Donors' Interest in Water and Sanitation Subsectors

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Accepted: 16 January 2021 / Published online: 10 March 2021

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Abstract

International efforts have taken place to alleviate poverty by adopting several obligations within the international society; one of these obligations is the provision of safe access to water and sanitation. The MDGs helped people around the world to gain improved water sources and better sanitation. Although the sectoral aid increased from 20% between 1990 and 1992 (only 4.9% distributed for water supply and sanitation (W&S)) to 35% between 2002 and 2004 (only 3.9% allocated for W&S), facts showed that the allocated aid was biased to social aims rather than infrastructural targets. In this study, I am focusing on the donors' commitment for W&S, whether their ODA for these two sub-sectors is aligned with the intentions of the SDGs. I find that donors allocated W&S aid by focusing on governments in general with higher governance indicators, and that poorer countries received a higher allocation of aid.

Keywords Water and sanitation · MDGs · SDGs · Official development assistance (ODA) · Donors' commitments · Governance · Tobit regression

Résumé

Les efforts internationaux pour la réduction de la pauvreté ont pris forme à travers de plusieurs obligations adoptés par la société internationale. Une de ces obligations est l'approvisionnement d'accès sécuritaire à l'eau et à l'assainissement (en anglais, water supply and sanitation, W&S). Les Objectifs du Millénaire pour le Développement (en anglais : Millennium Development Goals, MDGs) ont aidé des gens partout dans le monde à bénéficier d'un meilleur approvisionnement d'eau, et d'accès à des installations sanitaires. Même si l'aide dédiée à ce secteur a augmenté du 20% en 1990-1992 (que 4.9% distribué pour W&S) au 35% en 2002-2004 (que 3.9% dédié à W&S), les faits nous démontrent que cet aide est biaisé vers des finalités sociales plutôt que des objectifs d'infrastructure. Dans cet étude, nous nous focalisons sur l'engagement des donateurs envers W&S, pour voir si leur aide officielle au développement (en anglais

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: Official Development Assistance, ODA) pour ces deux secteurs est aligné avec les intentions des objectifs de développement durable (en anglais : Sustainable Development Goals, SDGs). Nous trouvons que les donateurs affectent leur aide W&S se focalisant généralement sur les gouvernements avec des meilleurs indicateurs de gouvernance, et que les pays les plus pauvres reçoivent une affectation d'aide supérieure.

Abbreviations

CRS	Creditor reporting system
DAC	Development Assistance Committee (OECD)
GDP	Gross domestic product
MDG	Millennium development goal
ODA	Official development assistance

Introduction

The increased international interest in financing environmental development projects for the developing countries is noticed during the beginning of the twenty first century (UNFCCC 2010). Therefore, international policies are issued to ensure the dedication of sustainable development in the international laws. International efforts since then have been taking place to alleviate poverty, where MDGs (the Millennium Development Goals) and consequently the SDGs (Sustainable Development Goals) are declared aiming at the alleviation of poverty by adopting several obligations within the international society. One of these obligations is the provision of safe access to water and sanitation, where the human development report (2006) emphasized that water is a crucial part in human rights. In view of this, Winpenny et al. (2016) stated that “*Achieving the Sustainable Development Goals will require governments, societies, and the private sector to change the way they use and manage water*”. Thus far, water and sanitation have lacked the interest that health and education have received.

After the declaration of the MDGs, three requirements were vital to meet the goals for water and sanitation. First, a proper infrastructure and a proper maintenance are required in place of the existing ones. A frequent maintenance of these infrastructures requires the keeping of reserved funds. Finally, meeting the required development for these sectors needs continuous finance together with the reforms for the required policies to meet the required monitoring and cooperation for efficient performance. Regrettably, data shows that in spite of these international efforts, enormous number of population still lacks access to proper sanitation (Baum et al. 2013), and this failure can be due to several factors, some of which are the lack of appropriate orientation for ODA for water and sanitation, where it is not targeting the areas that are mostly in need (El Khanji 2018). Other factors can be the rapid deterioration, destruction and defect of the installed sanitation system, where in some areas the failure has reached 50% (Starkl et al. 2013). Generally, although the MDG target for safe drinking water is accomplished in 2015, but the improvement was not the same in all countries, which calls for investigating donors' interest in financing W&S.

Well ahead, on 25 September 2015, the United Nations adopted the 2030 Agenda for Sustainable Development Goals,¹ where hygiene, which stands as a proxy for public health, is assimilated with these new goals. New sets of goals are declared, where the UN developed and declared these goals to shape their political policies, agenda for ending poverty, inequality, hunger and ensuring healthy life with food security, gender equality, education, energy, and the topic of study which is the sustainable provision of safe water and proper sanitation.

Adoption of these international agendas and the increase of international awareness are of great importance for these two subsectors in alleviating poverty. Moreover, W&S become public centrepiece for the international society. In addition, ODA flows for W&S has been raised significantly, but the question of decrying the selectivity official development assessment is a political incentive, rather than simply a moral aligned² with human rights, is debatable, especially that questioning about the donors selectivity choice for a particular sector is a matter of speculation that defended their decision. In this study, I am highlighting the political incentives of the donors for these two subsectors. I think that these vital goals deserve special interest as they are vital not only for life on earth but also for economic growth and development. The main difference between this study and the other papers that focus on sectorial aid is the explicit ethical motivation for giving aid, why some donors target W&S and not another ODA, their commitment in line with poverty alleviation and whether they are merit based aid or a need based aid.

The remaining of the paper is organized as follows. In Sect. 2, a literature review and an exploration for different issues with priority. Section 3 outlines the estimation methods and the data while results are presented and discussed in Sect. 4. Section 5 summarizes and concludes.

Literature Review

Collier and Dollar (2002) found that ODA helps 10 million people every year to escape the poll of poverty. However, some researchers found that aid is not really working in all countries (Bobba and Powell 2007; Boone 1994). Concerning water and sanitation subsectors, Wolf (2007) explored the effect of the ODA and the volatility of aid on several sectors to find that the share of ODA for education and health is affecting positively while the total aid seems to have a negative impact. In view

¹ SDG targets 6.1 and 6.2 (call for universal and equitable access for all) relate to drinking water, sanitation and hygiene and are more ambitious than the previous MDG target 7c (aimed to halve the proportion of the population without access to water and sanitation by 2015) (WHO and UNICEF 2017).

² Kaufmann et al. (2004) define governance as “the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected and replaced, the capacity of the government to formulate and implement sound policies, and the respect for citizens and the state for the institutions that govern economic and social interaction among them”. In addition, the international society in this regards and to ensure the implementation of the SDGs, a support with the required resources and the required political commitments is required. Therefore, the moral action is due to the interaction between political commitment, economic commitment and social commitment.

of this exploration, the results in (El Khanji 2018) suggest that aid is targeting urban areas while there is a clear evidence that care should be taken for the rural areas, and most of the aid is not targeting places that are really in need. Bayu et al. (2020) found that the inequality in safe access to water and sanitation is driven by different social, political (government effectiveness) and economic aspects (absorption of aid funds) of water governance in the developing countries. Therefore, donors' motivations, whether they are strategic, economic or political, beat the efficiency of aid and mislead the efficient allocation of aid for different subsectors.

Maurits van der Veen (2011) illustrated how donors' motivations are the main elements of their policy goals and objectives, which shape their inclination and directions in choosing to provide aid. The donors' motivation and intentions vary, what exactly motivates donors for this kind of aid. Could the motivation be driven by international influence or by domestic forces that shape the national policies toward the donor country donations? Aid motivation for these two subsectors still needs further investigations with the lack of literature concerning the donors' interest in allocating aid for W&S. No doubt, the international society has its effect on donors' commitment for this kind of aid, but further, focused exploration is required for better development. Donors may seek a mutual political benefit by providing aid, these two subsectors are vital for promoting better health circumstances and better application for human rights,³ which can emphasize the point, whether the provided aid is aligned with the recipients' needs or the donors' interest. Definitely, the international agendas (the MDGs followed by the SDGs) pressed and exerted pressure on donors to raise the amount of aid given to these subsectors and to provide more aid where it is needed. Political influence is an important factor here, where the safe access to W&S became an international mandatory commitment (Colina Martín 2020). But the recent shift in some donors' standards with the rising power of the emerging markets, where mutual benefits and future investments play an important role. After the financial crisis, the number of new non-DAC donors increased (Gore 2013; Gulrajani and Swiss 2019), this motivated the support of the international development and tend to increase the synergy between the donors and the recipients.

New donors can influence the modus operandi of the previous donors in allocating aid for different subsectors (Mawdsley 2017). The influence of the new donors is driven by proving their existence at an international level as a progressed and powerful country (Gulrajani and Swiss 2019). Thus, shifting the donors' interest toward social aims is a normal effect stemming from the appearance of the new donors. Gulrajani and Swiss (2019) discuss the influential effect of the OECD DAC in shaping the institutionalization of donor standards and how the ambitious donors join the DAC seeking some advantages, such as greater influence and role at an international

³ The United Nations General Assembly declared that the safe access to water and sanitation as an essential part of human rights (Brown et al. 2016). This declaration is followed by adopting a resolution (A/HRC/RES/15/9) by the UN Human Rights Council that affirms the right to water and sanitation as a part of international law, where the improvement for these two subsectors constitutes is an ethical obligation for both the national governments and the international community (De Albuquerque 2012).

level (OECD 2012). So, following an international agenda for W&S motivate different donors to adopt financing for these two subsectors.

Role of Policies and Institutions on ODA, a Shared Responsibility

Zetland (2010) highlights the fact that although the ODA increased during the last decade, monitoring the results and the feedback by donors is not covered enough with respect to the politics, where allocating ODA plays a part in interfering with domestic politics. The responsibility for safe access to water and sanitation within the individual country is a shared responsibility. Consequently, the ultimate responsibility partly lies with the current governments and the applied effective policies that stimulate and ascertain an efficient delivery for the public goods. The interaction between political intentions of the donors and the institutional policies govern the effectiveness of the targeted aid. To make ODA works, donors should make effort and influence to understand the political environment of the recipient countries (Leftwich 2007).

Okun (1988) stated that the provision of effective water supply and sanitation depends on domestic rules and on advancement and educational awareness concerning the health sector, this finding is agreeable with the results from Greßer and Stadelmann (2020) suggest that water and health related projects are effective in areas with better-educated individuals. According to Okun (1988), it is not enough to install an infrastructure for the provision such as pumps, wells, or pipes, but it is also needed for a proper intervention in the recipient countries in planning. Good responsible management of the projects is highly recommended by the international interest groups. Okun also mentioned the importance of finance for these projects and monitoring of the performance after installation. He pointed at the failure in some regions *"Africa, Asia, and Latin America are littered with inoperative pumps, wells, pipes, and treatment plants that may have been well conceived at the office of a donor agency and/or a country ministry but fell into disrepair because of the absence of local commitment at all stages of the project. Community participation, including local financing, has been the hallmark of successful sustained projects,* (Okun 1988, p. 1464)".

Mavrotas and Ouattara (2007) stated that when donors have more control on project financing, there is better growth in the recipient countries. However, donors' priorities are not always the same as recipient priorities, which may affect the volatility of aid. According to Hudson and Mosley (2008a), donors tend to show a coordination impact in their aid for certain countries. Dreher et al. (2008) conducted a panel data analysis for 143 countries over the period 1973–2002 for a disaggregated data set on aid to speculate whether or not aid is used as a mean to foster political support by the recipients in their voting in the UN General Assembly. They concluded that grants and untied aid are shaping the UN voting behaviour. Some donors take into account economic policy, institutional stability and the poverty index in the recipient countries. Some donors, on the other hand, focus on the objectivity of aid in line with their own targets. That being the case for the donors' part reflects how donating aid can have political goals.

The donors' reactions to the political, governance, economic performance and management in the recipient countries can stimulate aid volatility in those countries. Hudson (2012) explains how donors tend to maximize their welfare function subject to a budget constraint. Also, donors know that volatility affects negatively both on the recipient country and their own credibility as a donor. Volatility may be a response to recipient policies and behaviour.

Disbursement of aid can be decreased due to political interventions. Moreover, aid budgets can be subjected to a leakage due to emergency priorities. In addition, displacement or switching between sectors can be biased by the donors' preferences. Hudson comments that *"This can occur in response to an emergency in the country or unforeseen developments possibly associated with existing aid spending. However, as already indicated, having diverted aid away from sector j in period t, the donor may respond by increasing it above trend in the following period and vice versa in a sector which saw an aid surge. In this way aid shocks can have ripple effects. In addition aid between sectors may be complementary, for example, increasing humanitarian aid may foretell an increase in programme assistance aid"*.

In line with the Global Green New Deal (Barbier 2010), the G20⁴ group were aware of the importance of safe drinking water and sanitation for an economic development, not only for the vulnerable places in the world but also for the members of the G20 since the group itself accounts for 70% of population without proper sanitation and more than 50% without safe access to water resource (UNICEF 2001; Schuster-Wallace et al. 2008).

Donors' Policies in Financing W&S

Figure 1 shows that the moving trend of total aid is largely determined by the bilateral aid for the highest bilateral ODA donors (Denmark, France, Germany, Japan, Netherlands, Norway, Sweden, UK, and USA). From Fig. 1^{5,6}, it is clear that Japan is the highest bilateral donor for water and sanitation (20% of aid to water in 2005–2006). Japan accounted for 27% of water and sanitation aid between 2007 and 2008. Some donors, such as France and UK, are more interested in donating to previous colonies (Alesina and Dollar 2000).

⁴ The Group of Twenty, or G20, is the premier forum for international cooperation on the most important aspects of the international economic and financial agenda. It brings together the world's major advanced and emerging economies. G20 members are: Argentina, Australia, Brazil, Canada, China, European Union, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, United Kingdom and the United States.

⁵ A commitment is a firm written obligation by a government or official agency, backed by the appropriation or availability of the necessary funds, to provide resources of a specified amount under specified financial terms and conditions and for specified purposes for the benefit of a recipient country or a multi-lateral agency. (Source: OECD- DAC- CRS, Data Characteristics).

⁶ All amounts are expressed in USD millions in either constant prices. Constant prices (deflated amounts) include adjustments to allow for inflation rate changes in provider countries as well as changes in exchange rates between the provider currency and the US dollar over the same period. Constant prices are recommended for time series analysis. Accessed on: <http://www.oecd.org/development/financing-sustainable-development/development-finance-data/idsonline.htm>.

Fig. 1 Commitments for water and sanitation for all donors. Source of data from DAC-CRS

Following the increased interest of the international society in these two subsectors, the World Panel on Financing Water Infrastructure developed a model that directs the financing options. In addition, the third World Water Forum (WWF), which took place in Kyoto-Japan in 2003, issued a report that recommended doubling the financing options for W&S. Hence, the financing processes for W&S almost tripled between 2003 and 2014, which increased from \$6 billion in 2003 to approximately \$18 billion in 2014 (Winpenny et al. 2016).

Fig. 2 Volume of Donors' Disbursements and Commitments for Health, Education and Water & Sanitation, Source of Data: OECD-DAC official website

ODA for water has been suffering from little international attention and little allocation for ODA compared with other sectors. Figure 2⁷ illustrates how ODA for water & sanitation (the ODA is illustrated with donors' disbursements and donors' commitments) is less than that allocated for other sectors although ODA for W&S nearly doubled between 1995 and 2014 (increased from \$6.8 billion to \$12.9 billion annually, (constant 2014 prices)). ODA for water subsector remains less than the ODA allocated for other sectors for all sectors which are education, health and other social sectors (increased from \$42 billion in 1995 to \$140 billion in 2014). That means water ODA increased by 90% during this period while the overall ODA increased by more than 230% (Winpenny et al. 2016).

⁷ A definition given by the OECD "A disbursement is the release of funds to or the purchase of goods or services for a recipient; by extension, the amount thus spent. Disbursements record the actual international transfer of financial resources, or of goods or services valued at the cost to the donor. In the case of activities carried out in donor countries, such as training, administration or public awareness programmes, disbursement is taken to have occurred when the funds have been transferred to the service provider or the recipient.

In this regards and with the issue of the new SDGs, funding of the projects (where the SDGs have many goals on the agenda) is the key issue in here as well as how it is possible to develop measurement methods and indicators to measure the progress. Where Some member countries had intuition about the variety of the agenda, such as the UK and Japan, their concern is determined by how to finance all these projects, where calculations from the intergovernmental committee of experts on sustainable development financing have put the costs to eliminate extreme poverty at about \$66bn (£43bn) annually, while annual investments in improving infrastructure (water, agriculture, transport, power) could be up to a total of \$7tn globally, so how to finance all this budget and how to monitor these amounts of projects is a matter of concern for some of the committee countries.

Several literature criticized the lack of targeting in providing aid from donor countries (Alesina and Dollar 2000; Alesina and Weder 2002). There is no ground for assuming that the sectoral allocation of aid is purely based on just one set of motives. In general, many studies find that foreign aid is related to donors' strategic, political, and economic consideration. Doubts about the donors' real intention in targeting aid in achieving the goal is highlighted by Berthélemy and Tichit (2004).

The presence of the donors' strategic, economic, and political motivations is likely to distort the aid transfer process and diminish the efficiency gains from the resource reallocation. If aid is transferred to friendly regimes, then the role of aid in development is a matter of doubt. Furthermore, the conditionality attached to the aid often embodies elements of strategic, economic, and political motivations of donors, which may diverge from recipients' own development.

In this study, the intention is to analyse and point at the factors that make the ODA donors interested and willing to finance water and sanitation for the recipient countries. Clist (2011) stated that donors may target aid for emerging or growing economies to market and trade their production. Some studies point at the selectivity of the ODA as being directly linked to the demand and the acceptance of the tax payers in the donor country although tax payers may be kept unaware of the price of this ODA (Fuchs et al. 2014). Mosley (1985) emphasized that ODA can be considered as a public good provided by the donors. He also illustrated that tax payers see this ODA as a humanitarian necessity, and the amount paid should be acceptable and affordable depending on their countries' GDP per capita.

Donors can provide the required technologies in seeking the required goal from giving ODA as well. They should impose the required policies and the required facilities to ensure the success of the project. In fact, regulated institutions by donors are important to monitor the outcomes. They need to monitor the impact of the transferred funds and the outcomes of the projects with conducting risk analysis to avoid future misuse and the failure of the infrastructure, which is the highest reason why sanitation is not improved in most of the rural areas that are in need. Starkl et al. (2013) commented on this issue and recommended studying the reasons of the failures that occur in the infrastructure, where these failures could be avoided or improved by designing better suitable policies that make sure better planning, implementation, and monitoring of the projects. Furthermore,

they see the importance of institutional changes in developing and transferring better technologies to the areas in need.

The allocation of development aid for the recipient countries has been subjected to examination for a long time. After the cold war, examining the incentives for aid by the donors and the political reasons have been under investigation and explorations especially after the significant raise in international laws calling for human rights, decreasing social inequality and alleviating poverty. Some studies conclude that aid is working on promoting growth. After the declaration of the MDGs and consequently the SDGs, donors are under pressure by international organisations to follow measures in providing aid, such as the governmental quality of the country, which is aligned with development and sectoral targeted aid more than being targeted following political concerns. This will help in managing the ODA appropriately in the recipient country and consequently will be more oriented towards the goals contributing to poverty reduction.

Empirical Analysis

Estimation Methods

Several researchers investigate whether the allocation of aid is in line with the international commitment towards ending poverty, and if that aid is allocated for the benefit of the targeted sector (Thiele et al. 2007). Substantial literature commented on the shift in the international concern towards allocating aid not only taking into consideration the quantitative part, but having qualitative aspects which are gaining more attention from aid donors and sectoral allocating aid, especially that it started to be aligned with the recipient countries economics and needs (Thiele et al. 2007; Collier and Dollar 2002).

The empirical analysis aims at investigating the donors' interest and their commitment for the W&S subsectors, so the commitment would stand for two intentions here. The first one is the real commitment with the international society, where the second one is their genuine intention to help in providing and developing these two subsectors where they are really in need or their allocation for aid is aligned with political and individual interest. This is based on the concept used in Clist (2011) "*recipient need (RN) and donor interest (DI) were mutually exclusive and donors had to choose between increasing their own welfare and that of recipients*". Aid allocation (commitment) can be expressed as a function of the recipient need and donors' interest. In fact, here in this analysis donors' aid can be written as:

$$Aid_{ijt} = f(W\&S_j, GDP_j, Gov_j) \text{ for year} = t \quad (1)$$

where the dependent variable is Aid_{ijt} and this is the aid for water and sanitation allocated by donor i for recipient country j in year t . In this model, donors' interest (the dependent variable) is determined and affected by the variables of interest in the recipient countries, therefore aid is a function of independent variable: $W\&S_j$ (the percentage of population with safe access to water or sanitation in the recipient country j), the GDP_j per capita for the recipient country j , and the governance indicator for the recipient country j .

The analysis is based on monitoring and assessing this targeted aid whether the implementation and the commitments were in line with the achievements of the MDGs and the targets of the SDGs requisites the use of Tobit model. Lots of research work analysing donors' selectivity for targeted aid has adopted a Tobit model (Thiele et al. 2007; Alesina and Dollar 2000; McGillivray and White 1993). Donors are selective in their provision of aid; therefore, some countries may receive aid from a donor and others may not. Donors' aid is partly continuous with positive probability mass at one or more points. The model allows the illustration of the decision making process in aid provision from the donors. Censored models are applicable in this case and all the negative values of the negative donors' commitment are censored with value zero. Given that the aid that is allocated by the donor for W&S can be expressed as the aid that is needed and committed for the recipients in the Tobit model, therefore the aid that is received by the recipient countries aid_{jt}^* which is an unobservable censored variable for a number of observations has a linear form and can be expressed as:

$$aid_{jt}^* = \beta_0 + \beta_1 X_{jt} + \epsilon_{jt}, \quad (2)$$

where the variable aid_{jt}^* for the aid allocated and meets the donors' interest can be determined by:

$$\begin{cases} Aid_{ijt} = aid_{jt}^* & \text{if } aid_{jt}^* < 0 \\ Aid_{ijt} = 0 & \text{if } aid_{jt}^* \leq 0 \end{cases}$$

And $\epsilon_{jt} \sim N(0, \sigma^2)$

where Aid_{ijt} is the allocation of the desired aid (donors' interest) that takes positive value only when it is allocated as a commitment (we in this study are interested in the donors' commitments). In this case, aid_{jt}^* is the desired donation or provision and aid_{jt} is the actual aid, X_{jt} is the matrix of the explanatory variables. A negative value for desired aid (aid^*) would indicate that if possible donors would like to take money from W&S to divert to other uses. In other words, aid_{jt}^* illustrates whether aid is allocated or not for the recipient country, where $aid_{jt}^* > 0$ indicates that aid is allocated for these two subsectors and $aid_{jt}^* \leq 0$ means that the aid is not allocated for these two subsectors (Tables 1, 2).

Tobit model is the method of estimation, which is based on estimating a maximum likelihood of censored regression model and has been named after Tobin (1958). The problem with the Tobit model is the consistency, which depends on normality and homoscedasticity of errors. For the robustness of the analysis and to overcome the heteroscedasticity problem, a more robust method to calculate standard errors that is less likely to be biased by heteroscedasticity is used. Also, several models are implemented in this analysis. For instance, a longitudinal cross sectional times series random effects Tobit model that allows estimation with the dummy variable, so a cross sectional times series balanced panel with missing observations is used for this purpose.

The results of the Tobit model with the robustness of the errors⁸ are listed in Tables 3, 4, 5 and 6. Furthermore, to capture the effect of the international society' commitment and their interest in allocating aid for these two subsectors, a model is

⁸ We can skip the excluding of the outliers from the model with the robustness of the errors.

estimated with a dummy variable that tries to capture the effect of the MDGs (more details are provided in the data section); this estimation is illustrated in Tables 5 and 6.

The validity of the Tobit model is checked by testing the normality and the homoscedasticity. Cameron and Trivedi (2009) introduced a method to test for normality and homoscedasticity of the errors. Testing normality can be done by checking the normal distribution assumption of the disturbance using the Lagrange Multiplier,⁹ here in this study; a test of the Tobit specification¹⁰ is used. Results indicate the rejection of the null and indicated that the normal Tobit model lacks the normality. Also, a conditional moment test is used for testing the null hypothesis that the disturbances in a Tobit model have a normal distribution (Skeels and Vella 1999) which indicated the presence of heteroscedasticity¹¹ (see Tables 5 and 6).

Many researchers documented concerns about the inconsistent maximum likelihood when there is a heteroscedasticity. For these reasons and for statistical purposes that support using Tobit as the most appropriate model for this kind of regression analysis, I proceed with a model that fits a maximum likelihood for Tobit Multiplicative Heteroscedasticity (TMH) Regression.¹² The reason behind using this model is to overcome the first Tobit estimation problem when there is an evidence of heteroskedasticity (Hurd 1979). The new model is included in Tables 7 and 8, and it fits a maximum-likelihood for Tobit Multiplicative Heteroscedasticity Regression. Finally, to check the robustness and the validity of the model, a Random-effects Tobit model is used (see Tables 9 and 10), this model allows for further robustness of the results with the ability to see the effect of the time trend. For better exploration of the estimation results, several models are compared and are summarized in Table 11. Regression analysis in Table 11 includes the Tobit model, the Tobit Multiplicative Heteroscedasticity Regression and the Random effects (RE). The regression explores an interaction between the trend and the dummy variables that is illustrated in Table 11, this estimation will facilitate capturing the effect of time within the model and also will help in capturing the direct effect of the declaration of the international commitment on the allocation of aid.

Data Description

The empirical analysis implements aid commitment for water and sanitation as mentioned in Thiele et al. (2007) that Neumayer (2003) considers commitments as more expressive than disbursements for their inclusiveness of the nature of the donors' power. Moreover, OECD describes commitments as a written obligation, while disbursement stands for the actual financial transactions (OECD 2012).

⁹ Some literature suggested testing for normality using the score test (Lin and Schmidt 1984; Bera et al. 1984; Chesher and Irish 1987), others suggest carrying a Hausman test for the normality in the Tobit model (Nelson 1981).

¹⁰ LM-statistic for testing the Tobit specification against the alternative of a model that is non-linear in the regressors and contains an error term that can be heteroskedastic and non-normally distributed. The test is carried out by taking a Box-Cox transformation of the dependent variable $[y^{(\lambda)} - 1]/\lambda$ and testing whether the parameter $\lambda = 1$. Rejecting the null suggests that the Tobit specification is unsuitable. (source: <https://www.stata.com/support/faqs/statistics>)

¹¹ Bctobit Stata command is used. Results indicate the presence of heteroskeasticity.

¹² Stata's tobitthem is used to estimate the Multiplicative Heteroscedasticity Tobit (MHT) models.

All donors' commitment for water and sanitation target is represented by a ratio of water and sanitation aid to the total aid given by donors because it stands for the decision taken by donors for their commitment to this type of aid. Aid data is collected from the sectoral disaggregated DAC database on aid commitments (Creditor Reporting System). In El khanji (2018), where the main discussion in the study is about the effect of aid and aid volatility on the recipient countries for W&S targeted aid. In addition, explanations on the financing of the water and sanitation are discussed in this study. Figure 3 demonstrates the moving average for global commitment for W&S between the mid-1990s and 2016, where the increasing trend in donors' commitments for these two subsectors is well observed.

The independent variables cover the variables of interest for 139 countries covering the period between 1995 and 2016 that receive aid for water and sanitation, and these variables are illustrated as:

The proportion of populations with safe access to water or sanitation are used here as indicators how this allocated aid improves the access to W&S and how the recipient countries' spending on W&S can affect the donors' decision in raising or decreasing the provision of aid. Some countries may receive aid but decrease the government spending on their infrastructures (El Khanji 2018). The GDP per capita is added for several reasons. During the last decades, some of the developing economies enjoyed an economic transfer from low income to emerging or to middle-income economies. This will affect on the foreign aid and the account of foreign aid with respect to GDP of the recipient countries (Carbonnier and Sumner 2012). Carbonnier and Sumner (2012) also investigated the continuous flow of aid from the donor to a newly economically grown country, that can easily finance their development to find that this relationship has political incentives where they aim at protecting their global public good and guarantee their presence in shaping the international policies. Also, the donors can prolong their engagement in the internal political system of the recipient country. They also highlighted a fact which can be positive with respect to the bilateral mutual benefit between donors and recipients in terms of the comply of the recipient country with the international sustainable development policies that are imposed by the high income countries that support this international change also for political reasons which has a good excuse to be shaped and embodied in the form of alleviating poverty, where they commented on the changes of the "*shift in the geography of poverty*", thus most of the considered poor are living in middle income countries in contrary to what used to be believed that the most of the poor are living the poorest countries.

I add *government effectiveness* because the quality of governance may differ within countries. Some local governments and institutions can make aid productive while others can make it a part of the corruption or a shadow money. Dollar and Levin (2006) conducted a study to explore the effect of governance on the selectivity of aid by both the bilateral and the multilateral donors to find that recently good governance which facilitates the acquiring of aid. In addition, Hoebink (2006) highlights how the good governance could be a condition that affects the selectivity of aid recipients.

Finally, a dummy variable is added to the model to catch the effect of the MDGs and the effects of aid allocation by donors for these subsectors after the international adoption of the MDGs; a dummy takes the value 1 if observation refers to years starting from 2000 and a 0 value otherwise (Tables 1, 2).

Table 1 Definitions of variables for analysis

Variable	Definition and source
Improved water source (% of population with access)	Access to an improved water source refers to the percentage of the population using an improved drinking water source. Source: WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation (http://www.wssinfo.org/) and the World Bank development indicators. Data available from 1995 to 2015
Improved sanitation facilities (% of population with access)	Access to improved sanitation facilities refers to the percentage of the population using improved sanitation facilities. Improved sanitation facilities are likely to ensure hygienic separation of human excreta from human contact. Source: WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation (http://www.wssinfo.org/) and the World Bank Development Indicators. Data available from 1995 to 2015
Donors' commitments* for W&S	Obtained from the Creditor Reporting System (CRS)-Development Assistance Committee (DAC) database on aid commitments and is at a constant US\$ 2015 million for total W&S Official development assistance (ODA) is defined as those flows to countries and territories on the DAC List of ODA Recipients and to multilateral development institutions which are: (i) provided by official agencies, including state and local governments, or by their executing agencies; and (ii) each transaction of which: (a) is administered with the promotion of the economic development and welfare of developing countries as its main objective; and (b) is concessional in character and conveys a grant element of at least 25% (calculated at a discount rate of 10%). Data available from 1995 to 2016
Government effectiveness ^a	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate of governance (ranges from approximately – 2.5 (weak) to 2.5 (strong) governance performance) (source: World Bank Governance indicators, The WGI are produced by Daniel Kaufmann (Natural Resource Governance Institute and Brookings Institution) and Aart Kraay (World Bank Development Research Group). Data from 1996 to 2016
MDGs dummy variable	To catch the effect of the MDGs and the effects of aid allocation by donors for these subsectors after the international adoption of the MDGs; a dummy takes the value 1 if observation refers to years starting from 2000 and a 0-value otherwise

*Donors' commitments: all donors commitments for all sectors, all donors commitments for W&S, (DAC donors, G7, Multilateral total; EU institutions, UN, World Bank, Denmark, France, Germany, Japan, Korea, Netherlands, Norway, Sweden, UK and USA)' commitments for W&S

^aKaufmann et al. (2010). "The Worldwide Governance Indicators: Methodology and Analytical Issues". World Bank Policy Research Working Paper No. 5430 (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1682130)

Table 2 Summary statistics

Dependent variables	Obs	Mean	Std. dev	Min	Max
All ODA commitments from donors	2997	667.8758	1123.346	0.016	22,106.92
All donors commitments for W&S	2697	42.86424	88.96396	0	1091.578
DAC countries donors(ODA for W&S)	2616	28.96987	72.01226	0	1074.765
G7 (ODA for W&S)	2386	25.37693	71.19527	0	1072.477
Multilateral total (ODA for W&S)	1734	22.1404	47.90058	5.00E-06	488.8408
EU institutions (ODA for W&S)	483	16.59879	23.62661	0.000277	165.3332
UN (ODA for W&S)	1171	0.5547639	0.9733388	5.00E-06	7.352114
World Bank (ODA for W&S)	403	45.45758	69.61232	0.065242	487.5453
Denmark (ODA for W&S)	229	8.592482	16.9164	0	101.0939
France (ODA for W&S)	901	9.198727	21.35059	0	205.1192
Germany (ODA for W&S)	1200	10.48028	21.12608	0.000111	278.9743
Japan (ODA for W&S)	1716	15.04389	59.72092	0.000023	900.1043
Korea (ODA for W&S)	341	6.792881	18.98054	0.003064	110.3491
Netherlands (ODA for W&S)	503	5.943137	11.92982	0	112.8286
Norway (ODA for W&S)	479	1.191897	3.244629	0	44.31903
Sweden (ODA for W&S)	299	2.235717	4.99815	0	39.83453
United Kingdom (ODA for W&S)	380	5.895942	14.8484	0.001374	118.9304
United States (ODA for W&S)	702	13.98985	66.57971	0.000101	1067.645
Independent variables	Obs	Mean	Std. dev	Min	Max
Government effectiveness	2474	- 0.49837	0.6639749	- 2.44587	1.57223
Total water improved	2863	79.47352	17.9693	19.5	100
Improved total sanitation	2860	59.90538	29.68738	3	100
GDP per capita	2948	3710.6	3781.185	115.7941	20,333.94

Fig. 3 Five years moving average and yearly global aid commitment for W&S (Source: El Khanji (2018))

Results

The results of the analysis are present in Tables 3, 4, 5, 6, 7, 8, 9, 10, and 11, covering the period between the years 1995 and 2016. Tables 3 and 4 include the Tobit regression for the model presents in Eq. 1. To capture the effect and the extent of the international commitment, I use a dummy variable, the results for the Tobit regression are presented in Tables 5 and 6, the normality and the heteroscedasticity tests indicate the lack of normality and the presence of the heteroscedasticity (see Tables 5 and 6 where the CM test is recorded). For further testing and due to statistical purposes, the Tobit Multiplicative Heteroscedasticity (TMH) Regression is implemented. The reasons behind using this model are to check the robustness of the regression results in Tables 5 and 6, and to help in dealing with the heteroscedasticity which can be treated using this model (see Tables 7 and 8). For further investigation, the Random-Effects Tobit model is used which allows computation of individual-specific intercepts and helps in estimating the effect of dummy variable within a panel data analysis (see Tables 9 and 10).

Regression results show the significance of the dummy variable for both water and sanitation subsectors, that captures the influence of the MDGs declaration and the commitments of the donors in allocating this targeted ODA to increase the coverage and the access for W&S. The results of the different estimation methods showed the significance of the dummy variable that manifests the commitments of the international donors for this targeted aid (see Tables 5, 6, 7, 8, 9, 10, and 11). The dummy variable is highly significant at 1% significant level for both water and sanitation (Tables 5 and 6). This significance appears when the dependent variable is the total donors' commitment for these two subsectors, so this proves the donors'

Table 3 Tobit regression for donors' commitment and access to improved water resources (1995–2016)

	All donors/ratio [†]				All W&S donors				DAC countries				G7				Total multilateral				EU ins				UN				World Bank				Denmark			
	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA																											
Constant	5.622 (1.46)	1.686 (0.51)	4.64 (0.51)	-47.13*** (9.24)	-2.806 (1.30)	1.157 (1.57)	5.103** (3.02)	5.816 (1.02)	-52.42** (3.06)																											
Total improved water sources	0.0788 (1.56)	0.149*** (3.47)	0.318** (2.81)	0.207*** (3.63)	-0.0543 (1.86)	0.044,232 (0.58)	-0.0269 (1.15)	-0.0139 (0.18)	0.655** (3.14)																											
Government effectiveness	3.383* (2.29)	4.023** (3.01)	14.25*** (4.42)	-4.529** (2.82)	6.353*** (6.89)	0.528* (2.34)	-0.722 (1.03)	1.564 (0.66)	-27.87*** (4.81)																											
GDP per capita	-0.0467 (1.67)	-0.0443 (1.65)	-0.261*** (4.25)	-0.166*** (4.68)	-0.242*** (9.47)	-0.044*** (7.87)	-0.0393 (1.89)	-0.397*** (4.54)	0.0774 (0.66)																											
Sigma cons	20.48*** (40.84)	19.79*** (47.81)	60.08*** (56.32)	25.27*** (21.68)	15.71*** (28.12)	2.588* (132.23)	4.934*** (23.97)	20.25*** (18.45)	67.31*** (126.33)																											
N	840	1145	1586	2863	2863	2,863	290	361	662																											
LR chi2(3)	37.77***	64.46***	41.79***	29.25***	50.03***	32.18***	593.35***	20.82***	11.67*																											
Pseudo R ²	0.0018	0.0022	0.0015	0.0011	0.0029	0.0052	0.1101	0.0048	0.0062

Table 3 (continued)

	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA
LR chi2(3)	9.09*	31.53***	34.48***	48.28***	202.17***	107.84***	14.65***	40.04***	23.20***
Pseudo R ²	0.0012	0.0031	0.0020	0.0126	0.0364	0.0266	0.0083	0.0212	0.0031

*Ratio of W&S aid with respect to total aid given by all donors

t-statistics are in parentheses, ***significant at 1% level, **significant at 5% level, *significant at 10% level

This is the likelihood ratio (LR) chi-square test indicating that at least one of the regression coefficient is not equal to zero. The number in the parentheses indicates the degrees of freedom of the Chi-Square distribution

The correlation between All donors/ratio and Total improved water sources is (0.1102***)

The LR chi2(3) – This is the Likelihood Ratio (LR) Chi-Square test that at least one of the predictors' regression coefficient is not equal to zero in the model, the null hypothesis H_0 is that all of the regression coefficients in the model are equal to zero

Table 4 Tobit regression for donors' commitment and access to improved sanitation (1995–2016)

	All donors/ratio [†]										World Bank	Denmark
	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	UN	EU ins		
Constant	5.489*** (12.04)	55.33*** (11.98)	29.34*** (7.54)	21.96*** (5.33)	37.97*** (12.46)	-24.96*** (8.76)	0.127 (1.92)	72.02*** (8.51)	0.127 (1.92)	-24.96*** (8.76)	72.02*** (8.51)	15.20*** (6.05)
Improved sanitation	0.0246*** (3.48)	0.150* (2.02)	0.245*** (3.94)	0.278*** (4.27)	-0.0679 (1.36)	-0.0878* (2.06)	-0.00985*** (9.08)	0.0166 (0.1)	-0.00985*** (9.08)	-0.0878* (2.06)	0.0166 (0.1)	-0.074 (1.46)
Government effectiveness	1.524*** (4.94)	13.01*** (4.12)	9.472*** (3.44)	8.448** (2.79)	10.62*** (4.83)	8.127*** (4.1)	-0.422*** (8.82)	32.81*** (4.23)	-0.422*** (8.82)	8.127*** (4.1)	32.81*** (4.23)	0.826 (0.32)
GDP per capita	-0.0230*** (3.92)	-0.478*** (6.99)	-0.319*** (5.51)	-0.278*** (4.40)	-0.269*** (4.91)	-0.141*** (3.40)	-0.00967*** (7.92)	-0.655 (1.82)	-0.00967*** (7.92)	-0.141*** (3.40)	-0.655 (1.82)	-0.147 (1.72)
Sigma constant	9.008*** (75.63)	88.39*** (168.83)	72.31*** (70.01)	71.68*** (66.8)	47.34*** (56.96)	36.88*** (26.33)	1.103*** (44.25)	68.13*** (27.61)	1.103*** (44.25)	36.88*** (26.33)	68.13*** (27.61)	16.66*** (20.98)
N	2860	2528	2452	2232	1624	2860	2860	381	2860	2860	381	220
LR chi2(3)	41.79***	54.05***	36.87***	29.07***	50.65***	37.35***	636.82***	18.72***	636.82***	37.35***	18.72***	12.89***
Pseudo R ²	0.0020	0.0018	0.0013	0.0011	0.0029	0.0061	0.1181	0.0043	0.1181	0.0061	0.0043	0.0069
	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	Sweden	Norway	UK	USA
Constant	9.940*** (5.24)	7.143*** (4.67)	25.38*** (5.68)	-36.52*** (12.82)	-2.836* (2.56)	-3.106*** (9.90)	3.787*** (5.28)	6.316* (2.33)	3.787*** (5.28)	-3.106*** (9.90)	6.316* (2.33)	-29.46*** (3.95)
Improved sanitation	0.0308 (1.01)	0.137*** (5.47)	0.0737 (1.09)	0.120*** (3.49)	-0.0987*** (5.09)	0.00574 (1.18)	-0.0158 (1.20)	-0.0522 (0.92)	-0.0158 (1.20)	0.00574 (1.18)	-0.0522 (0.92)	0.622*** (5.25)
Government effectiveness	3.523* (2.37)	4.990*** (3.84)	16.13*** (5.08)	-3.577* (2.33)	6.356*** (7.04)	0.539* (2.41)	-0.828 (1.16)	1.392 (0.59)	-0.828 (1.16)	0.539* (2.41)	1.392 (0.59)	-26.51*** (4.97)
GDP per capita	-0.0415 (1.44)	-0.0849** (3.03)	-0.223*** (3.42)	-0.182*** (4.89)	-0.189*** (7.46)	-0.0490*** (8.19)	-0.0383 (1.83)	-0.352*** (3.78)	-0.0383 (1.83)	-0.0490*** (8.19)	-0.352*** (3.78)	-0.11 (0.89)
Sigma constant	20.52*** (40.76)	19.65*** (47.79)	60.21*** (56.27)	25.07*** (21.81)	15.57*** (28.21)	4.092*** (131.16)	4.940*** (23.93)	20.21*** (18.46)	4.940*** (23.93)	4.092*** (131.16)	20.21*** (18.46)	66.45*** (124.59)
N	837	1144	1583	2860	2860	2860	289	360	289	2860	360	662

Table 4 (continued)

	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA
LR chi2(3)	7.74*	49.29***	28.47***	46.30***	225.72***	108.16***	14.68***	40.51***	40.20***
Pseudo R ²	0.0010	0.0049	0.0016	0.0120	0.0406	0.0267	0.0084	0.0215	0.0054

*Ratio of W&S aid with respect to total aid given by all donors

t-statistics are in parentheses, *** significant at 1% level, ** significant at 5% level, * significant at 10% level

The correlation between All donors/ratio and Total improved sanitation is (0.1121***)

The LR chi2(3) – This is the Likelihood Ratio (LR) Chi-Square test that at least one of the predictors’ regression coefficient is not equal to zero in the model, the null hypothesis H₀ is that all of the regression coefficients in the model are equal to zero

Table 5 Tobit regression for donors' commitment and access to improved water resources (1995–2016) with the MDGs dummy variable

	All donors/ratio [†]				Total multilateral	EU. Ins	UN	World Bank	Denmark
Constant	3.891*** (5.34)	23.96*** (3.78)	5.068 (0.87)	0.386 (0.06)	26.98*** (4.99)	– 23.73*** (4.51)	– 0.319* (2.44)	59.13*** (3.69)	19.50** (3.3)
Total improved water sources	0.0385** (4.30)	0.356*** (4.33)	0.421*** (5.46)	0.464*** (5.61)	0.0425 (0.58)	– 0.133* (2.01)	– 0.0168*** (8.90)	0.406 (1.66)	– 0.0629 (0.86)
Government effectiveness	1.258*** (3.99)	14.89*** (3.2)	8.879* (2.09)	6.775 (1.35)	11.08*** (5.53)	9.854*** (4.73)	– 0.0341 (0.70)	26.70*** (3.64)	0.891 (0.44)
GDP per capita	– 0.0195*** (3.78)	– 0.538*** (7.69)	– 0.312*** (5.75)	– 0.251*** (3.81)	– 0.338*** (7.15)	– 0.176*** (4.38)	– 0.0152*** (8.90)	– 0.855*** (3.07)	– 0.181** (3.26)
MDGs dummy variable	– 0.310 (1.66)	18.50*** (4.53)	6.122 (1.85)	– 0.653 (0.18)	6.864 (1.94)	8.291*** (3.38)	1.851*** (12.8)	– 18.09 (1.50)	– 3.077 (1.11)
N	2863	2532	2454	2238	1626	2863	2863	380	220
Sigma cons	9.815*** (22.11)	87.84*** (116.31)	72.19*** (12.56)	71.60*** (11.38)	47.07*** (16.06)	36.53*** (13.98)	1.033*** (17.48)	67.79*** (10.76)	16.66*** (9.95)
LR chi2(4)	38.32***	80.40***	44.27***	29.28***	53.39***	42.97***	1095.14***	22.72***	12.91*
Pseudo R ²	0.0018	0.0027	0.0016	0.0011	0.0031	0.0070	0.2033	0.0053	0.0069
CM test ²	956.57***	1551.4***	1383.1***	1338.1***	1228.4***	99.902***	413.96***	311.74***	200.64***
					Netherlands	Norway	Sweden	UK	USA
Constant	4.977 (1.87)	2.711 (1.21)	14.91* (2.18)	– 0.538 (1.49)	– 2.902 (1.51)	– 2.83*** (4.56)	5.337** (2.68)	5.173 (0.89)	– 34.03** (2.77)
Total improved water sources	0.0645 (1.66)	0.170*** (5.14)	0.396*** (4.61)	0.0125* (2.37)	– 0.0580* (2.25)	– 0.00947 (1.16)	– 0.0367 (1.42)	– 0.0325 (0.38)	0.642*** (5.15)
Government effectiveness	4.151** (2.8)	2.906* (2.24)	10.65* (2.52)	0.212 (1.24)	6.564*** (5.76)	0.850*** (3.36)	– 0.244 (0.38)	3.625 (1.16)	– 29.80*** (5.91)

Table 5 (continued)

	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA
GDP per capita	-0.0504 (1.76)	-0.035 (1.11)	-0.223** (3.01)	-0.013*** (5.35)	-0.244*** (6.61)	-0.047*** (8.75)	-0.0441** (2.97)	-0.407*** (4.24)	0.091 (1.52)
MDGs dummy variable	2.805* (1.96)	-3.972* (2.14)	-21.09*** (3.30)	1.035*** (12.42)	0.731 (0.71)	1.082** (2.94)	1.23 (1.68)	4.63 (1.41)	-20.00** (3.04)
<i>N</i>	840	1145	1586	2863	2863	2863	290	361	662
Sigma cons	20.45*** (12.5)	19.75*** (17.07)	59.82*** (9.04)	6.416*** (272.35)	15.69*** (10.04)	4.109*** (125)	4.904*** (7.15)	20.13*** (7.5)	67.13*** (176.6)
LR chi2(4)	11.51**	36.53***	47.93***	21.66***	202.65***	120.46***	17.96***	42.31***	26.68***
Pseudo <i>R</i> ²	0.0015	0.0036	0.0027	0.0012	0.0365	0.0297	0.0102	0.0225	0.0036
CM test ²	653.84***	834.95***	1189.8***	280.63***	137.75***	142.91***	248.56***	314.36***	556.44***

¹Ratio of W&S aid with respect to total aid given by all donors

t-statistics are in parentheses, *** significant at 1% level, ** significant at 5% level, * significant at 10% level

The LR chi2(4) – This is the Likelihood Ratio (LR) Chi-Square test that at least one of the predictors' regression coefficient is not equal to zero in the model, the null hypothesis H_0 is that all of the regression coefficients in the model are equal to zero

² A conditional moment (CM) test for testing the null hypothesis that the disturbances in a Tobit model have a normal distribution

Table 6 Tobit regression for donors' commitment and access to improved sanitation (1995–2016) with the MDGs dummy variable

	All donors/ratio [†]			All W&S donors		DAC countries		G7	Total multilateral	EU	Ins	UN	World Bank	Denmark
Constant	5.500*** (11.69)	44.32*** (8.05)	25.18*** (6.04)	21.41*** (4.65)	32.60*** (8.41)	– 29.11*** (7.91)	– 0.983*** (9.24)	– 0.983*** (9.24)	82.63*** (6.9)	16.77*** (5.05)				
Improved sanitation	0.0246*** (3.81)	0.109 (1.62)	0.228*** (3.74)	0.275*** (4.32)	– 0.0769 (1.73)	– 0.0966* (2.23)	– 0.0116*** (10.23)	– 0.0116*** (10.23)	0.031 (0.21)	– 0.0676 (1.47)				
Government effective- ness	1.520*** (5.03)	17.61*** (3.67)	11.27** (2.69)	8.679 (1.71)	12.04*** (5.78)	10.06*** (4.79)	– 0.088 (1.70)	– 0.088 (1.70)	30.33*** (3.76)	– 0.0447 (0.02)				
GDP per capita	– 0.0229*** (3.93)	– 0.520*** (8.51)	– 0.335*** (6.67)	– 0.280*** (4.68)	– 0.284*** (6.13)	– 0.164*** (3.81)	– 0.0126*** (7.82)	– 0.0126*** (7.82)	– 0.640* (2.03)	– 0.138* (2.40)				
MDGs dummy variable	– 0.0204 (0.04)	21.04*** (5.04)	8.092* (2.39)	1.018 (0.27)	7.983* (2.25)	8.504*** (3.49)	1.748*** (12.72)	1.748*** (12.72)	– 14.08 (1.16)	– 3.124 (1.10)				
Sigma cons	9.008*** (22.1)	88.03*** (109.61)	72.25*** (12.54)	71.67*** (11.36)	47.27*** (16.16)	36.56*** (13.96)	1.031*** (17.73)	1.031*** (17.73)	68.02*** (10.69)	16.61*** (9.95)				
N	2860	2528	2452	2232	1624	2860	2860	2860	381	220				
LR chi2(4)	41.80***	75.00***	41.28***	29.13***	55.20***	48.83***	1101.93***	1101.93***	19.89***	14.23***				
Pseudo R ²	0.0020	0.0025	0.0015	0.0011	0.0032	0.0080	0.2044	0.2044	0.0046	0.0076				
CM test ²	960.74***	1552.1***	1384.3***	1330.2***	1216.5***	97.087***	389.47***	389.47***	312.12***	198.28***				
	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA					
Constant	8.383*** (5.87)	9.275*** (6.36)	37.89*** (6.07)	– 0.158 (0.71)	– 3.069** (2.81)	– 3.616*** (10.65)	3.460*** (4.1)	3.460*** (4.1)	4.612 (1.83)	– 14.53 (1.93)				
Improved sanitation	0.0242 (0.79)	0.142*** (6.09)	0.094 (1.49)	0.0115* (2.33)	– 0.0991*** (4.53)	0.00495 (1.03)	– 0.0167 (1.14)	– 0.0167 (1.14)	– 0.0565 (1.17)	0.606*** (8.36)				
Government effective- ness	4.347** (3.09)	4.085** (3.08)	13.43** (3.03)	0.252 (1.43)	6.492*** (5.72)	0.815*** (3.34)	– 0.424 (0.64)	– 0.424 (0.64)	3.307 (1.13)	– 28.04*** (6.38)

Table 6 (continued)

	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA
GDP per capita	- 0.0468 (1.37)	- 0.0739* (2.14)	- 0.187** (2.88)	- 0.0153*** (5.08)	- 0.191*** (6.65)	- 0.0531*** (9.10)	- 0.0457** (3.00)	- 0.366*** (3.89)	- 0.0927 (1.42)
MDGs dummy variable	3.100* (2.18)	- 3.674* (1.98)	- 17.57** (2.67)	1.079*** (12.62)	0.509 (0.5)	0.987** (2.72)	1.013 (1.43)	4.469 (1.43)	- 16.32** (2.60)
Sigma cons	20.49*** (12.47)	19.61*** (17.01)	60.03*** (9.02)	6.418*** (263.91)	15.55*** (10.19)	4.105*** (114.2)	4.920*** (7.08)	20.10*** (7.5)	66.33*** (183.7)
N	837	1144	1583	2860	2860	2860	289	360	662
LR chi2(4)	10.69***	53.73***	37.91***	24.43***	225.96***	118.95***	17.00**	42.67***	42.55***
Pseudo R ²	0.0014	0.0053	0.0022	0.0013	0.0407	0.0293	0.0097	0.0227	0.0057
CM test ²	658.69***	795.04***	1219.8***	364.67***	124.29***	134.36***	245.79***	312.9***	539.8***

¹Ratio of W&S aid with respect to total aid given by all donors

t-statistics are in parentheses, *** significant at 1% level, ** significant at 5% level, * significant at 10% level

The LR chi2(4) – This is the Likelihood Ratio (LR) Chi-Square test that at least one of the predictors' regression coefficient is not equal to zero in the model, the null hypothesis H_0 is that all of the regression coefficients in the model are equal to zero

² A conditional moment (CM) test for testing the null hypothesis that the disturbances in a Tobit model have a normal distribution

Table 7 Tobit multiplicative heteroscedasticity regression: donors' commitment and access to improved water resources (1995–2016) with the MDGs dummy variable

Tobit multiplicative heteroscedasticity regression: donors' commitment and access to improved water resources													
	All donors/ratio [†]		All W&S donors		DAC countries		G7	Total multilateral		EU. Ins	UN	World Bank	Denmark
Constant	2.400** (3.15)	19.39** (2.68)	4.633 (0.71)	4.633 (0.71)	– 6.56 (1.94)	33.10*** (6.13)	– 7.74 (0.92)	– 0.473*** (3.82)	57.71*** (3.34)	19.50*** (3.3)			
Total improved water sources	0.0368*** (3.86)	0.412*** (4.46)	0.436*** (4.59)	0.484*** (8.84)	– 0.0425 (0.68)	– 0.348** (2.93)	– 0.0135*** (8.21)	0.44 (1.75)	– 0.0629 (0.86)				
Government effectiveness	1.425*** (4.02)	13.78*** (3.42)	8.876* (2.29)	4.278 (1.75)	13.70*** (5.26)	8.898*** (4.39)	– 0.02 (0.45)	26.97*** (3.64)	0.891 (0.44)				
GDP per capita	– 0.0361*** (6.00)	– 0.531*** (8.53)	– 0.330*** (6.24)	– 0.181*** (3.48)	– 0.277*** (6.23)	– 0.173*** (4.26)	– 0.0141*** (7.81)	– 0.919** (2.96)	– 0.181*** (3.26)				
MDGs dummy variable	1.567** (3.24)	17.75*** (4.84)	5.974 (1.82)	2.408 (1.07)	7.405* (2.16)	8.352*** (3.46)	1.772*** (11.14)	– 18.11 (1.51)	– 3.077 (1.11)				
Sigma cons	12.74*** (12.32)	66.96*** (7.7)	– 70.24*** (12.93)	7.708* (2.54)	– 53.94*** (11.04)	23.23*** (3.83)	1.643*** (5.57)	59.60*** (3.45)	– 16.66*** (9.95)				
N	2863	2532	2454	2238	1626	2863	2863	380	220				
Wald chi ² (4)	57.35***	91.62***	58.93***	117.83***	76.95***	41.78***	173.55***	27.53***	26.05***				
	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA				
Constant	4.81 (1.77)	2.705 (1.21)	14.91* (2.18)	– 46.01*** (9.08)	– 2.902 (1.51)	– 2.832*** (3.53)	5.337*** (2.68)	4.028 (1.45)	– 42.05 (1.43)				
Total improved water sources	0.0677 (1.69)	0.171*** (5.17)	0.396*** (4.61)	0.109 (1.81)	– 0.0580* (2.25)	– 0.00948 (1.13)	– 0.0367 (1.42)	0.0271 (0.75)	0.768* (2.45)				
Government effectiveness	4.238** (2.8)	3.139* (2.29)	10.65* (2.52)	0.991 (0.59)	6.564*** (5.76)	0.851* (2.42)	– 0.244 (0.38)	1.277 (0.94)	– 29.70* (2.05)

Table 7 (continued)

	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA
GDP per capita	-0.0521 (1.79)	-0.0377 (1.18)	-0.223** (3.01)	-0.214*** (4.08)	-0.244*** (6.61)	-0.0470*** (4.15)	-0.0441** (2.97)	-0.0888*** (4.17)	0.00334 (0.05)
MDGs dummy variable	2.889* (1.99)	-3.762* (1.98)	-21.09*** (3.30)	1.547*** (4.90)	0.731 (0.71)	1.083* (2.48)	1.231 (1.68)	2.890* (1.97)	-19.39** (2.89)
Sigma cons	-20.86*** (11.58)	-20.84*** (11.63)	-59.82*** (9.04)	6.931*** (8.97)	-15.69*** (10.04)	-4.11*** (5.48)	-4.909*** (7.18)	8.499*** (4.35)	41.19*** (4.73)
N	840	1145	1586	2863	2863	2863	290	361	662
Wald chi2(4)	10.40***	44.81***	55.73***	73.75***	67.51***	22.14***	19.97***	27.70***	17.06***

*Ratio of W&S aid with respect to total aid given by all donors

t-statistics are in parentheses, ***significant at 1% level, **significant at 5% level, *significant at 10% level

Table 8 Tobit multiplicative heteroscedasticity regression: donors' commitment for the improved sanitation (1995–2016) with the MDGs dummy variable

Tobit multiplicative heteroscedasticity regression: donors' commitment for the improved sanitation													
	All donors/ratio [†]			All W&S donors		DAC countries		G7	Total multilateral	Eu. Ins	UN	World Bank	Denmark
Constant	4.637*** (8.88)	42.93*** (7.84)	24.22*** (6.12)	20.31*** (4.62)	32.87*** (8.88)	– 18.88*** (3.57)	– 0.902*** (4.61)	82.94*** (7.24)	16.59*** (5.28)				
Improved sanitation	0.0198** (2.69)	0.124 (1.78)	0.240*** (4.16)	0.297*** (4.74)	– 0.106* (2.05)	– 0.301** (2.81)	– 0.0115*** (10.02)	0.0373 (0.24)	– 0.0637 (1.37)				
Government effectiveness	1.657*** (4.8)	16.77*** (4.14)	10.70** (2.9)	8.484 (1.88)	10.51*** (5.14)	9.943*** (4.88)	– 0.0866 (1.67)	30.77*** (3.72)	0.0864 (0.05)				
GDP per capita	– 0.0368*** (5.08)	– 0.505*** (8.96)	– 0.323*** (6.51)	– 0.279*** (4.79)	– 0.252*** (5.13)	– 0.169*** (3.75)	– 0.0126*** (7.81)	– 0.678* (2.01)	– 0.136* (2.54)				
MDGs dummy variable	1.217* (2.22)	20.58*** (5.51)	7.650* (2.42)	0.664 (0.19)	7.663* (2.48)	8.836*** (3.7)	1.662*** (7.84)	– 13.88 (1.11)	– 3.129 (1.09)				
Sigma cons	– 9.834*** (22.14)	67.83*** (7.65)	52.74*** (9.89)	52.65*** (9.39)	63.40*** (8.16)	28.31*** (7.23)	0.0538 (0.49)	0.107 (0.35)	– 0.214 (0.93)				
N	2860	2528	2452	2232	1624	2860	2860	381	220				
Wald chi2(4)	36.92***	97.68***	51.70***	43.29***	77.19***	35.73***	240.74***	26.51***	27.87***				
	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA				
Constant	8.434*** (6.29)	9.098*** (5.65)	34.48*** (3.78)	– 61.40*** (22.39)	– 0.273 (0.31)	– 6.510*** (3.57)	3.326*** (3.73)	6.635*** (3.86)	– 15.28 (1.12)				
Improved sanitation	0.0252 (0.9)	0.147*** (6.04)	0.131 (1.24)	0.109** (2.95)	– 0.0839*** (4.31)	0.00455 (1.07)	– 0.0186 (1.38)	– 0.0292 (1.23)	0.655*** (3.83)				
Government effectiveness	4.157*** (3.33)	4.162** (3.21)	15.00*** (3.78)	1.391 (0.79)	4.515*** (3.55)	0.756* (2.03)	– 0.853 (1.28)	1.235 (0.93)	– 26.92* (2.16)				
GDP per capita	– 0.0492 (1.67)	– 0.0740* (2.17)	– 0.217** (2.99)	– 0.249*** (4.44)	– 0.159*** (5.86)	– 0.0473*** (3.40)	– 0.0361** (3.27)	– 0.0589*** (3.68)	– 0.174*** (2.78)				
MDGs dummy variable	3.042* (2.22)	– 3.583* (2.22)	– 14.32* (2.22)	0.347*** (3.33)	– 6.726* (2.22)	0.440* (2.22)	0.852 (2.22)	3.009* (2.22)	– 15.50* (2.22)

Table 8 (continued)

	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA
Sigma cons	(2.24) 12.63*** (7.64)	(2.06) 19.21*** (6.73)	(2.09) 47.38** (2.77)	(12.21) 10.11*** (584.14)	(2.52) 10.64*** (6.79)	(2.28) 6.281*** (4.38)	(1.43) 3.993*** (6.03)	(2.03) 8.643*** (4.45)	(2.44) 39.63*** (4.68)
N	837	1144	1583	2860	2860	2860	289	360	662
Wald chi2(4)	12.69***	57.42***	51.09***	227.90***	79.62***	28.21***	22.84***	28.25***	33.52***

^aRatio of W&S aid with respect to total aid given by all donors

t-statistics are in parentheses, ***significant at 1% level, **significant at 5% level, *significant at 10% level

Table 9 Random effects regression for donors' commitment and access to improved water resources (1995–2016) with the MDGs dummy variable

Random effects regression for donors' commitment and access to improved water resources									
	All donors/ratio [†]	All W&S donors	DAC countries	G7	Total multilateral	EU ins	UN	World Bank	Denmark
Constant	3.215* (2.44)	- 44.79* (2.56)	- 16.94 (1.23)	- 12.16 (0.84)	1.455 (0.15)	1.321 (0.82)	- 0.266* (1.98)	31.37 (1.33)	19.50** (2.83)
Total improved water sources	0.0422* (2.44)	1.085*** (4.75)	0.621*** (3.38)	0.545** (2.8)	0.267* (2.08)	0.00176 (0.08)	0.00484** (2.77)	0.424 (1.28)	- 0.0629 (0.67)
Government effectiveness	0.666 (1.67)	- 1.38 (0.36)	0.705 (0.2)	- 0.702 (0.18)	2.544 (0.89)	0.503 (1.05)	- 0.0527* (2.12)	11 (1.22)	0.891 (0.32)
GDP per capita	- 0.00906 (1.07)	- 0.348** (3.18)	- 0.255** (2.76)	- 0.223* (2.16)	- 0.234** (3.27)	- 0.00807 (0.79)	- 0.0036*** (5.11)	- 0.479 (1.19)	- 0.181* (2.33)
MDGs dummy variable	- 0.618 (1.49)	11.99** (3.12)	4.32 (1.27)	- 1.277 (0.34)	4.807 (1.42)	2.026*** (4.08)	0.256*** (10.35)	- 13.23 (1.13)	- 3.077 (1.11)
Sigma_u	2.867*** (11.39)	57.83*** (15.06)	41.58*** (14.92)	41.11*** (14.68)	22.75*** (13.18)	3.579*** (11.9)	0.427*** (14.03)	32.74*** (8.17)	1.67E-16 (0.00)
Sigma_e	8.535*** (73.74)	65.94*** (69.1)	58.22*** (68.1)	58.20*** (64.88)	39.85*** (54.91)	10.20*** (73.81)	0.475*** (73.34)	56.00*** (25.59)	16.66*** (20.98)
N	2863	2532	2454	2238	1626	2863	2863	380	220
LR test (chibar2)	132.84***	1078.56***	741.54***	629.89***	336.34***	158.07***	1038.01***	76.64***	0
	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA
Constant	4.421 (0.88)	- 1.207 (0.25)	4.695 (0.33)	- 1.659 (1.87)	1.206 (1.3)	0.469* (2.51)	5.065** (2.71)	7.013 (1.73)	- 7.704 (0.32)
Total improved water sources	0.0478 (0.71)	0.164* (2.41)	0.469* (2.49)	0.0267* (2.31)	0.000716 (0.06)	- 0.00123 (0.51)	- 0.0328 (1.23)	- 0.0295 (0.53)	0.289 (1.00)
Government effectiveness	3.504 (0.71)	- 0.113 (2.41)	6.494 (2.49)	0.0528 (2.31)	0.082 (0.06)	0.0924 (0.51)	- 0.205 (1.23)	0.363 (0.53)	- 15.49* (1.00)

Table 9 (continued)

	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA
GDP per capita	(1.91) – 0.0382 (1.04)	(0.06) 0.0113 (0.26)	(1.41) – 0.295** (3.10)	(0.19) – 0.0119* (2.17)	(0.36) – 0.0146* (2.54)	(1.54) – 0.00297* (2.51)	(0.26) – 0.0424 (1.85)	(0.21) – 0.0674 (1.91)	(2.16) – 0.00383 (0.02)
MDGs dummy variable	3.588* (1.96)	– 3.897* (2.19)	– 17.00** (3.20)	0.00907** (3.03)	0.351 (1.53)	– 0.0513 (0.80)	1.096 (1.61)	2.437 (1.37)	– 13.17 (1.37)
Sigma_u	7.238*** (7.3)	9.091*** (10.63)	29.75*** (13.09)	1.647*** (9.56)	2.591*** (14.41)	0.361*** (9.97)	1.261** (2.65)	3.623*** (4.48)	34.96*** (10.54)
Sigma_e	19.53*** (38.75)	18.41*** (46)	50.80*** (54.09)	6.224*** (73.73)	4.587*** (73.8)	1.342*** (73.83)	4.743*** (21.98)	12.87*** (25.72)	55.85*** (34.22)
N	840	1145	1586	2863	2863	2863	290	361	662
LR test (chibar2)	36.29***	156.59***	310.05***	67.59***	507.07***	74.38***	2.61	10.14**	126.68***

[†]Ratio of W&S aid with respect to total aid given by all donors

t-statistics are in parentheses, ***significant at 1% level, **significant at 5% level, *significant at 10% level

Table 10 Random effects Regression for donors' commitment and the improved sanitation (1995–2016) with the MDGs dummy variable

Random effects regression for donors' commitment and the improved sanitation										
	All donors/ratio [†]									
	All W&S donors	DAC countries	G7	Total multilateral	EU ins	UN	World Bank	Denmark		
Constant	5.047*** (7.16)	13.16 (1.25)	10.98 (1.36)	20.85*** (3.81)	2.143* (2.47)	0.172* (2.45)	55.96*** (3.99)	16.77*** (5.89)		
Improved sanitation	0.0248* (2.2)	0.387* (2.24)	0.335* (2.47)	– 0.0274 (0.31)	– 0.015 (1.07)	– 0.00193 (1.70)	0.0189 (0.08)	– 0.0676 (1.33)		
Government effectiveness	0.793* (1.99)	– 0.878 (0.22)	1.06 (0.31)	3.804 (1.33)	0.617 (1.3)	– 0.0474 (1.91)	12.79 (1.42)	– 0.0447 (0.02)		
GDP per capita	– 0.011 (1.24)	– 0.301** (2.65)	– 0.261** (2.68)	– 0.167* (2.15)	– 0.00271 (0.25)	– 0.0025*** (3.66)	– 0.233 (0.53)	– 0.138 (1.62)		
MDGs dummy variable	– 0.398 (0.97)	16.44*** (4.37)	6.464 (1.94)	6.817* (2.03)	2.130*** (4.35)	0.289*** (12.09)	– 9.909 (0.86)	– 3.124 (1.16)		
Sigma_u	2.792*** (11.09)	57.03*** (15.15)	41.52*** (14.92)	22.43*** (13.31)	3.563*** (11.86)	0.383*** (15.08)	32.62*** (8.25)	1.37E-16 (0)		
Sigma_e	8.578*** (73.67)	66.35*** (69.06)	58.29*** (68.06)	40.15*** (54.96)	10.21*** (73.76)	0.478*** (73.67)	56.15*** (25.68)	16.61*** (20.98)		
N	2860	2528	2452	1624	2860	2860	381	220		
LR test (chibar2)	119.13***	1060.97***	738.74***	329.52***	155.29***	1018.57***	77.97***	0		
	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA	
Constant	19.56*** (38.67)	18.43*** (45.94)	50.78*** (54.03)	– 0.557 (1.19)	2.080*** (4.05)	0.401*** (3.97)	3.651*** (4.18)	6.502** (3.2)	– 0.584 (0.04)	
Improved sanitation	0.00629 (0.15)	0.123** (2.78)	0.243* (1.97)	0.0174* (2.36)	– 0.0177* (2.10)	– 0.000424 (0.27)	– 0.0213 (1.36)	– 0.0436 (1.15)	0.34 (1.8)	
Government effectiveness	3.653* (1.98)	0.413 (0.23)	7.254 (1.56)	0.125 (0.46)	0.121 (0.53)	0.0865 (1.46)	– 0.36 (0.45)	0.155 (0.09)	– 16.24* (2.30)	
GDP per capita	– 0.0305	– 0.0108	– 0.303**	– 0.0140*	– 0.00861	– 0.00295*	– 0.0391	– 0.0501	– 0.0993

Table 10 (continued)

	France	Germany	Japan	Korea	Netherlands	Norway	Sweden	UK	USA
MDGs dummy variable	(0.79) 3.947* (2.18)	(0.24) - 3.492* (2.00)	(2.95) - 14.19** (2.75)	(2.45) 0.0101*** (3.4)	(1.47) 0.417 (1.85)	(2.35) - 0.006 (0.94)	(1.65) 0.929 (1.4)	(1.30) 2.377 (1.35)	(0.56) - 13.88 (1.44)
Sigma_u	7.287*** (7.33)	8.920*** (10.39)	30.32*** (13.04)	1.616*** (9.5)	2.555*** (14.34)	0.361*** (9.96)	1.367*** (3.1)	3.578*** (4.43)	34.07*** (10.3)
Sigma_e	19.56*** (38.67)	18.43*** (45.94)	50.78*** (54.03)	6.231*** (73.72)	4.589*** (73.76)	1.343*** (73.79)	4.728*** (22.09)	12.88*** (25.7)	55.90*** (34.2)
N	837	1144	1583	2860	2860	2860	289	360	662
LR test (chibar2)	36.57***	141.81***	318.30***	64.87***	489.35***	74.26***	3.96*	9.88***	112.96***

*Ratio of W&S aid with respect to total aid given by all donors

t-statistics are in parentheses, *** significant at 1% level, ** significant at 5% level, * significant at 10% level

Table 11 Regression of all donors' commitment with the MDGs dummy variable, the time trend, and the interaction term

	Column 1 (Tobit) All W&S donors commit- ments	Column 2 (TMH) All W&S donors commit- ments	Column 3 (RE model) All W&S donors commit- ments	Column 4 (RE model) All W&S donors commit- ments	Column 5 (RE model) All W&S donors commitments
Constant	23.96*** (3.78)	19.39** (2.68)	- 44.79* (2.56)	- 3758.6*** (6.63)	4370.8 (1.08)
Total water improved	0.356*** (4.33)	0.412*** (4.46)	1.085*** (4.75)	0.606** (2.58)	0.619** (2.64)
Government effectiveness	14.89** (3.2)	13.78*** (3.42)	- 1.38 (0.36)	3.558 (0.92)	3.249 (0.83)
GDP per capita	- 0.538*** (7.69)	- 0.531*** (8.53)	- 0.348** (3.18)	- 0.488*** (4.44)	- 0.494*** (4.49)
MDGs dummy variable	18.50*** (4.53)	17.75*** (4.84)	11.99** (3.12)		- 8.775* (2.14)
Time trend				1.879*** (6.53)	- 2.191 (1.08)
Interaction					4.391* (2.14)
N	2532	2532	2532	2532	2532
Sig constant	87.84*** (116.31)	66.96*** (7.7)			
Sigma_u			57.83*** (15.06)	56.23*** (15.43)	56.26*** (15.43)
Sigma_e			65.94*** (69.1)	65.60*** (69.21)	65.52*** (69.21)
Constant	44.32***	42.93***	13.16	- 4299.5***	3982.6

Table 11 (continued)

	All W&S donors commitments	All W&S donors commitments	All W&S donors commitments	All W&S donors commitments
	(8.05)	(7.84)	(1.25)	(8.09)
Improved sanitation	0.109 (1.62)	0.124 (1.78)	0.387* (2.24)	0.166 (0.97)
Government effectiveness	17.61*** (3.67)	16.77*** (4.14)	-0.878 (0.22)	4.582 (1.18)
GDP per capita	-0.520*** (8.51)	-0.505*** (8.96)	-0.301** (2.65)	-0.458*** (4.01)
MDGs dummy variable	21.04*** (5.04)	20.58*** (5.51)	16.44*** (4.37)	-8.890* (2.14)
Time trend				2.167*** (8.11)
Interaction				4.449* (2.14)
N	2528	2528	2528	2528
Sig constant ^a	88.03*** (109.61)	67.83*** (7.65)		
Sigma_u			57.03*** (15.15)	55.94*** (15.49)
Sigma_e			66.35*** (69.06)	65.71*** (69.16)

^aRatio of W&S aid with respect to total aid given by all donors

t-statistics are in parentheses, ***:significant at 1% level, **:significant at 5% level, *:significant at 10% level

Interaction term is calculated by using MDGs dummy variable × Time trend

commitment in allocating aid for W&S since year 2000. The significance disappears when the dependent variable is the ratio of W&S aid with respect to total aid given by all donors. In fact, this finding is agreeable with the discussion in [Donors' policies in financing W&S](#) section (see Fig. 2), where the ODA for water and sanitation subsectors is less than the ODA allocated for education, health and other social sectors (Winpenny et al. 2016). The dummy variables indicating the increase in access to safe water is obtained with the MDGs target when the ODA increased by 19 units (see Table 5). Table 6 reflects that when the dependent variable is all donors' commitment for proper sanitation, coverage has increased by 21 units since the declaration of the MDGs, and the significance for improved sanitation disappeared in this table when the dummy variable is added to the model; this indicates that the donors' interest in providing better sanitation is influenced by the MDGs targets.

For further investigation, the time trend is used in the model (Column 4, Table 11) which is significant at 1% significant level (column 4, Table 11) for both of the subsectors. An interaction between the dummy and the trend variables (Column 5, Table 11) is introduced to examine the effect of the donors' commitment in raising the coverage for W&S in recipient countries (see Table 11). The interaction term between the dummy and the trend variable¹³ is significant for both water and sanitation subsectors (Column 5, Table 11), this is an evidence of the increased interest in W&S after the declaration of the MDGs in the year 2000. The negative sign for both time trend and the MDGs dummy variables (column 5, Table 11) while the interaction term is positive reveals the effect of the international goals and the political influence in enhancing the selectivity of the donors for these two subsectors (see Fig. 3).

From the estimation results, we can see the impact of the ratio for all donors' ODA for water with respect to their total ODA (ODA-commitment for water and sanitation/total ODA-commitment given by donors for all the sectors) which is found to be positive and significant at the 1% significance level for both water (Table 3) and sanitation (Table 4). These significant results are consistent in Tables 5, 6, 7, 8, 9, 10, and 11 as well, and this indicates that the commitment increased by donors following the announcement of the MDG goals in 2000 that are followed by the SDGs, which dedicated target 7 for both water and sanitation, and thus, the SDGs committed the international community to expand international cooperation to develop water and sanitation subsectors. Through Goal 6, the countries of the world would facilitate the achieving of universal access to safe drinking water and adequate sanitation and hygiene to all in the next years.

Aid commitment increased as a means for achieving the SDG goals. Tables 3, 4, 5, 6, 7, 8, 9, and 10 show that the improved water sources are significant at 1% significant level, and this means that the ODA targeting W&S indicates that a one unit increase in safe access to water is corresponding to 0.4–1.1 units in sector allocable aid (see Tables 3, 4, 5, 6, 7, 8, 9, 10, and 11), and a 1 unit increase in improved sanitation coverage which is significant at a 10% significant level is a result of 0.2–0.4 increase in donors' allocation for aid for access to the improved sanitation facilities.

¹³ Interaction term is calculated by using MDGs dummy variable $\times$ Time trend.

Fig. 4 Percentage of population with safe access to safe water and proper sanitation from 1995 to 2015.
Source of data: World Bank Development Indicators

If we look through the results in the tables, it is obvious that most of the donors' targeted aid for water is working, but the negative sign indicates that the aid of the individual country is allocated to the countries with less or no safe access to water. France's aid is not significant for safe access to water or to sanitation; however, the significance is clear for Government effectiveness, which indicates that France is donating aid in line with the international commitment but is not catching up financially with the new SDGs commitment for the new goals. Figure 4 depicts the effect of increased international commitment on the increase of the percentage of people with safe access to water, while the access to proper sanitation has increased approximately by 21% (from 1995 to 2015).

Government effectiveness and GDP per capita are significant for most of the donors for water and sanitation access; results indicate that a 1 unit increase in governance enhances the donors' ability to allocate aid for water and sanitation with respect to total aid by donors by 1.3 units for water (Table 3) and a 1.5 unit for sanitation (Table 4), which confirms the belief that donors target aid in line with good governance in the recipient country. Tables 5, 6, 7, 8, 9, 10, and 11 draw the same conclusion, adding that the dummy variable didn't influence the significant effect of this governance indicator on the ability of the donors in allocating this targeted aid.

Results indicate that a lower GDP triggers the donations for water access and sanitation. This result is consistent with previous results from El Khanji (2018) who found that "*the aid (for W&S) to GDP ratio is found to be significant at the 1% significant level for all of the recipient countries. The impact of aid is significantly positive in impacting on the population with access to improved water source*". In other words the poorer the recipients are, the higher the targeted aid for water and sanitation is. This reflects the interest of donors to contribute in reaching the SDG goals for water and sanitation. When the data for the donors is dis-aggregated, the results reveal that both the GDP per capita is significant for most of the bilateral and the total multilateral donors. And not surprisingly the governance indicator is significant for most of the donors, but what is highlighted here is the negative significant effect of governance for the aid received from the USA, which can be explained

by the fact that much of aid received from the USA is for political reasons. Results give a hint that USA is recruiting the adoption of the international goals towards poverty alleviation as a good cover to pass their geopolitical agenda. In that regard, Harrigan and Wang (2011) found that the USA is giving aid based on their interest not on the recipient needs; 14.8% of USA aid is targeting recipient need and the recipient policy, and they also found that the USA is allocating aid based on geopolitically strategic regions (such as the MENA region, central America and the Caribbean). Moreover, according to Radelet (2003, p. 1), the USA bilateral aid is criticized for the lack of planning and its weak effect in the poor countries. From the results, the GDP per capita is not significant for the USA for both water access and improved sanitation (Tables 3, 4, 5, 6) which assists this concept that the USA gives aid with geopolitical intentions. Also, when the MCA¹⁴ of the USAID was reformed to include strategic political partners such as Egypt, Jordan, Columbia, Russia and Turkey, recipient countries are not necessarily low income countries. As for the safe access, Japan, the highest donor for water and sanitation, together with Netherlands and USA are allocating the most effective targeted aid for water and sanitation.

The fact that I need to impartially highlight here concerning the USA allocated aid for W&S is that aid is working, and it is significant at 1% significant level for both water access and sanitation improvement. This is not a surprise as the USA was initiative in funding several health related projects in Central America and consequently in Africa where the USA was initiative in financing water and sanitation projects. In fact, sustained projects are a matter of questioning whether the recipient countries share the highest responsibility in sustaining the projects or not. This thinking is justified by the lack of sustainable management for the projects in Africa, compared to those in Central America and that is due to the slow growing economy and the high level of corruption that is reflected in institutional performances (Bossert 1990). In connection therewith, the preceding discussion can be an explanation of the disappearance of the significance effect of the GDP for USA aid and the negative significant sign for the Government effectiveness. Moreover, the significance and the negative sign of the dummy variable for the USA targeted aid support the interest of the selectivity of the USA in financing these two subsectors before and after the declarations of the MDGs.

Most of the international institutions are significant in improving water and sanitation, except for the multilateral and the EU institutes as well as the World Bank for both safe access to water and proper sanitation. The EU is significant at 10% significant level for sanitation and it is highly significant for government effectiveness for both water and proper sanitation that indicates that the EU is providing aid subjected to conditionality. The EU used to provide aid aligned with the level of democracy in the recipient country. Koch (2015) illustrated the political conditionality by studying the history of the EU in giving aid and how they changed from political rights to human and environmental rights by highlighting the conditionality beyond aid. Moreover, results are agreeable with what researchers implied about the World Bank, which is found to allocate aid based on merit based purposes, and they

¹⁴ Millennium Challenge Account is a foreign aid program established by George W. Bush to provide aid for development in low-income countries.

tend to finance projects that benefit foreign direct investors that invest in infrastructures (Nunnenkamp et al. 2017). Hayter and Watson (1985, p. 214) found that the bilateral donors and the World Bank have special interest in countries where they can interfere in their political system or can have any political gain for the organization. While they deprive countries where there is no possibility of political gain, this leads to volatility and consequently to the weakness of developing these two subsectors especially in the rural areas. The dummy variable for the effect of the MDGs for the EU institute is significant at 1% significant level (see Tables 5 and 6), and this indicates that the institute is committed to the international society in providing this ODA for W&S.

Although the Netherlands is the considered as one of the higher donors (4th most European government donor in 2012), it contributes highly for WASH projects around the world, and it is found to be insignificant in their aid for water access, while its aid is significant at a 1% significant level; however, the negative sign indicates their conditionality in providing aid, where good governance is a priority, which is apparent in the significant results for both water and sanitation aid, and it is obvious that Netherlands aid goes for countries that are really in need. In fact, this is seen in the negative significant coefficients of the GDP per capita in the Tables. On the other hand, Germany's aid is working properly and is significant for both water access and proper sanitation. It is expected to have a significant impact of Japan's aid for water access, Japan is known as a highly contributor for water and sanitation projects and one of the highest donors, but Japan's aid is not significant for sanitation which can be due to their selectivity depending on good governance level and the targeting of low income countries. Moreover, when the MDGs dummy variable is added to the model, it is clear that the dummy is highly significant for both water and sanitation; however, it has a negative sign which is confusing given the fact that Japan is a high contributor for W&S subsectors. This negative sign is explained by adding the interaction variable in Table 11 (between the trend variable and the MDGs dummy variable), so what is obtained explains well what happened when the dummy is negative; the interaction is positive and significant, while the trend variable with the dummy variable are both negative in the same model. Korea sounds committed to international agenda, and its aid is significant and working for these two subsectors. As for Korea, its aid is targeting places really in need while ignoring the level of governance (Government effectiveness is not significant).

Our results are in agreement with Thiele et al. (2007), so that most donors give aid to countries with better governance. That is applicable as seen for the SDG goal for water and sanitation. In general, results show that the combined efforts of the donors are affecting target 6 of the SDGs for water and sanitation. If we concentrate on the individual effort it becomes non-significant for most of the donors. Kanbur and Sandler (1999, p.29) explained how donors are in their shift towards sectoral development assistance, where it is characterized by individual projects, face issues like a weak impact on the sector, or maybe if coordinated between donors for these individual projects, it can cause a donor recipient gap for *"policy makers in developing countries have been unable to get a clear idea of the totality of activity going on in any given sector. That is, even if the policy environment is a good one, recipient governments may not be able to coordinate the activities of donors"*. Moreover, there

are some of the political reasons behind the weak results of aid for some sectors. Well, some governments favour a specific sector over another, whether that behaviour is from the donor country or the recipient country; in addition, political priorities can lead to allocating aid for overly served locations and sectors. The UK, for example, although its multilateral spending has increased from £109 m to £172 m (by 58%) between 2007 and 2011 for water and sanitation, its allocation for these subsectors remained accounting for 2% of its total given aid. That is also observed in the UK bilateral expenditure on W&S, which has increased by 70% (£84.5 m in 2010/11), and it remains at the level of 2% of bilateral donations (DFID 2012). The Off-track, Off-target (2011) report by the Water aid organization sheds the light on different reasons why aid is not focused on where it should be and why it is not reaching the deprived places most. *"Aid is not well coordinated, is only loosely targeted according to need, and its effectiveness is constrained by red tape and lack of alignment with government systems. The sustainability of services rarely receives the attention it requires. These factors in turn undermine weak capability to capture, absorb and spend funds effectively, and lead to a vicious cycle of low investment and poor performance"* (DFID 2012, p.6).

Observing the regression results thoroughly concerning the GDP per capita is highly significant and negative for most of the donors, but this significance disappears from some bilateral donors. In a comparison between the bilateral and the multilateral donors, Harrigan and Wang (2011) highlighted the fact that the bilateral donors are not caring about recipient's need with respect to the multilateral donors. Good institution in the recipient countries results in a good sustainable management of the projects. Donors should be aware of the political institutions in the recipient countries; institutional corruption delays the outcome of the donated projects. Furthermore, Nunnenkamp et al. (2017) noted donors' random selectivity and their lack for focusing on the locations especially the deprived locations that are really in need.

Some researchers argue that aid is flowing in the opposite direction for solving this dilemma. Kar et al. (2015), who run comprehensive assessment of resource transfers, explained how the recipient developing countries play a role as a tax haven for the developed countries, while the general figure shows that the rich or the developed country is helping the poor country. In fact, the reality is a contrary to what is widely known. Also, they discovered that the financial flow from the rich to a poor country is nothing compared to the flow in the opposite direction. They gave an example when in 2012 there was a transfer of \$1.3tn of aid, investments from rich to poor countries, while that is accompanied with a transfer of \$3.3tn transferred from the developing countries to the developed ones. Generally, about \$16.3tn of money the developing world is contributed to the developed world. Mosley et al. (1995) commented on the ideology of bilateral donors, IMF and the World Bank, as being linked to market liberalization. I suggest that most of the bilateral donors are giving aid for these two subsectors particularly to transfer their technology and experiences to another recipient country. For instance, Germany and Japan, who are high donors for W&S are very advanced concerning their sewerage treatment technology and in their water treatment speciality. It is much cheaper for these bilateral donors to donate aid where they can save costs by using the already made technology, signing tied contracts for instalments and maintenance for W&S infrastructure for the

recipient countries and keeping their international commitments at the same time which is agreeable with Kar et al. (2015) findings that aid is a cover for a reversed transferred funds.

Conclusion

The main goal of this study has been to explore the donors' motivations driving their commitments to reach the SDGs. Results show that aid allocation by donors as to these targets is focused on governments with higher governance indicators, and the poorer the country the higher the allocation of aid will be. That indicates a degree of consistency between the donors and the recipients. Nevertheless, different reforms for development assessment during the last decades gave more flexibility in expenditure for the recipient country, where that can be both an advantage and a disadvantage. It is an advantage when the country escapes the problems of tied aid, and a disadvantage when some governments, especially in the low-income countries, are careless or do not give any effort to development. Some countries with a high bureaucracy level can cause a leaching effect of aid to specific parties or to lobbies in the governments. The selectivity of the donors can be due to the fact that the available aid is not enough to cover the targeted aid for these two subsectors. Generally, I find that solving the access to proper sanitation requires social, cultural and economic dimensions in addition to a stronger political commitment by the donors.

Still this area of development aid needs better concern and more commitment from the global society, and this is apparent in the results of the MDGs dummy variable with the interaction term that donors tend to commit with the international agenda. Several reports hint that global spending on health and education sectors is taking priority over the water and sanitation sectors. Concerning the health sector, it especially tends to get the priority with the consequences of the Covid 19. According to Water Aid there are more people today lacking the facilities of basic sanitation than during the 1990s (Water Aid 2011). So far, over 2 billion people have gained access to improved sources for drinking water since 1990 (JMP estimates). Currently, last report from the WHO/UNICEF (2017) highlighted that 3 in 10 people worldwide (accounts for 2.1 billion) lack access to domestic water, and 6 in 10 (accounts for 4.5 billion) lack access to proper sanitation. Although UNICEF and the WHO announced in 2015 that the MDG targets for drinking water had been reached, still the sanitation target would not be met; and about 780 million people lack safe access to safe water.

In April 2012, donors declared in an agreement to increase the number of people with safe access to water and sanitation for the next 2 years. As for bilateral donors, a new joint cooperation between the Netherlands and United Kingdom is in progress to improve water and sanitation for 10 million people in nine countries in West and Central Africa. Several factors such as rapid urbanization, population density, and globalization enhance the access to the best sanitation and safe water, where these two subsectors are a challenge for most of the developing countries. The off-track record in some areas for reaching the MDG goals calls for a new management and

alignments of the received aid whether that management comes from the donors or the recipients. That is, given the resources which are devoted to W&S; those resources need to be used with maximum efficiency. In addition, a further adaptation arrangement for the climate change issue has its weight on the resources and plays a critical part in the development of water and sanitation sub sectors in some parts of the world, especially for Sub-Saharan Africa where 19% of population still lack safe access to improved water sources and improved sanitation facilities during 2015 where 32% suffer from open defecation in rural areas in Sub Saharan Africa, and 25% still facing unimproved sanitation in the rural areas in Southern Asia (WHO/ UNICEF 2017).

Climate change consequences add the impossibility of solving the problem of access to unimproved water and sanitation in the near future, where a study for the WHO (2009) organization sheds light on this fact that may hamper the efforts to improve these facilities *"Most impacts will be experienced through more droughts, floods, and less predictable rainfall and water flows. These will place established water and sanitation services –and future gains in access and service quality—at real risk. The impacts are likely to be dramatic and severe for the billions of people who continue to seek the elusive goal of meeting their own basic needs. The effects of climate change could also cause a substantive set-back in the developed world among those who feel confident that they have secured access to basic services"*. Moreover, the Eurozone economic crisis will cost the world's poorest countries \$238bn, and that will affect investment in poor countries, aid and trade according to the Overseas Development Institute (Massa et al. 2012, p. 51). In addition, the World Bank warned the developing countries to be prepared for a shortfall in aid due to the new economic crisis. The OECD report (2012) commented on the decrease of bilateral ODA by 4.5% in 2011.

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