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# Is the Sectoral Aid Allocation within Countries Need-Oriented?

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## Abstract

The paper focuses on an important dimension of donor aid allocation, which has largely been neglected in the empirical literature: the need orientation of donors when deciding on the sectoral composition of their recipient country portfolios. Employing sector-specific need indicators in logit and zero-one inflated beta estimations our results show that the degree of need orientation of donors depends on the sector. While in the sectors of governance, transport, environment protection, sexually transmitted diseases control including HIV/AIDS and emergency response, the analysis clearly points to a need-based allocation of resources, it is striking that need considerations seem not to play a role in the health and water and sanitation sectors. Remarkably, we find evidence for donor coordination within countries, in that donors took other donors' sector activities into account when deciding on the sectoral composition of their country portfolios.

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## Abbreviations

|                 |  |
|-----------------|--|
| CO <sub>2</sub> | carbon dioxide   |
| CRS             | Creditor Reporting System                              |
| DAC             | Development Assistance Committee                       |
| EU              | European Union   |
| GDP             | gross domestic product                                 |
| IDA             | International Development Association                  |
| ODA             | official development assistance                        |
| OECD            | Organisation for Economic Co-operation and Development |
| SDG             | Sustainable Development Goal                           |
| STD             | sexually transmitted disease                           |

## 1 Introduction

Recent studies on the allocation and effectiveness of aid provide evidence for aid being more effective if allocated according to need rather than political motives (Dreher, Eichenauer, & Gehring, 2018; Dreher, Klasen, Vreeland, & Werker, 2013). So far the question of how need-oriented aid has been allocated has mainly been investigated by looking at the cross-country allocation of aid (e.g. Alesina & Dollar, 2000). However, two important aspects are not considered in these studies. First, the geographical allocation of aid within recipient countries matters in terms of need orientation: does aid flow to the regions where the poor and needy are located or is aid rather concentrated in economic centres, where it is more easily implemented and more visible? Few studies deal with this question, while those that do arrive at rather discouraging results (Briggs, 2017, 2018; Nunnenkamp, Öhler, & Sosa Andres, 2017; Öhler, Negre, Smets, Massari, & Bogetic, 2017; Öhler & Nunnenkamp, 2014).

The second important aspect of donors' need orientation, which has largely been neglected in the empirical literature and is the focus of this paper, is the question of to what extent donors take sector-specific needs into account when deciding on the sectoral composition of their country aid portfolios. Arguably, donors can help achieve the Sustainable Development Goals (SDGs) of the 2030 Agenda by focusing on the areas where the respective recipient country still lags far behind the targets. Previously, Thiele, Nunnenkamp and Dreher (2007, p. 598) pointed out that the scant attention which the sectoral composition of aid has received "is surprising once it is taken into consideration that the sectoral composition of aid should have an important say on whether or not donors help achieving MDGs [Millennium Development Goals] other than the general target of halving absolute poverty".

In line with Öhler et al. (2017), assessing donors' sectoral allocation of aid within countries with respect to needs requires the consideration of a number of caveats. First of all, donors' within-country allocations are influenced by recipient country preferences and, therefore, not entirely at the donors' own discretion. Related to this, aid has been found to be (at least partly) fungible across sectors at country level (Collier & Dollar, 2002; Feyzioglu, Swaroop, & Zhu, 1998; Pack & Pack, 1993).<sup>1</sup> Insofar as aid is fungible, donors may not be able to target specific sectors where need is most urgent. Whether donors use information or not on the government's budgetary allocation is likely to affect the sectoral aid composition displayed by donors. However, causality may run in both directions. The government may adapt its allocation in response to that of the international donor community or the other way around, with donors allocating aid to those sectors where the government investments relative to needs are lowest.<sup>2</sup> Furthermore, not all aid modalities are meant to target specific sectors within countries. In particular, general budget support cannot be attributed to specific sectors and is, therefore, not considered in this study.

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1 Van de Sijpe (2013), however, finds limited fungibility in the case of education and health aid in the form of technical cooperation.

2 In a robustness test, we account for government expenditure in the health and education sector. Data limitations, however, prevent us from considering this variable for the other sectors.

Importantly, efficiency concerns may play a role in deciding the sectoral allocation of development assistance. That is, it may be inefficient to invest in sectors where the expected returns to aid are low (Dillinger, 2007), and this may lead to very different sectoral aid allocations than those solely based on needs (Carter, 2014). Related to this, the bureaucratic capacity and the quality of governance may vary substantially across sectors, implying different costs of implementation and different returns to aid. In addition, assessing the sectoral within-country aid allocation of donors by looking at the needs in the different sectors does not take into account general equilibrium effects. That means, different sectoral aid allocation patterns may have different effects on economic co-benefits, such as increased growth.

Within recipient countries, aid fragmentation and lack of donor coordination pose important challenges: well documented are the high transaction costs associated with fragmented aid (Negre & Klingebiel, 2016) and the negative impact of fragmentation on bureaucratic quality (Knack & Rahman, 2007), growth (e.g. Kimura, Mori, & Sawada, 2012) and aid tying (Knack & Smets, 2013).<sup>3</sup> Indeed, the international development community has committed themselves to better coordination on numerous occasions – the Paris Declaration on Aid Effectiveness, the Accra Agenda for Action, and the Busan Partnership for Effective Development Cooperation – although with limited results (Nunnenkamp, Öhler, & Thiele, 2013). Nevertheless, we assess donor coordination within countries, that is whether donors take other donors' aid activities into account when deciding on the sectoral composition of their country aid portfolios.

In our empirical analysis, we draw on sectorally disaggregated official development assistance (ODA) data of the 15 largest bilateral Development Assistance Committee (DAC)-donors (in terms of the absolute size of their ODA budgets) and the two main multilateral donors (the European Union (EU) and the World Bank's International Development Association (IDA)) for 2000-2015.<sup>4</sup> We use two dependent variables: the first one is a binary variable equal to one if a donor is engaged in a given sector in a given recipient country. Importantly, we also control for a donor's overall aid funds to a recipient country because a higher aid budget is expected to typically spread over a higher number of sectors. The second dependent variable we employ is a donor's sector-specific share in its overall aid budget to a recipient country. We use this variable, rather than sector-specific aid amounts, in order to focus exclusively on the donors' decisions on the sectoral composition of their country budgets.<sup>5</sup> We focus on 10 aid sectors and employ one need indicator for each sector as our variable of interest in order to estimate the degree of need orientation in the different sectors.<sup>6</sup>

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3 However, Gehring, Michaelowa, Dreher and Spörri (2017) find no systematic negative effect of aid fragmentation on the effectiveness of aid.

4 In order to classify aid flows according to sectors we use the Organisation for Economic Co-operation and Development (OECD) Creditor Reporting System (CRS) purpose codes.

5 The amount of aid a donor allocates to a specific sector in a recipient country is determined, partly, by the decision on the overall aid volume the respective recipient country receives and, partly, by the decision as to how the previously decided aid budget is allocated across the different sectors.

6 See Section 2 on the sectors and the corresponding need indicators employed.

Is the sectoral aid allocation within countries need-oriented?

Our results show that the degree of need orientation of donors depends on the sector. In the sectors of governance, transport, environment protection, sexually transmitted diseases (STD) control including HIV/AIDS<sup>7</sup> and emergency response, the analysis clearly indicates that the needs in these sectors play a significant role in whether donors decide to engage in these sectors and in the share of aid funds (of the overall country budget) they receive. However, it is striking that need considerations seem not to play a role in the health and water and sanitation sectors. On the positive side, our results show that donors typically take other donors' aid activities into account when deciding on the sectoral composition of their country portfolios.

Our paper proceeds as follows: Section 2 describes the data and method employed, while we present our results in Section 3; we conclude with a summary and discussion of our findings in Section 4.

## 2 Data, stylised facts and method

The data on ODA come from the Creditor Reporting System (CRS) database provided by the Organisation for Economic Co-operation and Development (OECD) DAC. The database contains detailed information on the sector-specific aid allocation of donors. As mentioned previously, we focus on the 15 largest bilateral DAC-donors and the two main multilateral donors (EU and IDA).<sup>8</sup> With respect to aid sectors, we chose those which account for a considerable share of overall aid and for which we were able to identify meaningful need indicators. These sectors and the corresponding (preferred) need indicators are: education (primary school enrolment); health (under-five mortality); water supply and sanitation (access to improved water source); government and civil society (control of corruption); transport and storage (paved roads); energy (access to electricity); agriculture, forestry and fishing (agricultural land); general environmental protection (carbon dioxide (CO<sub>2</sub>) emissions); STD control including HIV/AIDS (HIV prevalence); and emergency response (disaster-related deaths).<sup>9</sup> Our analysis covers the 2000-2015 period.

Before introducing our method, we present some stylised facts on the sectoral composition of donors' aid portfolios. Table 1 shows how the sectoral composition of aid developed from 2000 until 2015. While the share of aid provided for economic infrastructure projects (transport, energy) increased over time, the trend in the social infrastructure sectors is more ambiguous. We see a slight decline in the share of aid going to the education sector. In contrast, the share of aid for water and sanitation increased slightly and the increase in health

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7 “STD control including HIV/AIDS” is a subsector of “Population policies/programmes and reproductive health”. However, as STD control including HIV/AIDS constitutes 70.6 per cent of the sector and in order to use relevant need indicators which match the sectors employed, we decided to use the subsector in this case.

8 The 15 bilateral DAC-donors are Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom and the United States. These donor countries, plus the two multilateral donors, accounted for over 95 per cent of the overall DAC aid budget in 2000-2015.

9 Taken together, they represent 58.4 per cent of total aid in 2000-2015. See Appendix for the complete list of the need indicators, the exact definitions and the data sources.

aid is even more pronounced. Interestingly, the importance of governance and civil society increased until the 2008-2011 period, but decreased in more recent years. Aid for HIV/AIDS shows a similar trajectory, with a steep increase until 2008-2011. As expected, the aid share for environmental protection increased over time. Finally, a steady increase can also be observed in the share of humanitarian aid.

Table 2 shows the sectoral composition over the whole 2000-2015 period for the five highest contributing bilateral donors and the two multilateral donors. The figures reveal relatively pronounced differences in the donors' emphasis on the various aid sectors. While France and Germany clearly put most emphasis on education, Japan stands out when it comes to the share of aid for water and sanitation and transport. Health is not that important for any of the donors, with the United Kingdom (UK) and IDA having the highest share (below 8 per cent). In contrast, we see large differences among the donors in the case of governance and civil society: while the sector does not figure highly in the aid budgets of France and Japan (the share is below 2 per cent), the United States (US), IDA and the UK spend a significant share of their funds in that sector (above 13 per cent). When it comes to the fight against STDs including HIV/AIDS and emergency response, the US clearly stands out with respect to the share of aid money spent for these purposes.

While these figures are informative for a general assessment of donors' development foci, they cannot tell us anything about the need orientation of donors when it comes to the sectoral composition of their country portfolios. For this purpose, we need to rely on a more sophisticated empirical estimation strategy, which consists of two parts. In the first part, we analyse whether donors' selection of aid sectors in recipient countries is according to needs. For this purpose, we estimate a logit model where the dependent variable is a dummy variable (*Aid*) set equal to one if donor *i* is engaged in sector *s* in recipient country *r* in period *t*.

In the second part, we examine the need orientation of donor budgets in recipient countries. Thus, the dependent variable is the share of aid allocated by donor *i* towards sector *s* in recipient country *r* in period *t* (*Aid share*). Sector shares are used rather than sector-specific aid amounts to focus exclusively on donors' sectoral aid allocation decisions within countries. We estimate a zero-one inflated beta regression, because the dependent variable is bound between zero and one and has positive probability masses at both extremes, especially at zero.<sup>10</sup> Because of the high volatility of aid, we average our dependent as well as our independent variables over four year periods. In line with previous studies, we use aid commitments, rather than disbursements, because donors are expected to exert more control over this variable (Neumayer, 2003).

The estimation equations are as follows:

$$Aid_{irts} = \beta_0 + \beta_1 need_{rts} + \beta_2 ODA\ of\ other\ donors_{irts} + \beta_3 X'_{rt} + ODA_{irt} + \delta_i + \eta_r + \theta_t + \varepsilon_{irt} \quad (1)$$

$$Aid\ Share_{irts} = \beta_0 + \beta_1 need_{rts} + \beta_2 ODA\ of\ other\ donors_{irts} + \beta_3 X'_{rt} + ODA_{irt} + \delta_i + \eta_r + \theta_t + \varepsilon_{irt} \quad (2)$$

where *need* is our variable of interest (i.e. the sector-specific need indicators). *ODA of other donors* represents the log of total ODA allocated to the specific sector in

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10 See, for example, Ospina and Ferrari (2012). We use Maarten Buis' "zoib" estimator in Stata.

the respective recipient country by other bi- and multilateral DAC donors. By including this variable, we can test whether donors take other donors' activities in the respective sector into account when deciding on their engagement in the sector.  $X'$  is a vector of standard control variables in the aid allocation literature (the log of gross domestic product (GDP) per capita, the log of the population and control of corruption). With respect to our analysis, the level of development, the size and the quality of governance of a recipient country may influence donors' decisions on which sectors to engage in. Importantly, we account for total ODA of the donor allocated to the specific recipient country ( $ODA_{irt}$ ) in all estimations because a larger budget can be expected to spread, on average, over a larger number of sectors. In addition, we include recipient country ( $\delta_i$ ), donor ( $\eta_r$ ) and period fixed effects ( $\theta_t$ ). Standard errors are clustered at the level of recipient countries.

In our estimation strategy, we introduce the explanatory variables mentioned above in a stepwise process. In a first specification, we introduce the sector-specific need indicator and the log of the overall ODA allocated by a donor to a specific recipient country in a given period. In a second specification, sector-specific ODA of other donors is included, and in a third specification, GDP per capita, population and control of corruption are included as additional control variables.

### 3 Results

#### *Logit estimations*

In the first part of our econometric analysis, we investigate whether donors' selection of aid sectors in recipient countries has been need-oriented. For this purpose, we perform sector-specific logit estimations with a dummy variable as the dependent variable, which takes the value of one if a donor has been active in a given sector in a given recipient country and period. The logit estimations in Table 3 include the sector-specific need indicator and total ODA of the donor to the respective recipient country as explanatory variables. In addition, we introduce the log of sector-specific ODA of other donors in column (2) and other control variables in column (3) (GDP per capita, population and control of corruption).

The results in Table 3 show robust evidence of need orientation for some sectors: education, STD control including HIV/AIDS and emergency response.<sup>11</sup> For instance, the significant and negative coefficient of primary school enrolment suggest that a higher percentage of primary school enrolment leads to a lower likelihood of donors engaging in the education sector. With respect to the log of ODA of other donors, we find a significant and negative effect in most sectors (columns (2) and (3) of Table 3). This means that we find some coordination among donors taking place within countries. The calculation of marginal effects (not shown) reveals that the magnitude of the effect is significant. According to column (3), a 10 percent increase in ODA of other donors leads to a decrease in the likelihood that a donor engages in a certain sector by 0.20-0.66 percentage points, depending

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11 The significant and positive coefficient of *access to improved water sources* is rather counterintuitive. However, the variable is only significant at 10 per cent and loses its significance in column (3), where other control variables are included. There is also no sign of need orientation in this sector when we use *access to improved sanitation facilities* as an alternative need indicator.

on the sector.<sup>12</sup> The only sector where the variable turns out to be insignificant in both columns (2) and (3) is the government and civil society sector.<sup>13</sup> By contrast, ODA of other donors turns out to be significant and positive in the estimation of emergency response, where herding among donors is perceived as beneficial (Frot & Santiso, 2011).

#### *Estimations with the aid share as the dependent variable*

In the second part of our empirical analysis, we examine whether the sectoral composition of donors' aid budgets in recipient countries is need-oriented. In doing so, we use the sector-specific aid shares as our dependent variable. Results from zero-one inflated beta regressions are presented in Table 4. In column (1), we only include the sector-specific need indicator and total ODA of the donor to the respective recipient country as explanatory variables. The results with respect to the sectors of environment protection, STD control including HIV/AIDS and emergency response are in line with the findings of the logit regressions and show evidence for a need-oriented allocation of resources within recipient countries. These results are also robust to the introduction of the sector-specific ODA of other donors in column (2) and other control variables in column (3) (GDP per capita, population and control of corruption).

In addition, the results show robust evidence for need orientation in the transport sector, where a higher percentage of paved roads leads to a lower share of aid going into this sector, although at the 10 per cent significance level only. According to column (3), need considerations also appear to be present in the governance sector, where donors allocate higher shares of their aid funds when corruption is high. However, the results with respect to the social infrastructure sectors are puzzling. Whereas the coefficients on the need indicators for the education and water and sanitation sectors turn out to be insignificant,<sup>14</sup> the coefficient on under-five mortality is even counter-intuitive, as it turns out to be significant and negative in columns (1) and (2).<sup>15</sup> These results are no doubt surprising. However, the analysis does not take into account the government expenditures in the different sectors. It may be the case that donors take government expenditures in these sectors into account when deciding on the share of aid going into them, which would imply a potential omitted variable bias in our estimations. However, when we include government expenditures in education and health in the respective estimations (not shown), the results on the need indicators remain qualitatively the same. Of course, one cannot rule out some form of reverse causality either, as the donors' share of aid going into a sector may in fact improve the situation in that sector. Indeed, the coefficient of under-five mortality loses its significance when we lag the variable for one period.

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12 The extreme values correspond to 7.2 and 20.4 per cent of the mean of the dependent variable, respectively.

13 This finding may not necessarily be negative as Ziaja (2014) finds positive effects of aid fragmentation in the field of democracy promotion.

14 An exception is column (3) in the case of the water and sanitation sector, where *access to improved water sources* turns out to be positive and significant at the 10 per cent level. The coefficient of the need indicator in the case of the education sector stays insignificant if we use primary completion rate, secondary school enrollment or secondary completion rate instead of primary school enrollment.

15 There is also no evidence of need orientation if we consider infant mortality or maternal health (percentage of births attended by skilled health staff) instead.

With respect to the question on donor coordination, the results clearly show that donors take other donors' aid activities in the different sectors into account when deciding on the sectoral composition of their country portfolios. With the exception of emergency response, all coefficients of ODA by other donors enter significantly negative throughout the specifications. Hence, donors allocate a lower share of their aid budgets to a sector where other donors are already heavily engaged.

#### **4 Conclusion**

In this paper, we focus on an important dimension of donors' aid allocation, which has largely been neglected in the empirical literature: the need orientation of donors' country portfolios. Employing sector-specific need indicators we are able to examine the need orientation of donors in various sectors. Logit and zero-one inflated beta estimations show that the degree of need orientation of donors depends on the sector. While in the sectors of governance, transport, environment protection, STD control including HIV/AIDS and emergency response, the analysis clearly points to a need-based allocation of resources, it is striking that need considerations seem not to play a role in the health and water and sanitation sectors. Our mixed results are in line with Thiele et al. (2007) who also find need considerations to matter in some but not in all sectors.

On the positive side, our results show that donors take other donors' aid activities into account when deciding on the sectoral composition of their country portfolios. This is an important finding as cross-country studies came to rather negative conclusions in terms of donor coordination (e.g. Davies & Klasen, 2013). In contrast, our findings suggest that donor coordination takes place within recipient countries.

In summary, we conclude that donors could improve their aid allocation by taking greater account of sector-specific need indicators within recipient countries. This is particularly the case in the social infrastructure sectors. Only when donors allocate their country budgets according to need, can aid be used in the best way to help achieve the SDGs of the 2030 Agenda.



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## Tables

| Sectors                           | 2000-2003 | 2004-2007 | 2008-2011 | 2012-2015 |
|-----------------------------------|-----------|-----------|-----------|-----------|
| Education                         | 7.79      | 7.72      | 7.72      | 6.81      |
| Health                            | 4.71      | 5.46      | 6.01      | 6.86      |
| Water & sanitation                | 4.40      | 4.73      | 4.75      | 4.78      |
| Governance & civil society        | 9.42      | 12.08     | 12.37     | 10.20     |
| Transport & storage               | 6.28      | 5.77      | 8.00      | 8.56      |
| Energy                            | 4.09      | 4.63      | 5.81      | 8.30      |
| Agriculture, forestry and fishing | 5.13      | 4.24      | 5.50      | 5.75      |
| General environmental protection  | 2.40      | 2.29      | 3.40      | 3.19      |
| STD control including HIV/AIDS    | 1.94      | 3.96      | 5.29      | 4.07      |
| Emergency response                | 6.08      | 6.20      | 6.63      | 7.28      |

Source: Authors' calculations based on OECD-DAC CRS data

| Sectors                           | EU    | France | Germany | Japan | UK    | USA   | IDA   |
|-----------------------------------|-------|--------|---------|-------|-------|-------|-------|
| Education                         | 4.99  | 17.21  | 14.17   | 4.95  | 7.80  | 3.15  | 10.52 |
| Health                            | 2.91  | 2.99   | 2.61    | 2.47  | 7.57  | 5.04  | 6.99  |
| Water & sanitation                | 3.51  | 5.22   | 6.94    | 10.14 | 2.16  | 2.04  | 7.56  |
| Governance & civil society        | 15.15 | 1.54   | 9.68    | 1.89  | 13.50 | 15.81 | 13.55 |
| Transport & storage               | 9.09  | 6.97   | 2.49    | 24.59 | 1.95  | 2.69  | 11.82 |
| Energy                            | 5.67  | 4.80   | 10.96   | 12.63 | 2.02  | 3.56  | 10.74 |
| Agriculture, forestry and fishing | 5.16  | 4.23   | 3.75    | 5.33  | 2.99  | 3.97  | 10.04 |
| General environmental protection  | 2.45  | 5.47   | 3.87    | 2.66  | 3.54  | 1.58  | 1.69  |
| STD control including HIV/AIDS    | 0.16  | 0.16   | 0.63    | 0.05  | 2.91  | 12.41 | 1.01  |
| Emergency response                | 8.77  | 1.72   | 3.08    | 2.25  | 8.58  | 14.62 | 0.29  |

Source: Authors' calculations based on OECD-DAC CRS data

| <b>Table 3: Logit estimations for the 15 largest bilateral donors and the two main multilateral donors (EU and IDA)</b>   |            |            |            |
|---|------------|------------|------------|
| <b>Sector/need indicator</b>  | <b>(1)</b> | <b>(2)</b> | <b>(3)</b> |
| <b>Education</b>  |            |            |            |
| • Primary school enrolment  | -0.0208**  | -0.0228**  | -0.0193*   |
| • Ln ODA of other donors  |            | -0.266**   | -0.247**   |
| <b>Health</b>   |            |            |            |
| • Under-five mortality  | -0.00201   | -0.00334   | -0.000518  |
| • Ln ODA of other donors  |            | -0.0936    | -0.134*    |
| <b>Water &amp; sanitation</b>   |            |            |            |
| • Access to improved water sources  | 0.0255*    | 0.0273*    | 0.0216     |
| • Ln ODA of other donors  |            | -0.113**   | -0.137***  |
| <b>Government &amp; civil society</b>   |            |            |            |
| • Control of corruption   | -0.140     | -0.138     | -0.350     |
| • Ln ODA of other donors  |            | -0.00484   | -0.0577    |
| <b>Transport &amp; storage</b>  |            |            |            |
| • Paved roads   | 0.00667    | 0.00527    | 0.00642    |
| • Ln ODA of other donors  |            | -0.336**   | -0.336**   |
| <b>Energy</b>   |            |            |            |
| • Electricity access  | -0.00458   | -0.00396   | -0.00248   |
| • Ln ODA of other donors  |            | -0.0703    | -0.0950*   |
| <b>Agriculture, forestry and fishing</b>  |            |            |            |
| • Agricultural land   | 0.00786    | 0.00651    | 0.00383    |
| • Ln ODA of other donors  |            | -0.113     | -0.156**   |
| <b>General environmental protection</b>   |            |            |            |
| • CO <sub>2</sub> emissions   | 0.194      | 0.276      | 0.314      |
| • Ln ODA of other donors  |            | -0.188***  | -0.207***  |
| <b>STD control including HIV/AIDS</b>   |            |            |            |
| • HIV prevalence  | 0.122**    | 0.102*     | 0.148**    |
| • Ln ODA of other donors  |            | -0.267***  | -0.290***  |
| <b>Emergency response</b>   |            |            |            |
| • Ln disaster-related deaths  | 0.171**    | 0.165**    | 0.175**    |
| • Ln ODA of other donors  |            | 0.726***   | 0.681***   |
| Notes: Ln = natural logarithm.<br>Regressions are performed for each sector separately.<br>Column (1): need indicator and donor's total ODA to the respective country; column (2): (1) + Ln of ODA of other donors; column (3): (2) + GDP per capita, population and control of corruption.<br>Standard errors are clustered at the level of the recipient countries.<br>* p<0.1, ** p<0.05, *** p<0.01.<br>Source: Authors' estimations based on OECD-DAC CRS data |            |            |            |

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| <b>Table 4: Zero-one inflated beta estimations with the 15 largest bilateral donors and the two main multilateral donors (EU and IDA)</b>  |            |             |            |
|--|------------|-------------|------------|
| <b>Sector/need indicator</b>   | <b>(1)</b> | <b>(2)</b>  | <b>(3)</b> |
| <b>Education</b>   |            |             |            |
| • Primary school enrolment   | 0.00292    | 0.00235     | 0.000730   |
| • Ln ODA of other donors   |            | -0.151***   | -0.148***  |
| <b>Health</b>  |            |             |            |
| • Under-five mortality   | -0.00285** | -0.00364*** | -0.00190   |
| • Ln ODA of other donors   |            | -0.0731***  | -0.0779*** |
| <b>Water &amp; sanitation</b>  |            |             |            |
| • Access to improved water sources   | 0.0140*    | 0.00902     | 0.0137*    |
| • Ln ODA of other donors   |            | -0.0399***  | -0.0438*** |
| <b>Government &amp; civil society</b>  |            |             |            |
| • Control of corruption  | -0.117     | -0.0786     | -0.0241    |
| • Ln ODA of other donors   |            | -0.0650***  | -0.05953** |
| <b>Transport &amp; storage</b>   |            |             |            |
| • Paved roads  | -0.0106*   | -0.0104*    | -0.0108*   |
| • Ln ODA of other donors   |            | -0.0930***  | -0.0902*** |
| <b>Energy</b>  |            |             |            |
| • Electricity access   | -0.00468   | -0.00426    | -0.00417   |
| • Ln ODA of other donors   |            | -0.0334***  | -0.0401*** |
| <b>Agriculture, forestry and fishing</b>   |            |             |            |
| • Agricultural land  | 0.0168     | 0.0150      | 0.00916    |
| • Ln ODA of other donors   |            | -0.0923***  | -0.0982*** |
| <b>General environmental protection</b>  |            |             |            |
| • CO <sub>2</sub> emissions  | 0.180***   | 0.213***    | 0.196***   |
| • Ln ODA of other donors   |            | -0.0802***  | -0.0844*** |
| <b>STD control including HIV/AIDS</b>  |            |             |            |
| • HIV prevalence   | 0.0691***  | 0.0581**    | 0.0683*    |
| • Ln ODA of other donors   |            | -0.169***   | -0.175***  |
| <b>Emergency response</b>  |            |             |            |
| • Ln disaster-related deaths   | 0.137***   | 0.115***    | 0.107**    |
| • Ln ODA of other donors   |            | 0.203***    | 0.185***   |
| Notes: Regressions are performed for each sector separately.<br>Column (1): need indicator and donor's total ODA to the respective country; column (2): (1) + Ln of ODA of other donors; column (3): (2) + GDP per capita, population and control of corruption.<br>Standard errors are clustered at the level of the recipient countries.<br>* p<0.1, ** p<0.05, *** p<0.01.<br>Source: Authors' estimations based on OECD-DAC CRS data |            |             |            |

## Appendix

| <b>Table A.1: Definition of variables and data sources</b> |                                  |  |                   |
|--|----------------------------------|--|-------------------|
| <b>Sector (OECD CRS)</b>                                   | <b>Variable</b>                  | <b>Definition</b>  | <b>Source</b>     |
| Dependent variables  |                                  |  |                   |
|  | Aid                              | Dummy variable equal to 1 if a recipient country received any amount of ODA in a specific sector by a specific donor   | OECD (2017)       |
|  | Aid share                        | Recipient- and sector-specific ODA share allocated by a specific donor Ranges between 0 and 1  | OECD (2017)       |
| ODA-related control variables                              |                                  |  |                   |
|  | Donor's total ODA                | The recipient-specific ODA by a donor  | OECD (2017)       |
|  | ODA of other donors              | The sector-specific total ODA by other donors  | OECD (2017)       |
| Sector-specific need indicators                            |                                  |  |                   |
| I,1, Education, Total                                      | Primary enrolment                | Total number of students in the theoretical age group for primary education enrolled in that level, expressed as a percentage of the total population in that age group  | World Bank (2017) |
| I,2, Health, Total   | Under-five mortality             | Under-five mortality rate is the probability per 1,000 that a newborn baby will die before reaching age five, if subject to age-specific mortality rates of the specified year.  | World Bank (2017) |
| I,4, Water Supply & Sanitation, Total                      | Access to improved water sources | Access to an improved water source refers to the percentage of the population using an improved drinking water source.   | World Bank (2017) |
| I,5, Government & Civil Society, Total                     | Control of corruption            | Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. | World Bank (2017) |
| II,1, Transport & Storage, Total                           | Paved roads                      | Paved roads are those surfaced with crushed stone (macadam) and hydrocarbon binder or bituminized agents, with concrete, or with cobblestones, as a percentage of all the country's roads, measured in length.                       | World Bank (2017) |
| II,3, Energy, Total  | Electricity access               | Access to electricity is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys and international sources.  | World Bank (2017) |
| III,1, Agriculture, Forestry, Fishing, Total               | Agricultural land                | Agricultural land refers to the share of land area that is arable, under permanent crops and under permanent pastures.   | World Bank (2017) |
| IV,1, General Environment Protection, Total                | CO <sub>2</sub> emissions        | CO <sub>2</sub> emissions are those stemming from the burning of fossil fuels and the manufacture of cement.   | World Bank (2017) |
| STD control including HIV/AIDS                             | HIV prevalence                   | Prevalence of HIV refers to the percentage of people aged 15-49 who are infected with HIV.   | World Bank (2017) |

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|   |                                      |  |                   |
|---|--------------------------------------|--|-------------------|
| VIII,1,<br>Emergency<br>Response, Total | Ln<br>disaster-<br>related<br>deaths | Logarithm of the total number of deaths through natural disasters  | CRED (2017)       |
| Standard control variables              |                                      |  |                   |
|   | Ln<br>population                     | Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.  | World Bank (2017) |
|   | Ln GDP<br>per capita                 | GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 US dollars. | World Bank (2017) |
|   | Control of<br>corruption             | Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as “capture” of the state by elites and private interests.   | World Bank (2017) |

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