICRG (2012)
Absence of corruption	284	2.78	1.01	0.00	6.00	Corruption indicator, higher values indicate less corruption.	ICRG (2012)
Log initial GDP/capita	382	2.09	0.10	1.82	2.34	Logarithm of initial GDP p.c. in international prices.	Penn World Tables 6.2*
Institutional Quality	382	-0.08	0.49	-5.51	2.35	Period averages of the sum of three components (Bureaucratic Quality, Rule of Law and Corruption) of the ICRG index, normalized to one.	ICRG (2012)*

Geography	382	0.23	0.47	0.00	4.19	Combination of the average number of frost days per month in winter and the fraction of a country's area in the tropics.	Bosworth and Collins (2003)*
Revolutions	382	0.41	0.49	0.00	1.00	Average number of revolutions in a period.	Banks (2007)*
Initial Life Expectancy	382	4.56	1.66	1.58	9.50	Natural logarithm of first non-missing value in each period of total life expectancy.	World Bank (2007)*
Inflation	382	-0.50	0.77	-1.04	1.53	Natural log of (1+consumer price inflation).	World Bank (2005, 2007), IMF (2005)*
Budget Balance	382	61.29	10.16	35.39	79.41	Overall budget balance, including grants. Measured as cash surplus/deficit as % of GDP.	World Bank (2005, 2007), IMF (2005)*
Ethnolinguistic Fractionalization	382	0.25	0.41	0.00	2.60	Ethnolinguistic fractionalization in a country in a given period.	Easterly and Levine (1997), Roeder (2001)*
Initial Policy	382	0.44	0.30	0.00	0.90	First non-missing value of the Wacziarg-Welch openness dummy.	Wacziarg and Welsh (2008)*
M2 (% of GDP)	382	2.90	7.89	0.00	60.76	Money and quasi-money (M2) in % of GDP.	World Bank (2007)*

Knack & Rahman (Table 4)							
Bureaucratic quality	89	2.28	1.07	0.00	4.00	Higher scores indicate better quality, value in 2001.	ICRG (2012)
K&R AiDA	89	79.21	12.14	15.94	90.54	1 - [Herfindahl index of donor concentration}. Calculated by summing the squared shares of aid over all donor agencies.	AiDA data base
K&R DAC	89	74.61	14.60	28.37	91.62	1 - [Herfindahl index of donor concentration]. Calculated by summing the squared shares of aid commitments over all donor agencies.	OECD/DAC (2012)
FHI	89	0.75	0.14	0.26	0.91	Fragmentation index based on Herfindahl Index for disbursements, calculated only for donor countries (1-Herfindahl).	OECD/DAC 2012
CR3	89	0.34	0.14	0.07	0.61	Fragmentation index based on concentration ratio of disbursements for the 3 largest donors = [1- Sum of the share of largest three donors].	OECD/DAC 2012
Total number of donors	89	25.41	4.81	11.50	32.60	Number of donors active in one recipient country (bi- and multilateral).	OECD/DAC 2012
Small donors (N<10%)	89	17.01	3.40	7.05	24.50	Number of insignificant donors. OECD definition: "Is the donor among the largest donors that cumulatively account for at least 90% of the partner country's aid."	OECD/DAC (2012)
Initial bureaucratic quality	89	2.25	1.20	0.00	6.00	Bureaucracy quality indicator, higher scores indicate better quality.	ICRG (2012)
Absence of corruption	89	2.72	1.14	0.00	6.00	Corruption indicator, higher values indicate less corruption.	Penn World Tables 6.2*
Log initial GDP p.c.	89	1488.27	1500.40	112.01	6771.52	Logarithm of initial GDP p.c. in international prices.	World Development Indicators

Population change/ initial population	89	1.94	1.07	-0.80	3.98	Change in population divided by initial population.	World Development Indicators
GDP p.c. change/ Initial GDP p.c.	89	1.11	2.44	-5.43	8.69	Change in GDP p.c. divided by initial GDP.	World Development Indicators
No. of years covered	89	15.89	4.87	3.00	19.00	Number of years covered by the cross-section.	ICRG (2012)
Aid/GNI	89	6.94	8.73	0.05	50.56	Aid flows as percentage of gross national income GNI.	World Development Indicators

Michaelowa & Birchler (Table 5)							
Net primary enrolment rate (%)	166	81.86	16.25	27.04	100.00	Net enrolment rate for primary education (%).	WDI (World Bank 2012)
Aid for primary education	166	51.78	73.35	0.09	494.18	Aid per capita allocated to education (disbursement, constant 2000 US$) / population.	OECD (2012), Creditor Reporting System (CRS)[2]
FHI	166	0.57	0.21	0.03	0.90	Fragmentation index based on Herfindahl Index for disbursements, calculated only for donor countries (1-Herfindahl).	OECD (2012), Creditor Reporting System (CRS)[2]
CR3	166	0.15	0.13	-0.29	0.54	Fragmentation index based on concentration ratio of disbursements for the 3 largest donors = 1- Sum of the share of largest three donors.	OECD (2012), Creditor Reporting System (CRS)[2]
Total number of donors	166	10.40	6.06	1.20	25.20	Number of donors active in one recipient country (bi- and multilateral).	OECD (2012), Creditor Reporting System (CRS)[2]

						Description	Source
Small donors (N<10%)	166	6.29	4.35	0.00	17.00	Number of insignificant donors. OECD definition: "Is the donor among the largest donors that cumulatively account for at least 90% of the partner country's aid."	OECD (2012), Creditor Reporting System (CRS)[2]
Initial bureaucratic quality	166	1.65	0.83	0.00	3.92	Initial bureaucracy quality indicator, higher scores indicate better quality.	ICRG (2012)
Absence of corruption	166	2.54	0.89	0.00	5.00	Corruption indicator, higher values indicate less initial corruption.	ICRG (2012)
Log initial GDP p.c.	164	4509.39	4735.63	239.07	23362.07	Logarithm of initial GDP p.c. in international prices.	WDI (World Bank 2012)
EDUCEXP	166	16.62	4.13	6.35	32.78	Public spending on education (% of government expenditure).	WDI (World Bank 2012)
PTR	166	34.77	13.48	11.14	79.98	Pupil-teacher ratio in primary education.	WDI (World Bank 2012)
YOUNG POP	166	37.59	7.92	14.80	49.64	Population aged 0-14 (% of total population).	WDI (World Bank 2012)
GDP per capita	166	4485.21	4712.06	239.07	23362.07	GDP per capita (constant 2000 US$).	WDI (World Bank 2012)
BUDGET (surplus)	166	-1.46	4.23	-18.40	35.14	Cash surplus/deficit (% of GDP).	WDI (World Bank 2012)
INFLATION	166	19.17	81.97	-4.07	1008.95	Inflation (consumer prices, % annual).	WDI (World Bank 2012)
OPEN	166	75.14	35.77	22.36	206.43	Openness (exports+imports as % of GDP).	WDI (World Bank 2012)
FREE	166	4.04	1.57	1.00	7.00	Freedom House (mean of political rights and civil liberties; lowest freedom=7, highest=1).	Freedom House (2011)

Note: DAC is the OECD's Development Assistance Committee; ICRG is the International Country Risk Guide.