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## **Gender inequality, female leadership, and aid allocation**

A panel analysis of aid for education

Linda Kleemann, Peter Nunnenkamp, and Rainer Thiele\*

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**Abstract:** The aid allocation literature has neglected gender-specific needs for aid. We assess the hypothesis that gender inequality in education is more likely to affect the aid allocation of donor countries with female leadership in the relevant ministry. We find no evidence for a needs-based allocation of aid for education. Female as well as male leaders appear to have rewarded countries with more years of schooling of all children, or specifically of girls. Our estimates indicate just minor gender differences in the allocation behaviour.

**Keywords:** aid allocation, education, gender inequality, female leadership

**JEL classification:** F35, I24

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**Note:** Tables are at the end of the paper.

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\* All authors Kiel Institute for the World Economy (corresponding author, linda.kleemann@ifw-kiel.de)

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UNU-WIDER, Katajanokanlaituri 6 B, 00160 Helsinki, Finland, [wider.unu.edu](http://wider.unu.edu)

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## 1 Introduction

The empirical literature on the allocation of aid continues to be gender blind. In particular, previous studies apply broadly defined indicators such as the average per capita income or the rate of infant mortality to assess the need for aid at the country level. The aid allocation literature has neglected gender-specific needs for aid, as reflected in gender gaps in various dimensions that persist in many recipient countries and typically put the female part of the population at a disadvantage. Gender inequality in education represents an important manifestation of such gaps that foreign aid may help reduce if allocated according to need.

As stressed by the United Nations, ‘women continue to face discrimination in access to education’ (UN 2012: 5), even though parity between girls and boys has widely been achieved with respect to enrolment in primary education. Notably in sub-Saharan Africa (SSA), boys are more likely to complete their primary education. Furthermore, girls ‘face greater barriers at the secondary level of education;’ and parity in tertiary education remains a distant goal in several regions (UN 2012: 21). As a result, average years of schooling of females continue to fall 30 per cent short of the benchmark for the whole population in various sub-Saharan African countries.<sup>1</sup>

Donors have often claimed to take gender issues into account when deciding on aid projects (Dreher et al. 2013b).<sup>2</sup> In the late 1990s already Degnbol-Martinussen and Engberg-Pedersen (2003: 28) noted that ‘most donors have formulated goals with focus on women and gender equality.’ The OECD’s Development Assistance Committee (DAC) attempted to operationalize donor commitments to gender equality and women’s empowerment by issuing DAC guidelines in 1999 and so-called guiding principles with respect to aid effectiveness and gender equality in 2008.<sup>3</sup> Nevertheless, UN Women, the UN Entity for Gender Equality and the Empowerment of Women, reports that less than five per cent of total aid has gender equality as its principle objective.<sup>4</sup> Even Denmark, which is widely perceived to be a ‘progressive’ donor with regard to gender equality, has been criticized for ‘the divergence between policy and practice’ (Richey 2001: 193).

In particular, it remains open to question whether gender inequality shapes the allocation behaviour of donors systematically. We address this question by performing an empirical study on the allocation of aid for education. Specifically, we assess the hypothesis that gender inequality in education in the recipient countries is more likely to shape the allocation behaviour of donor countries which are more gender aware at home. We consider female leadership of the ministry that carries the principal responsibility for the allocation of aid to account for gender awareness on the part of donor countries. We prefer female leadership in this dimension over broader measures of gender awareness in donor countries since our analysis focuses on the allocation of a predetermined overall aid budget. Clearly, various other aspects of gender awareness may be relevant as determinants of the donor country’s overall generosity and the size of the total aid budget. Factors

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<sup>1</sup> Benin, the Central African Republic, the Democratic Republic of Congo, Mozambique, Niger, and Togo represented examples in 2010; for details see the Barro and Lee dataset (<http://www.barrolee.com/data/dataexp.htm>).

<sup>2</sup> For instance, the (German) Federal Ministry for Economic Cooperation and Development (2007: 14) ‘sensitises partner governments to the need to specifically promote girls and supports moves to achieve equal access for both sexes to the education system.’

<sup>3</sup> For details, see OECD (2008).

<sup>4</sup> For details, see UN Women (2011).

that may help to expand the overall pool of aid resources to fight worldwide gender gaps include: the representation of women in other (political, societal, and commercial) high level decision-making bodies, the degree to which even male political leaders are committed to gender equality, and the extent to which the policy framework is shaped by gender concerns (e.g. with respect to the educational system, labour market policy, and social protection).<sup>5</sup> However, we argue that such broader measures of gender awareness are much less important in the implementation stage, i.e., when it comes to the allocation of a given amount of sector-specific aid such as aid for education across all potential recipient countries (see also Section 3).

We perform panel estimations covering all DAC donor countries and all recipient countries listed in the OECD's Creditor Reporting System (CRS) during the 1995-2011 period.<sup>6</sup> We modify and augment traditional Probit, Tobit, and Poisson Pseudo Maximum Likelihood (PPML) models on the allocation of aid in several respects. We consider indicators of need that are specifically related to education. In addition to average years of schooling, we draw on the Barro and Lee dataset (2013) to capture gender inequality in education in the recipient countries. Using these indicators we investigate whether donors take country-specific needs into account when giving aid for education. Alternatively, they might reward past educational achievements as suggested by the literature on performance-based aid (e.g. Collier 1997). We follow Dreher et al. (2011) and estimate nested models in order to test for peculiarities in the allocation behaviour of donor countries with female leadership of the relevant ministry. Finally, we differentiate between primary, secondary, and tertiary education for the dependent aid variable.

The paper is structured as follows. We review the related literature in Section 2. Section 3 describes the data and methodological approach. Our empirical results are presented in Section 4. We find no evidence for a needs-based allocation of aid for education. Rather, female as well as male leaders of the ministries responsible for development co-operation appear to have rewarded countries with more years of schooling of all children, or specifically of girls. Our estimates indicate just minor gender differences in the allocation behaviour: While female leaders reward educational achievements in post-secondary education more strongly than male leaders when selecting recipients of aid for education at this level, male leaders reward educational achievements in post-secondary education more strongly when deciding on aid amounts for selected recipients. Section 5 discusses possible policy implications, while Section 6 provides a brief summary.

## 2 Related literature

The analysis in the present paper relates to several strands of the literature on foreign aid. First of all, there are an increasing number of empirical studies on aid for education. Furthermore, a few contributions have considered the role of political leadership as a determinant of overall aid effort as well as the cross-country allocation of aid. However, gender issues have received only scant attention in the academic literature on aid, even though donors have stressed the empowerment of women as a major objective of development co-operation (e.g. Federal Ministry for Economic Cooperation and Development 2007; UN 2009).

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<sup>5</sup> We owe this point to Caren Grown.

<sup>6</sup> Note that earlier data on sector-specific aid commitments are unreliable due to serious underreporting.

## 2.1 Aid for education

Aid for education represents an early and prominent example of the recent trend of focusing on specific aid items. It is now widely agreed that analysing disaggregated aid and its impact on narrowly defined outcome variables offers a more promising way to assess the effectiveness of aid, compared to earlier studies on the economic growth effects of aggregate aid. Aid for health and aid for education have received particular attention in this respect. Even though the empirical evidence is far from conclusive, aid for education appears to be effective in improving educational outcome variables.<sup>7</sup> Michaelowa and Weber (2007) find that aid for education increases primary education, even though the impact of aid is rather small and conditional on local governance. According to Wolf (2007), aid for education has a positive impact on both primary completion rates and youth literacy. Dreher et al. (2008) show that higher per capita aid for education significantly increases primary school enrolment. This result is fairly robust to the set of control variables included in the estimations, the use of instruments to account for the endogeneity of aid, and the method of estimation.

Christensen et al. (2011) compare aid for primary education from bilateral and multilateral donors. Bilateral aid proves to be more effective in boosting school enrolment than multilateral aid. Christensen et al. (2011) argue that this is because bilateral donors condition their aid on better control for corruption in the recipient countries. D'Aiglepiere and Wagner (2013) also focus on aid for primary education, which they find to be highly effective. These authors address a broader spectrum of educational outcome variables. They consider repetition rates and pupil-teacher ratios as indicators of the quality of education. Furthermore, D'Aiglepiere and Wagner (2013) stand out in assessing the effects of aid on gender-related outcome variables, finding that aid tends to improve gender parity with regard to primary school enrolment and completion.

Birchler and Michaelowa (2013) underscore the positive effects of aid for education on school enrolment. In contrast to previous contributions, the results of this study are based on actually disbursed aid, rather than aid commitments. Moreover, the authors differentiate aid disbursements using the most disaggregated sub-categories from the CRS, finding that aid for education facilities and training is most effective. Birchler and Michaelowa (2013: 3) are critical of the 'more or less questionable proxies' used by D'Aiglepiere and Wagner (2013) to capture the quality of education. Appropriate data on the quality of education in developing countries are scarce. Yet some case studies suggest that 'donors may have focused on quantity to the detriment of quality' (Birchler and Michaelowa 2013: 16).<sup>8</sup>

Compared to the literature on aid effectiveness, the allocation of sector-specific aid—and, specifically, the allocation of aid for education—has received little attention.<sup>9</sup> D'Aiglepiere and Wagner (2013)

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<sup>7</sup> For the impact of aid for health, see Wolf (2007), Williamson (2008), and Mishra and Newhouse (2009). Donaubauer et al. (2012) find that aid for education has helped Latin American recipient countries to attract higher foreign direct investment inflows.

<sup>8</sup> In addition, Birchler and Michaelowa (2013) present a qualitative comparative analysis (QCA) of student achievement at the end of primary education for 15 African countries with sufficient data. The QCA does not support the view that the overall amount of aid for education has played an important role for improving the quality of education in the African sample (in contrast to the composition of aid for education).

<sup>9</sup> This is even though the earlier study of Neumayer (2005) on the allocation of food aid underscores the need for a disaggregated analysis of aid allocation. Neumayer found that the allocation of food aid differed strikingly from previous results based on aggregate aid. In particular, food aid was better targeted at countries in need.

state on the basis of some stylized facts that ‘aid to primary education appears rather poorly focused on the needs.’ Thiele et al. (2007) come to a similar verdict by performing Tobit estimations to assess whether donors have allocated sector-specific aid in line with the Millennium Development Goals (MDGs). Thiele et al. (2007: 596) conclude: ‘Some MDGs, notably the fight against HIV/AIDS, have shaped the allocation of aid. However, with respect to other MDGs such as primary education, there is a considerable gap between donor rhetoric and actual aid allocation.’ Specifically, it turns out that recipient countries with wider gender disparity in education (in terms of school enrolment and literacy) have not received more aid for education from the group of all DAC donors. At the same time, the study shows that donors differ in the extent to which their sector-specific aid allocation is conducive to achieving the MDGs. These differences may become more pronounced when considering a longer period of observation.<sup>10</sup> Indeed, broadly following the approach of Thiele et al. (2007), the recent study of Dreher et al. (2013b) finds some evidence that gender gaps affect the allocation of aid in total and in particular sectors, including education. However, ‘the quantitative effects are all rather modest’ (Dreher et al. 2013b: 29). Moreover, the results may not be particularly reliable as the study draws on sector-specific aid data that suffer from serious underreporting.<sup>11</sup>

## 2.2 Political leadership and gendered aid

While conclusive evidence is lacking that gender inequality in education affects the aid allocation of donors, it has been shown that gender inequality in education is associated with lower exports and lower foreign direct investment (FDI) inflows of developing countries (Busse and Spielmann 2006; Busse and Nunnenkamp 2009). Moreover, Klasen (2002) has found that gender inequality in education reduces growth considerably. Against this backdrop, it seems plausible to expect that recipient countries with wider gender gaps in education are more dependent on foreign aid. Gender-aware donor countries might have taken this into account when deciding on the allocation of aid for education.

As noted before, some previous studies account for political leadership in the donor countries as a possible determinant of the allocation of aid. Dreher et al. (2013a: 1) suspect that changes in political leadership can have ‘important bearings on the allocation of foreign aid.’ However, recent contributions to the empirical literature focus on the political orientation of donor governments, rather than female leadership of executive bodies. For instance, Thérien and Noel (2000) as well as Tingley (2010) argue that left-wing politicians tend to be more supportive of aid than right-wing politicians. Regarding aid allocation, Fleck and Kilby (2006) find that changes in political leadership in the US along the liberal-conservative dimension affect the impact of allocation criteria such as recipient need and US commercial interest. Inter alia, recipient need shapes aid allocation more strongly when the President and Congress are liberal. In some contrast, Dreher et al. (2013a) find that the importance of commercial and geo-strategic motives of German aid increases when the Social Democratic Party leads the German government in general, and the Ministry for Economic Cooperation and Development, and the Federal Foreign Office in particular.

The international relations literature has shown that female representation in national parliaments, and gender equality in general, impact on foreign policy. For instance, Caprioli (2000: 53) finds that

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<sup>10</sup> Note that Thiele et al. (2007) perform a cross-section analysis based on data for the 2002-04 period.

<sup>11</sup> See Section 3 for details on underreporting of sector-specific aid data in the OECD’s Creditor Reporting System until the mid-1990s.

‘domestic gender equality has a pacifying effect on state behaviour on the international level.’<sup>12</sup> Against this backdrop, female representation in parliaments has been considered by Breuning (2001) and Fuchs et al. (2013) as a possible determinant of the overall aid effort (i.e., the size of the total budget for foreign aid) of donor countries.<sup>13</sup> According to Breuning (2001), stronger female representation is associated with more generous aid policies. Lu and Breuning (2011) account for different dimensions of women’s political participation, including the female representation in cabinet and parliament as well as in specific ministries (foreign affairs, trade, and development co-operation). Lu and Breuning (2011) corroborate Breuning (2001) insofar as female representation in parliament has a significant impact on donor generosity, while cabinet membership of women hardly matters. However, the Extreme Bounds Analysis of Fuchs et al. (2013) indicates that female representation has no robust impact on the donors’ aid effort.<sup>14</sup>

Breuning (2005, 2006) as well as Dreher et al. (2013b) are more closely related to our empirical analysis below. Breuning (2005) compares the allocation of (total) aid by performing separate estimations for the Netherlands and Japan over the 1993-2001 period. Female representation in the Dutch parliament is almost five times as high as in the Japanese parliament (36 versus 7.3 per cent in 2001). This invites the hypothesis that the Netherlands, though not Japan, takes gender issues such as female literacy and school enrolment into account when deciding on the allocation of aid.<sup>15</sup> In some contrast to expectations, it appears that gender issues have also shaped the allocation of Japanese aid, though less strongly than in the case of the Netherlands. It should be noted, however, that female literacy and school enrolment does not necessarily reflect gender *inequality* in education. Breuning (2006) estimates for four large donors (Britain, France, Japan, the US) separately whether they have taken differences in gender equality into account when allocating aid to African countries. She finds that recipients with a higher male-female literacy gap have received a larger share of the overall aid these donors have given to Africa over the 1993-2003 period. The most recent study of Dreher et al. (2013b) indicates that the decisions of female development ministers on the allocation of total aid differ in some respects from the decisions of male development ministers, e.g. with respect to need in tertiary education.

### 3 Data and approach

In contrast to Breuning (2005, 2006), who assesses the allocation of *total* aid across recipient countries, we take aid for education as the dependent variable, arguing that gender inequality in

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<sup>12</sup> According to Togeby (1994), the gender gap in foreign policy attitudes also implies that women have stronger preferences for international solidarity and, specifically, higher foreign aid than men.

<sup>13</sup> Lundsgaarde et al. (2007) introduce female representation in donor parliaments as a control variable in their assessment of the link between donor imports from developing countries and their aid effort. The overall aid effort is not affected by this control variable according to the empirical results of Lundsgaarde et al.

<sup>14</sup> The Extreme Bounds Analysis (EBA) of Fuchs et al. (2014) accounts for the possibility that the sign and significance of particular determinants of the donors’ aid effort might depend on the particular set of control variables included in the regressions. Indeed, the EBA reveals that the impact of various determinants of overall aid effort considered in the previous literature, including female representation in parliaments, is sensitive to the choice of control variables. Specifically, female representation in parliaments is significant in just six per cent of all regressions run in the EBA.

<sup>15</sup> As noted above, Denmark is another donor which is widely perceived to be gender aware; for details and a critical assessment, see Richey (2001). Tarp et al. (1999) provided an early empirical analysis of Danish aid allocation. Tarp et al. explicitly listed gender imbalances as a possible determinant of Danish aid allocation. However, gender imbalances were not captured in their empirical model because of data limitations.

education would signal a need for educational aid rather than aid in general. Data on aid for education are taken from the OECD's Creditor Reporting System (CRS). We use aid commitments, rather than actually disbursed aid.<sup>16</sup> The subsequent analysis covers the 1995-2011 period as sector-specific aid commitments tend to suffer from considerable underreporting in earlier years.<sup>17</sup> Our sample consists of 23 DAC donors—the Czech Republic and Iceland are excluded as they only recently became DAC members—and 123 recipient countries. The selection of the latter is based on the CRS list of recipients, from which we exclude three groups of countries: (i) very small ones with a population of less than 250,000; (ii) high-income countries; and (iii) countries that in several of the years considered in our analysis were on DAC's part II list of recipients (countries in transition) and therefore lack disaggregated aid data for these years.

Compared to conventional aid allocation studies, we refine the measurement of the recipient countries' need for aid. In addition to gross domestic product (GDP) per capita in recipient countries, which serves as the usual encompassing indicator of need, we also consider more specific educational needs that might give rise to higher aid for education. Specifically, we draw on the Barro-Lee educational database (Barro and Lee 2013) and include 'average years of schooling' as an indicator of educational attainment as well as the female-male schooling gap to indicate gender inequality in education. Since it cannot be ruled out that a fall in the female-male schooling gap captures deteriorations for boys rather than improvements for girls, we perform a robustness test with a modified indicator of gender-specific need that controls for changes in boys' education (see Section 4 below).

To capture the gender awareness of donors, we consider the extent to which women are politically responsible for development co-operation. As noted before, we prefer female leadership in this dimension over broader measures of gender awareness in the donor countries since our analysis focuses on the allocation of a predetermined overall aid budget. In a similar vein, Dreher et al. (2013b: 26) argue that the development minister has 'a more immediate effect on aid allocation policies.' We assume that broader measures of gender awareness are less important in the implementation stage of allocating a given amount of aid for education across all potential recipient countries.<sup>18</sup> Specifically, more general proxies of female leadership such as female representation in parliament and cabinet, which are used by Lu and Breuning (2011) to explain differences in overall aid effort, appear to be less relevant when looking at the allocation across recipient countries of a specific aid category. We create a dummy variable set equal to one for donor countries and years with female leadership of the ministry or government department that carries principal political responsibility for the allocation of aid.<sup>19</sup>

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<sup>16</sup> Aid commitments are typically used in aid allocation studies as commitments represent 'the decision variable of the donor' (White and McGillivray 1995: 166). By contrast, disbursements are to be preferred in aid effectiveness studies. As discussed in more detail below, the use of commitments, rather than disbursements, helps mitigate endogeneity concerns.

<sup>17</sup> Even though underreporting of sector-specific aid is less serious since the mid-1990s, we adjust the CRS data by the ratio of total commitments from the aggregate DAC statistics over total CRS commitments. For details, see Michaelowa and Weber (2007: 359).

<sup>18</sup> Importantly, various other aspects of gender awareness may be relevant as determinants of the donor country's general generosity and the size of the total aid budget (see also Section 1).

<sup>19</sup> More precisely, we take the relevant fraction of the year when the leadership in the relevant ministry changed from male to female or vice versa.



The relevant ministry or department is taken from the profiles of DAC member countries in OECD (2009: Annex A). As explained in more detail by the OECD (2009: Chapter 3), development co-operation is often part of the Ministry of Foreign Affairs (MFA). However, there are different models of political responsibility for development co-operation under the roof of the MFA. In some countries, development co-operation is an integral part of the much broader portfolio of the MFA (e.g. in Austria, Italy, Japan, and New Zealand).<sup>20</sup> In other models, the specific portfolio of development co-operation is held by a distinct political authority, even though under the roof of the MFA. Examples include the Ministers for (International) Development Cooperation in Belgium, Denmark, the Netherlands, Norway, and Sweden, or the Secretary of State for Cooperation and Francophonie in France, as well as the Secretary of State for International Cooperation in Spain.

In Appendix Table 1, left column, we list the political authorities of all DAC countries whose gender defines the dummy variable in our preferred estimation approach. For countries where ultimate responsibility for development co-operation might rest with the MFA, we construct an alternative dummy variable based on the gender of the foreign minister and employ this variable to check for the robustness of our results. In a set of further robustness tests, we tentatively account for the fact that donors may also differ in various other dimensions by excluding one donor at a time from the regression (see Section 4 below).

Women were on average politically responsible for the allocation of aid in roughly a third of the 17 years under consideration. This average masks a strong variation across countries: Whereas in Australia and Belgium, for example, leadership was male throughout, women assumed responsibility for development co-operation over more than half the sample period in several other countries. Among the latter are not only smaller donors that are deemed ‘progressive’ or ‘like-minded’ (Neumayer 2003)—Canada (topping the list with 15 years of female leadership), the Netherlands, Norway, and Sweden—but also three of the ‘big five’ donors (Germany, the UK, and the US).

In addition to educational need in the recipient countries and female leadership in the donor countries, we use a fairly standard set of control variables. We include the recipient country’s population given that our aid variable is not defined in per-capita terms. We control for recipient merit by including the Polity2 score from the Polity 4 project (Marshall et al. 2013). This score combines information on the extent to which various democratic and autocratic features are prevalent in the country under consideration. Trade-related interests are represented by the donor’s exports to the respective recipient country. Finally, we employ temporary membership in the United Nations Security Council (UNSC) as our preferred measure of political interest. There is growing evidence that governments elected to the UNSC receive substantially more financial support than other developing countries (e.g. Dreher et al. 2013a). Compared to previously used proxies of geo-political donor motives, UNSC membership also has the conceptual advantage that it is likely to be exogenous to variables that are directly related to foreign aid (Dreher et al. 2012). We also include a linear time trend, following Dreher et al. (2013a). The time trend helps reduce concerns about serial correlation in the data.<sup>21</sup> In Appendix Table 2 we provide summary statistics for all variables used in the empirical analysis.

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<sup>20</sup> This is not to ignore that the implementation of aid allocation may be delegated to fairly autonomous administrative agencies. However, we are assessing the role of *political* leadership here.

<sup>21</sup> This is not to deny that serial correlation may also be due to other factors such as omitted variables, non-linearities, and measurement error (Wooldridge 2013).

The proposed approach allows us to assess the following hypotheses: First, controlling for the recipients' merit and broadly defined need as well as donors' self-interest, we expect that the allocation of aid for education depends on educational needs, both gender-neutral and gender-specific, in the recipient countries. Second, we expect that the impact of educational needs on the allocation of aid for education depends on the gender awareness of donor countries. Specifically, gender-specific educational needs are supposed to have a stronger impact on the allocation of aid if and when the relevant ministries have female leaders. The counter-hypothesis is that donors favour (poor) recipients with better schooling to reward past achievements in bringing girls and boys to school.

We test these hypotheses by employing different estimators for the two stages of the donors' decision on aid allocation—i.e., 'the aid eligibility stage, in which it is decided whether a potential recipient country receives any aid at all, and the level stage, in which it is decided how much aid to allocate to countries, which have been selected as eligible in the first stage (Neumayer 2003: 2). In line with this standard approach in the aid allocation literature (see also Berthélemy 2006), we first look at the decision of donors to select recipients eligible to receive any aid for education. Subsequently, we look at the decision on the amounts of aid for education. For the initial step we estimate Probit models where the dependent variable is a binary indicator, taking the value of one when a recipient received any aid for education at time  $t$  (and zero otherwise). Standard errors are clustered at the donor level. Except for UNSC membership of recipient countries and female leadership in donor countries, all explanatory variables are lagged by one period to mitigate endogeneity concerns. For the subsequent step we assume that the same set of variables determines whether countries are selected and how much aid is allocated to selected countries. Accordingly, we estimate Tobit models—again clustering standard errors and lagging the explanatory variables.<sup>22</sup>

Formally, the estimation equations for the first and second stage of aid allocation are as follows (Berthélemy 2006):

$$P(Aid_{ijt} > 0) = F(b\mathbf{X}_{ijt} + u_{ijt}) \quad (1)$$

$$Aid_{ijt} = \text{Max}(c\mathbf{X}_{ijt} + v_{ijt}, 0) \quad (2)$$

where  $Aid$  stands for the dependent aid variable (see below) and  $\mathbf{X}$  represents the set of explanatory variables introduced above;  $F(\cdot)$  stands for the cumulative distribution function;  $b$  and  $c$  are the set of parameters to be estimated;  $i, j$ , and  $t$  indicate the donor country, the recipient country, and the year, respectively; and  $u$  and  $v$  are the error terms.

Equations (1) and (2) could each be estimated separately for two distinct types of aid: aid granted to recipient countries  $j$  under female leadership in donor country  $i$  at time  $t$ , and aid granted to recipient countries  $j$  under male leadership in donor country  $i$  at time  $t$ . We prefer a slightly different option

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<sup>22</sup> Following Dreher et al. (2011), we prefer the Tobit estimator over the Heckman selection model. As is typical in the relevant literature, we lack a meaningful exclusion restriction and would thus be forced to solely identify the model on the non-linearity inherent in the Probit selection equation. Another alternative would be to perform an ordinary least squares (OLS) estimation including all non-zero observations. However, this could give rise to strong selection bias since smaller donors, in particular, grant aid for education to a limited number of recipient countries. In addition to Probit and Tobit estimators, we estimate Poisson Pseudo Maximum Likelihood (PPML) models which help to avoid biased results due to heteroskedasticity (Santos Silva and Tenreiro 2006). In contrast to the Tobit estimator, the PPML estimator incorporates the zero values of the dependent variable. However, the PPML estimator is less convenient when it comes to our favoured approach of nesting aid allocation under male or female leadership.

by estimating nested Probit and Tobit models to test for peculiarities in the allocation behaviour of female leaders of the relevant ministries in the donor countries. In other words, we pool the two types of our dependent variable  $Aid_{ijt}$ , i.e., aid for education granted to recipient countries  $j$  by donor countries with female leadership in year  $t$  and by donor countries with male leadership in year  $t$ . At the same time, we introduce a dummy variable for observations of  $Aid_{ijt}$  with female leadership and interact this dummy with our educational determinants and all other explanatory variables. Note that this procedure mirrors separate regressions for  $Aid_{ijt}$  with female or male leadership. Importantly, the estimation results for the nested Probit and Tobit models are exactly analogous to those resulting from separate estimates of equations (1) and (2) for the two distinct types of aid. However, pooling our aid observations in this way increases the flexibility to statistically test for differences and similarities among donors with female and male leaders. We perform a Wald test for equality in the marginal effects of a specific variable on the allocation behaviour of donors at times of female or male leadership.<sup>23</sup>

As noted before, we lag potentially endogenous variables, notably gender-related indicators of need. However, this does not necessarily resolve concerns about endogeneity. Specifically, reverse causality may be an issue to the extent that aid for education is effective in improving educational outcomes. As stressed by Dreher et al. (2013b: 30), the aid allocation literature in general ‘does not so far offer smoking-gun evidence regarding causality.’ While this verdict also applies to the present study, it appears to be unlikely that our variable of principal interest, the interaction of educational need with female leadership, is systematically biased—even if the coefficients on educational need per se were biased. According to Nunn and Qian (2012), the interaction between an arguably exogenous term (in our case: female leadership) with a variable that is potentially endogenous (educational need) can be interpreted as exogenous since we directly control for the main effect of the endogenous variable.<sup>24</sup>

Reverse causation is also unlikely to be of major concern recalling from Clemens et al. (2012) that a large part of aid cannot reasonably be expected to have short-term effects. In the case of aid for education, the effects of building educational facilities or training teachers on educational outcomes may be delayed considerably. Furthermore, it is important to recall that we assess the effects of educational need on aid commitments, rather than aid disbursements. Aid is often committed for projects spanning several years so that it is disbursed in several instalments throughout the project’s life. This means that, by using aid commitments, we implicitly account for longer lags than just one period between the observation of educational need and the time of the arrival of disbursed aid.<sup>25</sup>

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<sup>23</sup> Note that the coefficients of interacted variables are difficult to interpret in non-linear models such as Probit and Tobit (Ai and Norton 2003). Therefore, we present conditional marginal effects (at the mean of the other explanatory variables) for the nested models in Section 4 below.

<sup>24</sup> See also Nizalova and Murtazashvili (2012: 2): ‘If all the regressors but the exogenous regressor and the interaction term between this exogenous regressor and an endogenous covariate are jointly independent of the exogenous regressor of interest, the OLS estimate of interaction term’s coefficient is consistent.’

<sup>25</sup> See also Berthélemy (2006: 184) who argues: ‘The risk [of simultaneity bias] is limited since I am working on aid commitment flows, and aid disbursements usually lag behind commitments, particularly for project aid, which require building new equipment.’ Odedokun (2003) offers a detailed analysis of delays in aid disbursements and deviations from commitments.

## 4 Results

### 4.1 Baseline estimations

We present a set of benchmark estimations in Table 1 before distinguishing systematically between aid observations depending on whether aid for education was granted under male or female leadership of the relevant ministry in the particular donor country. Yet all estimations in Table 1 include the dummy variable set equal to one for donor-year combinations with female leadership. Note that the upper part of Table 1 displays the complete estimation results, including the marginal effects of all control variables, when the indicator of educational need refers to schooling at all three levels taken together. Educational need is defined in a gender-neutral way, i.e., combining average years of schooling of girls and boys (*edut\_need*) in columns 1 and 3. In contrast, educational need is defined in a gender-specific way, i.e. relating average years of schooling of girls to the average for both girls and boys (*edut\_needFem*) in columns 2 and 4. Columns 1 and 2 present the Probit results, while columns 3 and 4 present the Tobit results.<sup>26</sup>

Apart from the indicators of educational need (see below), the results for the dummy variable of female leadership are of interest in the context of the present paper. The variable proves to be insignificant in the Probit models in columns 1 and 2, while it enters significantly positive at the five per cent level in the Tobit models in columns 3 and 4. This implies that female leaders of the relevant ministries behaved as their male counterparts in the first stage of selecting recipients of aid for education. However, female leaders appear to be more generous than male leaders in the subsequent step of deciding on the amount of aid for education granted to eligible countries. When re-running the regression using the alternative dummy variable of female leadership (as specified in Appendix Table 1), the variable turns out to be significant at the five per cent level in both models, indicating that female leaders are also more generous than male leaders when selecting recipients (not shown).

Most of the control variables which are conventionally used in aid allocation studies enter significant and with the expected sign in the Probit and Tobit models.<sup>27</sup> *UNSC* is the only exception, indicating that temporary membership in the Security Council does neither increase the probability of being selected as a recipient of aid for education, nor the amounts of aid eligible countries receive. Larger and poorer recipient countries with better governance are more likely to be selected as aid recipients and to receive more aid for education. The same is true for recipient countries absorbing a higher share of the donor country's exports.

As discussed before, we complement GDP per capita which is widely used as an encompassing indicator of need in the aid allocation literature by more specific indicators of educational need in all our estimations. In other words, the indicators of educational need to reveal whether donors focus aid for education on countries which are not only poor, but are also characterized by low average years of schooling for both girls and boys or specifically for girls. Strikingly, the Probit models suggest that gender-neutral and gender-specific educational needs, measured by average years of

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<sup>26</sup> As noted before, we also performed PPML estimations for the non-nested models. The results are not shown for the sake of brevity, but are available on request.

<sup>27</sup> Note that the size and significance of the marginal effects of the control variables are almost identical independent of whether gender-neutral or gender-specific indicators of educational need enter the estimations. This applies to both, the Probit and the Tobit models.

schooling at all three levels taken together, reduce the probability of being selected as a recipient of aid for education, once need in more general terms is controlled for. Likewise, the Tobit models imply that recipients with more (gender-neutral and gender-specific) schooling at all three levels taken together receive more aid for education, once need in more general terms is controlled for. This lends support to our counterhypothesis that donors reward past educational performance.

The end part of Table 1 presents a succinct summary of major results when considering alternative measures of educational need. In order to avoid clutter, we do not show the results for the control variables here, which are the same as in the benchmark specifications with *edut\_need* or *edut\_needFem*, respectively. The results for the control variables are hardly affected when running the Probit models with alternative indicators of educational need.<sup>28</sup> Regarding the Tobit models, donors appear to consider merit and general need only at the lowest level of education: The indicator on governance (*Polity2*) is no longer significant when donors decide on the amount of aid for secondary and post-secondary education, while the impact of GDP per capita on aid amounts switches from significantly negative in the case of aid for primary education to significantly positive in the case of aid for post-secondary education.<sup>29</sup>

Alternative indicators of educational need fall into two categories: (i) gender-neutral years of schooling of girls and boys at three distinct levels, i.e., primary schooling (*edub\_need*), secondary schooling (*edus\_need*), and post-secondary schooling (*edup\_need*); and (ii) gender-specific measures, i.e., the ratio of average years of schooling of girls, relative to boys and girls, at the three distinct levels (*edub\_needFem*, *edus\_needFem*, and *edup\_needFem*, respectively). Importantly, we also redefine the dependent aid variable when considering educational need at the three distinct levels of schooling. For instance, aid specifically meant to improve primary education represents the dependent variable, instead of overall aid for education, in all estimations with either *edub\_need* or *edub\_needFem* as an indicator of educational need.

As concerns the Probit models, all alternative indicators of educational need corroborate the previous finding that the probability of being selected as a recipient of aid for education increases with higher average years of schooling—independent of whether schooling is defined in a gender-neutral or gender-specific way. At all three distinct levels of schooling, the indicators of educational need enter significantly positive at the one per cent level in columns 1 and 2 of Table 1. As shown in columns 3 and 4, this pattern carries over to the second stage of the aid allocation process. According to the Tobit results, higher average years of primary schooling—independent of whether defined in a gender-neutral or gender-specific way—are associated with higher aid amounts at all levels of education. The results on all gender-neutral and gender-specific indicators of educational need, concerning the signs and significance of the marginal effects hold when employing the PPML estimator, instead of the Tobit estimator.<sup>30</sup>

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<sup>28</sup> The export variable loses its significance in one estimation. The coefficient on GDP per capita switches to positive, though insignificant, when considering aid for post-secondary education. Full results are available on request.

<sup>29</sup> The finding that the merit-based allocation of aid does not extend beyond the first stage of selecting eligible countries resembles similar results of earlier studies (e.g. Koch et al. 2009).

<sup>30</sup> PPML results are available on request.

## 4.2 Nested Probit and Tobit models

In the following, we distinguish between the allocation of aid for education by female or male leaders of the relevant ministries in the donor countries. Table 2 presents the results for the nested Probit and Tobit models when gender-neutral measures of schooling are used as indicators of educational need. Subsequently, we present the results for the nested Probit and Tobit models when replacing gender-neutral by gender-specific measures of schooling. Recall that we show conditional marginal effects, assessed at the mean of all other explanatory variables, for all nested models.

The results on the control variables shown in Table 2 are closely in line with the baseline estimations reported in the previous sub-section. The Probit estimations in columns 1-4 reveal that both female and male leaders are more likely to select larger and poorer recipient countries with better governance as recipients of overall aid for education—and typically also as recipients of aid for distinct levels of education. Temporary membership in the UNSC hardly matters for female and male leaders at the gatekeeping stage of deciding on aid for education. Most of the Wald tests for all these control variables do not point to significantly different marginal effects depending on whether female or male leaders decide on eligibility to aid for education. The only notable exception is GDP per capita when deciding on eligibility to aid for primary education: Here the poverty orientation of female leaders appears to be significantly stronger than the poverty orientation of male leaders (column 2). As for the Tobit estimations, the Wald tests suggest that the export variable affects the allocation behaviour of male leaders in a significantly stronger way than the behaviour of female leaders (columns 5-8). It appears that male leaders grant higher amounts of aid for education to selected trading partners than female leaders.<sup>31</sup>

Turning to the educational indicators of principal interest, the Probit results in columns 1-4 show that both female and male leaders of the relevant ministries are more likely to select countries with higher average years of schooling of both girls and boys as recipients of aid for education, once general need (proxied by GDP per capita) is controlled for. The finding that female and male leaders reward more gender-neutral schooling at the gatekeeping stage holds, at the one per cent level of significance, for overall aid for education and also for the three distinct levels of education.<sup>32</sup> Nevertheless, the Wald tests point to two significant differences between female and male leaders. Female leaders reward higher average years of schooling in a significantly stronger way than male leaders when deciding on eligibility to overall aid for education (column 1). The estimations for distinct levels of education indicate that this difference is exclusively because female leaders reward higher average years of post-secondary schooling more strongly than male leaders when deciding on aid for post-secondary education. In contrast to column 4, the Wald tests in columns 2 and 3 do not point to significant differences between female and male leaders at the primary and secondary levels of schooling.

The finding that female and male leaders alike reward better educational performance carries over to the second stage of deciding on aid amounts (columns 5-8 of Table 2). At all levels of education, the conditional marginal effects of average years of schooling on the amounts of aid for education prove to be significant at the one per cent level for both female and male leaders. While female and male

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<sup>31</sup> At the same time, the results on the leadership dummy per se in columns 5-8 of Table 2 once again suggest that female leaders generally tend to be more generous in granting aid for education to recipients having passed the gatekeeping stage.

<sup>32</sup> Recall that the indicator of educational need and the dependent aid variable always refer to the same level in the estimations for primary, secondary, and post-secondary education.

leaders do not differ significantly from each other at the primary and secondary levels of schooling, they do so when deciding on the amount of aid for post-secondary education (column 8): Both reward better post-secondary schooling, as they did at the gatekeeping stage, but male leaders allocate aid amounts for post-secondary education much more strongly in favour of good educational performers than female leaders do. This difference results in a strongly significant Wald test.<sup>33</sup>

In the final step of our empirical analysis, we replace the gender-neutral indicators of educational need by gender-specific indicators. Table 3 presents the results.<sup>34</sup> The sign and significance of the marginal effects of the gender-specific indicators largely resemble those of the gender-neutral indicators in Table 2. Likewise, the Wald tests in Table 3 point to significantly different allocation behaviour of female and male leaders exactly where they did before with gender-neutral indicators of educational need. Specifically, the Probit estimations in column 1-4 of Table 3 reveal that both female and male leaders are more likely to select countries with higher average years of schooling of girls (relative to boys and girls taken together) as recipients of aid for education, once general need is controlled for. Yet the Wald tests indicate once again that female leaders reward better schooling, now specifically for girls, in a significantly stronger way than male leaders when deciding on eligibility to aid for post-secondary education. The significant difference at the post-secondary level feeds back into a significant Wald test for overall aid for education in column 1.

As before with gender-neutral indicators, Probit and Tobit results are closely in line with each other in Table 3. Both female and male leaders allocate higher amounts of aid for all levels of education to recipient countries where girls lag less behind boys in terms of average years of primary schooling. At the post-secondary level there is again the same gender difference: Male leaders reward better schooling of girls to a much larger extent than female leaders by granting higher amounts of aid at this level—resulting in a strongly significant Wald test (column 8).

### 4.3 Robustness tests

In the remainder of this section, we assess the robustness of our major findings reported in Table 3. For the sake of brevity, we limit the robustness tests to the Probit and Tobit estimations with gender-specific educational needs at all levels of education taken together. In the first robustness test, we modify our indicator of gender-specific need. In the second set of robustness tests, we account for the heterogeneity within our sample of donor countries.

The modification of our indicator of gender-specific need resembles the approach of Seguino (2004) to ensure that changes in need such as higher average years of schooling for girls relative to all pupils result from improvements for girls, rather than declining average years of schooling for boys. This can be achieved by multiplying our standard measure of gender-specific educational need, *edut\_needFem*, in *t* with the ratio of gender-neutral educational need, *edut\_need*, in *t* over *t-1*. Applying the adjusted measure it can be ruled out that gender-specific educational need appears to be less pronounced only because average years of schooling of boys had declined. Differences between the adjusted and the standard measure turn out to be very small. It is therefore not surprising that all

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<sup>33</sup> Results remain qualitatively the same, but point to even more pronounced differences between male and female leaders, when we use the alternative dummy of female leadership.

<sup>34</sup> The marginal effects of the control variables are not affected by this modification and are almost identical to those shown in the corresponding columns of Table 2.

major results remain unaffected by the adjustment.<sup>35</sup> In particular, we corroborate the previous finding that male and female leaders favour recipients with better educational performance at both the eligibility and the level stage, and that female leaders do so more strongly than male leaders when deciding on who is eligible to receive educational aid.

By performing the second set of robustness tests, we assess whether our major results are sensitive to the inclusion of donor countries with specific characteristics that are more or less time-invariant. By excluding one donor at a time, we account at least tentatively for the heterogeneity within our sample of 23 donor countries.<sup>36</sup> Donor countries differ in various dimensions that are potentially relevant for the link between recipient need and aid allocation.<sup>37</sup> Most importantly perhaps, the aid architecture differs considerably within our sample—e.g. in terms of the number and autonomy of aid agencies implementing the political guidelines on aid allocation. Donors may prefer specific aid modalities; for instance, some donors have shifted from project-related aid to general budget support and so-called sector-wide approaches.<sup>38</sup> In some donor countries such as the United States, the parliament—and in particular the political opposition—not only has a major say in determining the overall size of the aid budget, but also tends to interfere in the allocation of a given aid budget across recipients. There is also heterogeneity with respect to the leadership of the relevant ministries, as the process of appointing ministers, the length of their appointment, as well as their accountability to taxpayers may differ from country to country.

The robustness tests reveal that the estimated coefficients, as well as the p-values of the Wald tests for differences between male and female leaders, vary somewhat with the composition of the donor sample (Table 4). At the eligibility stage, female leaders are no longer found to reward educational performance significantly more strongly than male leaders when certain donors (France, for example) are excluded from the regression. Yet, our core finding that recipient countries with more favourable indicators of educational need are more likely to be selected, and selected countries receive more aid for education once general economic backwardness is controlled for, is not affected by the exclusion of specific donor countries. In all specifications reported in Table 4, the respective coefficients for male and female leaders are significantly positive at the one per cent level of significance.

## 5 Policy implications

More than 20 years ago (in 1990), delegates from 155 countries agreed at the Conference on Education for All (EFA) in Jomtien, Thailand, to make primary education accessible to all children. The goals included universal access to learning, a focus on equity, and strengthening partnerships.<sup>39</sup> The Jomtien EFA targets were not achieved until the turn of the century. The relevance of universal education was reiterated in the so-called Millennium Development Goals (MDGs) agreed at the UN

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<sup>35</sup> Results are not shown but available from the authors upon request.

<sup>36</sup> We prefer this procedure over the standard approach of accounting for time-invariant characteristics by donor-country fixed effects. Accounting for donor-country fixed effects would imply that we lose a considerable part of the variation across donors in our variable of principal interest, female leadership of the relevant ministries. In particular, our sample includes donors with male leadership throughout the period of observation. This information would be fully absorbed by the fixed effects.

<sup>37</sup> We thank Caren Grown for having alerted us to several dimensions of donor heterogeneity.

<sup>38</sup> See Holvoet (2010) for a discussion of new aid modalities from a gender perspective. In contrast to major institutional characteristics of the aid architecture, aid modalities vary not only across donors but also over time.

<sup>39</sup> For details, see the background document to the World Conference on Education for All (WCEFA, 1990).



General Assembly in September 2000. In particular, Goal 3 among the MDGs stressed gender disparity in education and called upon the international community to ‘eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015.’<sup>40</sup> To this end, donors have devoted an increasing share of overall aid resources to the education sector (Thiele et al. 2007).

Against this backdrop, it may be surprising that we found no evidence for a needs-based allocation of aid for education by female and male leaders of the relevant ministries in DAC donor countries. More precisely, recipient countries where gender-neutral and gender-specific indicators reveal greater need are typically *less* likely to be selected, and selected countries receive *less* aid for education once general economic backwardness is controlled for. Rather than granting aid preferably to countries with lower average years of schooling of all children, or specifically of girls, female as well as male leaders appear to have rewarded better educational performance along these dimensions when deciding on the selection of recipients and on the amounts of aid for selected countries.

Our findings suggest that performance-based aid allocation is gathering momentum and extends well beyond the health sector (Eichler and Glassman 2008) and the fight against corruption—notably by the United States’ Millennium Challenge Corporation (Öhler et al. 2012). Performance-based aid, or ex-post conditionality, is generally justified as an alternative allocation mechanism to the failed traditional approach of making aid conditional on mere reform promises of recipient countries.<sup>41</sup> In a famous example of aid for education, Reinikka and Svensson (2004) estimated that just 13 per cent of a grant received by the Ugandan government to cover primary schools’ non-wage expenditures actually reached the schools during the 1991-95 period. Donors may increasingly refer to performance-based aid, including in education, to prevent leakages at such a scale.

It is clearly beyond the scope of this paper to assess whether performance-based aid for education is more effective in expanding schooling for boys and girls alike, and/or mitigating persistent gender inequality in education by increasing the girls-boys ratio at all levels of schooling. However, donors are likely to face a dilemma when rewarding better performance, rather than targeting the particularly needy. There is the risk that the particularly needy fall further behind unless their governments are sufficiently reform-minded to ‘deserve’ being rewarded by aid for education. Indeed, according to a recent progress report on the MDGs, ‘only 2 out of 130 countries have achieved that target [elimination of gender disparity] at all levels of education. ... In many countries, gender inequality persists and women continue to face discrimination in access to education.’<sup>42</sup>

Neither male nor female leaders in the donor countries seem to be aware of this dilemma when deciding on the selection of recipients and on aid amounts to selected recipients. Otherwise, one could have expected that donors rewarded better educational performance at the gatekeeping stage, possibly to avoid leakage in suspect countries—while pursuing a needs-based allocation of aid for education when deciding on aid amounts to eligible countries at the second stage.

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<sup>40</sup> See UN (no date) for further details.

<sup>41</sup> As argued by Collier (1997: 56), aid might be ‘remarkably effective if it induces governments to adopt growth-inducing and poverty-reducing policies. This is indeed the core of what conditionality is supposedly about—aid buys reform. Unfortunately, it does no such thing.’

<sup>42</sup> See: <http://www.un.org/millenniumgoals/gender.shtml> (accessed August 2013).

However, the dilemma between rewarding the better performers versus targeting the particularly needy is likely to persist at the second stage of allocating aid amounts, unless donors are perfectly successful to prevent leakage at the gatekeeping stage by selecting only sufficiently reform-minded countries. Realistically assuming that the selection of recipients is at best partially successful, the needs-based allocation of aid amounts would be still prone to leakage. On the other hand, rewarding the better performers at the second stage, too, increases the risk of leaving the particularly needy still more behind.

## 6 Conclusion

In this paper, we address the question of whether gender inequality shapes the allocation behaviour of donors by performing an empirical study on the allocation of aid for education. Specifically, we assess the hypothesis that gender inequality in education in the recipient countries is more likely to affect the aid allocation of donor countries which are more gender aware at home. We consider female leadership of the ministry that carries the principal responsibility for the allocation of aid to account for gender awareness on the part of donor countries. At the recipient country level, we define average years of schooling and gender inequality in schooling as gender-neutral and gender-specific indicators of educational need, respectively.

We find no evidence for a needs-based allocation of aid for education. When deciding on the selection of recipients, female as well as male leaders of the ministry responsible for development co-operation appear to have rewarded countries with more years of schooling of all children, or specifically of girls. Furthermore, our results for the amounts of aid given to eligible recipients also point to performance-based allocation of aid for education once general need, in terms of average per-capita incomes, is controlled for. Higher average years of schooling—independent of whether defined in a gender-neutral or gender-specific way—are associated with higher aid for education, granted by female as well as male leaders at all levels of education. Our estimates indicate just minor gender differences in the allocation behaviour: While female leaders reward educational achievements in post-secondary education more strongly than male leaders when selecting recipients of aid for education at this level, male leaders reward educational achievements in post-secondary education more strongly when deciding on aid amounts for selected recipients.

The focus on female and male leaders of the ministry responsible for international development co-operation clearly implies several limitations of our analysis that future research may help to overcome. First of all, various other aspects of gender awareness may be relevant as determinants of donor behaviour. Factors deserving attention in future research include: the representation of women in other (political, societal, and commercial) high level decision-making bodies, the degree to which male political leaders are committed to gender equality, and the extent to which the policy framework is shaped by gender concerns (e.g. with respect to the educational system, labour market policy and social protection). Addressing such factors in future research would offer insights on whether our assumption is correct that gender awareness broadly defined is mainly relevant with respect to the generosity of the donor and the overall size of the aid budget, but considerably less relevant with respect to the allocation of a given amount of sector-specific aid across recipient countries. Apart from gender awareness, it remains open to question in which way donor heterogeneity in general—e.g. in terms of the aid architecture, aid modalities, the role of parliamentary control and, in particular, the political opposition—may influence the link between ministerial leadership and the allocation of aid.

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**Table 1: Baseline estimations, Probit and Tobit, marginal effects, gender-neutral, and gender-specific educational need**

	1	2	3	4
	PROBIT		TOBIT	
Variables	Gender-neutral (girls and boys)	Gender-specific (girls/girls+boys)	Gender-neutral (girls and boys)	Gender-specific (girls/girls+boys)
<b>Educational need (all levels)</b>	0.26***	9.45***	0.95***	34.54***
<b>(Log) GDP p.c.</b>	-0.034***	-0.034***	-0.28***	-0.28***
<b>(Log) Population</b>	0.076***	0.076***	0.51***	0.51***
<b>Polity2</b>	0.006***	0.006***	0.036***	0.036***
<b>UNSC</b>	0.007	0.007	-0.076	-0.076
<b>Exports</b>	2.48***	2.48***	13.21***	13.21***
<b>Dummy for female leadership</b>	0.002	0.002	0.34***	0.34***
<b>Alternative indicators of educational need:</b>				
<b>Primary</b>	0.35***	8.91***	1.54***	39.35***
<b>Secondary</b>	0.29***	4.03***	2.12***	29.4***
<b>Post-secondary</b>	3.71***	2.00***	15.78***	8.17***

Dependent aid variables: aid for total education, aid for primary education, aid for secondary education, and aid for post-secondary education.

\* Indicates significance at the 10% level.

\*\* Indicates significance at the 5% level.

\*\*\* Indicates significance at the 1% level.

Trend not shown

Note: Logarithm (Log)

Source: Authors' calculations.

Table 2: Probit and Tobit results, nested models, conditional marginal effects, gender-neutral educational need

EDUCATIONAL NEEDS VARIABLE		PROBIT				TOBIT			
		EDUCATIONAL NEED: GIRLS AND BOYS				EDUCATIONAL NEED: GIRLS AND BOYS			
		edut_need	edub_need	edus_need	edup_need	edut_need	edub_need	edus_need	edup_need
VARIABLES	Dependent aid variable	Total education	Primary education	Secondary education	Post-secondary education	Total education	Primary education	Secondary education	Post-secondary education
Educational need	Male leaders	0.23***	0.34***	0.30***	3.42***	0.96***	1.32***	2.12***	21.78***
	Female leaders	0.30***	0.35***	0.27**	4.26***	0.93***	1.85***	2.13***	5.14***
	WALD	<b>0.01</b>	<b>0.92</b>	<b>0.35</b>	<b>0.01</b>	<b>0.86</b>	<b>0.33</b>	<b>0.99</b>	<b>0.00</b>
(Log) GDP p.c.	Male leaders	-0.03***	-0.04***	-0.01**	0.01	-0.20***	-0.69***	-0.12	0.07
	Female leaders	-0.04***	-0.05***	-0.01***	0.01	-0.30***	-0.79***	-0.07	0.23**
	WALD	<b>0.48</b>	<b>0.08</b>	<b>0.65</b>	<b>0.96</b>	<b>0.63</b>	<b>0.37</b>	<b>0.65</b>	<b>0.17</b>
(Log) Population	Male leaders	0.08***	0.04***	0.03***	0.05***	0.46***	0.41***	0.31***	0.42***
	Female leaders	0.08***	0.05***	0.03***	0.05***	0.58***	0.58***	0.40***	0.56***
	WALD	<b>0.78</b>	<b>0.06</b>	<b>0.93</b>	<b>0.93</b>	<b>0.00</b>	<b>0.01</b>	<b>0.18</b>	<b>0.05</b>
Polity2	Male leaders	0.07***	0.05***	0.003***	0.002***	0.03***	0.06***	0.02	0.003
	Female leaders	0.06***	0.05***	0.003***	0.003***	0.04***	0.08***	0.02	0.002
	WALD	<b>0.79</b>	<b>0.79</b>	<b>0.76</b>	<b>0.77</b>	<b>0.61</b>	<b>0.13</b>	<b>0.85</b>	<b>0.95</b>
UNSC	Male leaders	0.02	-0.002	-0.005	0.01	0.11	-0.18	-0.10	0.16
	Female leaders	-0.01	--0.024*	-0.011	-0.03	-0.32*	-0.46*	-0.14	-0.27
	WALD	<b>0.32</b>	<b>0.21</b>	<b>0.69</b>	<b>0.14</b>	<b>0.05</b>	<b>0.41</b>	<b>0.91</b>	<b>0.13</b>
Exports	Male leaders	2.68***	0.39	0.60*	3.08**	18.5***	5.92***	14.80***	22.95***
	Female leaders	2.20***	0.22	0.31**	3.49*	8.9*	-7.65	1.40	14.18***
	WALD	<b>0.77</b>	<b>0.59</b>	<b>0.34</b>	<b>0.81</b>	<b>0.06</b>	<b>0.10</b>	<b>0.02</b>	<b>0.08</b>
Female leaders		0.001	0.09	-0.01	0.01	0.30***	0.55***	0.30***	0.35***

\* Indicates significance at the 10% level.

\*\* Indicates significance at the 5% level.

\*\*\* Indicates significance at the 1% level.

Trend not shown; WALD: p values for test on equality of coefficients between male and female leaders.

Source: Authors' calculations.



Table 3: Probit and Tobit results, nested models, conditional marginal effects, gender-specific educational need

EDUCATIONAL NEEDS VARIABLE		PROBIT				TOBIT			
		EDUCATIONAL NEED: GIRLS / (GIRLS + BOYS)				EDUCATIONAL NEED: GIRLS / (GIRLS + BOYS)			
		edut_needFem	edub_needFem	edus_needFem	edup_needFem	edut_needFem	edub_needFem	edus_needFem	edup_needFem
Variables	Dependent aid variable	Total education	Primary education	Secondary education	Post-Secondary education	Total education	Primary education	Secondary education	Post-Secondary education
Educational need	Male leaders	8.57***	8.89***	4.08***	1.84***	35.04***	34.88***	28.04***	11.51***
	Female leaders	11.01***	8.82***	3.99***	2.29***	33.77***	46.08***	31.56***	2.57**
	WALD	<b>0.01</b>	<b>0.94</b>	<b>0.37</b>	<b>0.02</b>	<b>0.84</b>	<b>0.43</b>	<b>0.63</b>	<b>0.00</b>
(Log)GDP p.c.	Male leaders	-0.03***	-0.04***	-0.01**	0.01	-0.26***	-0.69***	-0.12	0.08
	Female leaders	-0.04***	-0.06***	-0.01***	0.01	-0.31***	-0.79***	-0.07	0.23**
	WALD	<b>0.48</b>	<b>0.08</b>	<b>0.62</b>	<b>0.99</b>	<b>0.63</b>	<b>0.37</b>	<b>0.69</b>	<b>0.17</b>
(Log)Population	Male leaders	0.08***	0.04***	0.03***	0.05***	0.46***	0.41**	0.31**	0.42***
	Female leaders	0.08***	0.05***	0.03***	0.05***	0.58***	0.58***	0.40***	0.56***
	WALD	<b>0.78</b>	<b>0.06</b>	<b>0.80</b>	<b>0.91</b>	<b>0.02</b>	<b>0.01</b>	<b>0.18</b>	<b>0.05</b>
Polity2	Male leaders	0.006***	0.005***	0.003***	0.002**	0.03***	0.06***	0.02	0.03
	Female leaders	0.006***	0.006***	0.003***	0.003**	0.04***	0.08***	0.02	0.02
	WALD	<b>0.72</b>	<b>0.73</b>	<b>0.69</b>	<b>0.85</b>	<b>0.61</b>	<b>0.13</b>	<b>0.84</b>	<b>0.94</b>
UNSC	Male leaders	0.019	-0.002	-0.005	0.010	0.11	-0.18	-0.10	0.17
	Female leaders	-0.009	-0.024*	-0.010	-0.026	-0.31*	-0.46*	-0.14	-0.26
	WALD	<b>0.32</b>	<b>0.21</b>	<b>0.68</b>	<b>0.15</b>	<b>0.05</b>	<b>0.41</b>	<b>0.90</b>	<b>0.14</b>
Exports	Male leaders	2.68***	0.39	0.61*	3.09***	18.47***	5.89**	14.82**	23.03***
	Female leaders	2.19	0.22	0.30**	3.43**	8.97**	-7.71	1.4	14.16***
	WALD	<b>0.76</b>	<b>0.60</b>	<b>0.31</b>	<b>0.85</b>	<b>0.06</b>	<b>0.10</b>	<b>0.01</b>	<b>0.08</b>
Female leaders		0.001	0.011*	-0.010*	0.01	0.30***	0.56***	0.28***	0.35***

\* Indicates significance at the 10% level.

\*\* Indicates significance at the 5% level.

\*\*\* Indicates significance at the 1% level.

Trend not shown; WALD: p values for test on equality of coefficients between male and female leaders.

Source: Authors' calculations.

**Table 4: Reduced country sample, nested models, conditional marginal effects, gender specific educational need**

Omitted country	PROBIT			TOBIT		
	Needs variable: <i>edut_needFem</i> Dependent aid variable: total education			Needs variable: <i>edut_needFem</i> Dependent aid variable: total education		
	Male leaders	Female leaders	WALD	Male leaders	Female leaders	WALD
Austria	9.27	10.68	0.13	36.61	35.06	0.81
Australia	9.39	11.10	0.06	35.85	37.38	0.80
Belgium	8.76	11.00	0.01	36.34	34.40	0.77
Canada	8.56	11.62	0.00	35.06	31.62	0.61
Denmark	8.26	12.33	0.00	33.80	37.71	0.55
France	9.53	10.65	0.22	41.70	31.48	0.14
Finland	8.98	10.56	0.09	37.31	28.31	0.17
Germany	8.01	11.13	0.00	28.94	38.21	0.21
Greece	7.50	10.68	0.00	31.76	37.03	0.41
Italy	9.01	11.01	0.03	37.15	34.05	0.64
Ireland	8.80	9.73	0.32	37.58	26.04	0.07
Japan	6.94	10.94	0.00	26.46	35.26	0.19
Korea	8.57	8.30	0.76	34.92	25.54	0.15
Luxembourg	8.21	11.90	0.00	33.10	38.50	0.41
Netherlands	9.75	10.74	0.28	37.62	32.13	0.40
New Zealand	8.26	11.01	0.00	33.84	33.52	0.96
Norway	8.60	11.97	0.00	36.55	34.17	0.72
Portugal	8.60	11.04	0.01	34.62	33.41	0.85
Spain	9.29	9.85	0.53	39.90	31.70	0.21
Sweden	8.24	13.61	0.00	33.67	39.73	0.35
Switzerland	7.94	11.56	0.00	32.84	41.18	0.19
UK	8.38	10.87	0.01	34.69	32.46	0.73
USA	8.48	10.93	0.01	36.14	27.30	0.19

All coefficients for male and female leaders are significant at the 1% level;  
WALD: p values for test on equality of coefficients between male and female leaders.  
Source: Authors' calculations.

## Appendix

**Table 1: Relevant political leaders in DAC donor countries**

<b>Donor country</b>	<b>Preferred</b>	<b>Alternative</b>
Austria	Federal M for European and International Affairs	
Australia	Parliamentary Secretary for International Development and Assistance	MFA
Belgium	M for Development Cooperation	MFA
Canada	M for International Cooperation	
Denmark	M for Development Cooperation	MFA
France	Secretary of State for Cooperation and Francophonie	M for Foreign and European Affairs
Finland	MFA	
Germany	M for Economic Cooperation and Development	
Greece	MFA	
Italy	MFA	
Ireland	M of State for Overseas Development	MFA
Japan	MFA	
Korea	MFA	
Luxembourg	M for Development Cooperation and Humanitarian Action	MFA and Immigration
Netherlands	M for Development Cooperation	MFA
New Zealand	MFA	
Norway	M for International Development	MFA
Portugal	MFA	
Spain	Secretary of State for International Cooperation	MFA
Sweden	M Int Dev Coop	MFA
Switzerland	Federal Councillor for Foreign Affairs	
UK	Secretary of State for International Development, DfID	
USA	Secretary of State	

Note: Minister (M), Minister for Foreign Affairs (MFA).

Source: Own representation based on OECD (2009: Annex A).

## Appendix

**Table 2: List of variables and summary statistics**

Variable	Definition	Mean	Std. Dev.	Min	Max
(log)Aid for Total Education	(log)Aid; Total education (Constant Prices, 2011 USD millions)	-4.82687	3.236013	-6.907755	6.4877931
(log)Aid for Primary Education	(log)Aid; Primary education (Constant Prices, 2011 USD millions)	-6.124715	2.159588	-6.907755	5.989997
(log)Aid for Secondary Education	(log)Aid; Secondary education (Constant Prices, 2011 USD millions)	-6.309177	1.818492	-6.907755	4.626225
(log)Aid for Post-Secondary Education	(log)Aid; Post- Secondary education (Constant Prices, 2011 USD millions)	3.019011	16.4671	-6.907755	6.46954
Female leadership	Dummy = 1 for Female Ministers responsible for aid; 1995-2011	.4143223	.4926098	0	1
edut_need	Average years of schooling for girls and boys	6.503491	.3958127	5.871579	7.158863
edub_need	Average years of primary schooling for girls and boys	4.226995	.1948836	3.909189	4.536484
edus_need	Average years of secondary schooling for girls and boys	1.972586	.1763827	1.699947	2.273474
edup_need	Average years of post-secondary schooling for girls and boys	.3039105	.0248652	.2624421	.3489053
edut_needFem	Average years of schooling of girls to the average for girls and boys	.9011005	.0108869	.8839349	.9188704
edub_needFem	Same as above; primary schooling	.9052462	.0073216	.8948358	.9178274
edus_needFem	Same as above; secondary schooling	.9323468	.0135971	.9065049	.9520141
edup_needFem	Same as above; post-secondary schooling	.638723	.0451144	.575365	.7164665
(log)GDP p.c.	(log) GDP per capita, (constant 2005 international \$)	7.943883	.9791585	4.614001	10.37251
(log)Population	(log) of total population, 1992–2011	15.94059	1.630664	12.20106	21.01901
Polity2	Extent to which various democratic and autocratic features are prevalent in the aid recipient countries	1.850753	6.203968	-10	10
UNSC	Dummy = 1 for countries which were members of the United Nations Security Council in a particular year	.0597804	.2370816	0	1
Exports	Donor's exports to recipient as a share of total exports (both adjusted for inflation using US CPI for 2011)	.0015143	.00103608	0	.932255

Note: standard deviation (Std. Dev.), Consumer Price Index (CPI).  
Source: Authors' own calculations