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Analysing the Determinants of Health Aid Allocation in Sub-Saharan Africa

by

Abrams M. E. Tagem

Abstract

Aid allocation studies typically find considerable heterogeneity in donors' allocation patterns; be it for total Official Development Assistance (ODA) or sector-specific aid. This paper investigates the underlying factors influencing donors' selection and actual allocation decisions for health aid, using health aid data from the newly-created Institute of Health Metrics and Evaluation (IHME) database; covering 9 major donors and 44 recipient countries from 1990 to 2011. This is carried out in three steps; first, we test the selection and allocation decisions of bilateral/multilateral donors. Second, we proceed to test for increased importance of the previous Millennium Development Goals (MDGs, recently replaced by the Sustainable Development Goals) after the Millennium Declaration. Third, we test the hypothesis that Public-Private Partnerships (PPPs) have different selection/allocation patterns to traditional donors. The first exercise confirms that donors differ in their selection/allocation patterns, but they all select poorer countries as recipients. The second exercise shows that donors placed more emphasis on the MDGs post the Millennium Declaration while the final exercise confirms that the PPPs are indeed different in their selection and disbursement patterns.

JEL Classification: C25, F35, I15, O19

Keywords: MDGs, Public-Private Partnerships, Health Aid, Disease Burden

Centre for Research in Economic Development and International Trade, University of Nottingham

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Outline

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1. INTRODUCTION

Low-income countries (LICs) in Sub-Saharan Africa (SSA hereafter) typically have poor health outcomes, echoed in the Millennium Declaration (UN, 2000) which shone spotlight on the pressing health demands in developing regions. Three of the eight erstwhile Millennium Development Goals (MDGs hereafter) explicitly focus on health-related issues; reduction of child mortality, improvements in maternal health, and combatting HIV/AIDS, malaria and other diseases. Recipient countries have made huge strides in improving these health outcomes but still face constraints in financing their health expenditures domestically (some of the countries are characterized by low GDP *per capita*); hence their need for complementary foreign assistance. The volume of Development Assistance for Health (DAH hereafter) from major donors to SSA has risen steadily, peaking at $8.8 billion in 2011; representing 28.6% of total DAH and 46.5% of total allocable aid (IHME, 2013). This surge in disbursements reflects income trends in the region (SSA comprises a raft of low-income countries); in addition to the scourge of HIV/AIDS in the region. HIV/AIDS assistance amounted to $7.7 billion in 2011, a 1.2% increase from 2010 (IHME, 2013). Thus, this paper contributes to the aid allocation literature by examining the extent to which health indicators are important determinants of selection and allocation decisions for DAH of major international donors to 44 SSA countries covering the period 1990 to 2011.

There has been extensive research on total aid allocation by bilateral and multilateral aid agencies (Alesina and Dollar, 2000; Berthélemy, 2006b; Berthélemy and Tichit, 2004; Isopi and Mavrotas, 2006; Clist 2009; Neumayer, 2003; Younas, 2008 among others). These studies demonstrate a clear pattern of results: donor heterogeneity is pervasive and entrenched. Donors generally provide aid to serve varying, and even mutually exclusive motivations (early research on aid allocation postulates a dichotomy between donors' interests and recipients' needs). Nordic donors (Sweden, Finland, Denmark, Iceland and Norway) have historically disbursed aid in a more recipient-friendly way: more sensitivity to poverty and policy while giving less aid to more corrupt governments (see *inter alia* Alesina and Weber, 2002; Dollar and Levin, 2004) but there are still fundamental differences in how each of the countries respond to recipients' characteristics in giving aid. Research on sector-aid allocation has, however, been relatively scant. Some recent studies include Lewis (2003) for energy aid; Farooq (2012) for education aid; Fielding (2010) for humanitarian aid; and Neumayer (2005) for development food aid. Existing studies on health aid have modelled the effects of health aid in the context of MDGs (Thiele, Nunnenkamp and Dreher, 2007; Kasuga, 2007); the impact of health aid on health outcomes (Mishra and Newhouse, 2009; Williamson, 2008); the impact of governance on health aid allocation (Fielding, 2011) and the inclusion of bilateral donors' characteristics as variables influencing their allocation patterns (Stepping, 2015). In this paper, we avail of the available data on the health-related MDGs and explicitly test the hypothesis that donors placed more importance on the health-related MDGs post the Millennium Declaration.

A new type of donor has emerged, so-called Public-Private Partnerships (PPPs): for example, the GAVI Alliance (GAVI) and the Global Fund to Fight HIV, Tuberculosis and Malaria (GFATM). There is increasing evidence of their importance in DAH allocation (Ravishankar, Gubbins, Cooley, Leach-Kemon, Michaud, Jamison and Murray, 2009). Global health improvements (in addition to improvements in education and other social sectors) have been a priority for donors, with the PPPs established to streamline efforts to tackle a few salient global health areas. Hence, since their inception PPPs have become a favourite channel through which traditional donors disburse their health aid. While these PPPs are funded by traditional donors, they are essentially apolitical: thus, their allocation patterns should more clearly match recipients' needs and merits. In this paper, we test for differences between the allocation patterns PPPs and those of bilateral and multilateral donors.

This paper allows the comparison of health aid allocation patterns of major donors based on a conceptual framework. The empirical section discusses the different estimation techniques and provides a testing strategy to discriminate between them. The main contribution of this paper is to show that allocation patterns of health aid differ substantially across donors (even for the PPPs), and that donors placed more importance on the MDGs post the Millennium Declaration. The overarching tendency among donors, however, is them selecting and/or providing more health aid to countries with already high disease burdens and mortality rates. The PPPs, on their part, are found to be very expansive in their selection decisions, but more 'predictable' in their allocation decisions. Most countries in Sub-Saharan Africa are low-income countries with severe disease burdens hence they are automatically eligible for health aid from the PPPs. Nonetheless, better governed countries (from the selected countries) do receive more health aid from the PPPs.

The rest of the paper is as follows: section 2 provides a conceptual framework of health aid allocation. Section 3 reviews the empirical general and health aid allocation. Section 4 discusses the data and presents some descriptive statistics while section 5 discusses the empirical specifications. Section 6 presents main results, as well as robustness checks. Section 7 concludes.

2. CONCEPTUAL FRAMEWORK OF HEALTH AID ALLOCATION

Many studies on aid allocation have developed theoretical models which form the conceptual frameworks of their empirical analyses (Trumbull and Wall, 1994; Feeny and McGillivray, 2008 among others). Most of the theoretical models are variants of the original model developed by Dudley and Montmarquette (1976).[1] In their model, they assume aid decisions are motivated by donors subjectively measured developmental impact of its aid on recipient countries. In this section, we provide a conceptual framework of the allocation of development assistance for health (DAH hereafter) by the major donors in the international health scene.[2]

In the Dudley and Montmarquette (1976) model, they posit that all donors have the same objective; to maximize their utilities based on the subjectively measured impact of aid on the wellbeing of residents in recipient countries. Following Trumbull and Wall (1994), we postulate that donors have an overarching measure of the impact of their aid on recipient countries; for example, an indicator like the reduction in infant mortality rates will show how much donors' aid impacted on recipients'

[1] The model with no administrative costs; in which foreign aid is treated as a private good by the donor. Dudley and Montmarquette (1976) extend their model to include administrative costs.

[2] This includes bilateral and multilateral donors, as well as Private-Public Partnerships (PPPs). Wiseman (2010) labels this last group, polylateral donors. The inclusion of multilateral aid in the model might raise questions as to whether multilaterals behave like bilaterals in aid allocation. However, Harrigan and Wang (2011) posit that if the overarching intention of all DAH donors is the same (for example, reductions in mortality rates and poverty), then all donors use the same subjective measure of the impact of their aid to a recipient and all recipients are viewed as equally important in the eyes of the donors.

welfare.[3] This facilitates modelling the allocation behaviour of a representative donor. Each year the donor sets aside a fixed total pool of funds available to k recipient countries. Following Dudley and Montmarquette (1976) the representative utility function of the donor can then be written as:

$$M = \sum_{i=1}^{k} \theta_i M_i = \sum_{i=1}^{k} \theta_i M_i(a_i\,, n_i, RN_i, RM_i, DI_i) \qquad (1)$$

$i = 1, \dots, k$ recipient countries

where M is the weighted sum of the impacts of the donor's aid from allocating to k recipient countries, M_i is the subjectively measured impact of *per capita* health aid on recipient i, a_i is the amount of *per capita* DAH disbursements received by the recipient from each donor, RN_i is a vector of variables representing recipients' need for DAH, RM_i is a vector of recipients' merit variables, and DI_i is a vector of variables representing donors' interests in recipient i. n_i represents the population of recipient i. θ_i is a weight measuring the unobservable (or unquantifiable) importance of a recipient to a specific donor. These weights are not directly observable but they are what make donors prefer some recipients to others (see subsequent paragraphs). We make some postulations which can be mathematically expressed as follows:

$$\frac{\partial M_i}{\partial a_i} > 0, \frac{\partial M_i}{\partial n_i} > 0, \frac{\partial M_i}{\partial RN_i} \lesseqgtr 0, \frac{\partial M_i}{\partial RM_i} > 0, \frac{\partial M_i}{\partial DI_i} > 0 \qquad (2)$$

Taking a specific functional form for the impact function;

$$M_i(a_i, n_i, RN_i, RM_i, DI_i) = a_i^{\alpha} RN_i^{\delta} RM_i^{\mu} DI_i^{\eta} n_i^{\tau} \qquad (3)$$

$0 < \alpha < 1, 0 < |\delta| < 1, 0 < \eta < 1, 0 < \mu < 1, 0 \leq \tau \leq 1$

Note that DAH disbursements can be negative in cases where recipients' loan repayments are more than their aid receipts. However, as donor decision makers believe that the aid they provide is of benefit developmentally, IHME (2013, p.23) provides evidence of increasing DAH receipts to SSA countries from 1990 to 2013. This implies the impact of *per capita* DAH in the recipient country invariably increases with the amount of DAH allocated to that recipient country.

$0 < \alpha < 1$ is interpreted, theoretically, as diminishing returns of the creation of impact of *per capita* DAH. As *per capita* DAH is increased, holding other factors constant, the incremental impact on each individual falls. Higher values of α mean it will take longer for such diminishing returns to set in.[4] α is the same for all recipients, implying the β coefficients attached to recipients' need, recipients' merit and donors' interest variables do not vary across recipient countries. Feeny and McGillivray (2008) postulate a theoretical model in which α varies by recipient country.

[3] Most aid allocation models implicitly assume that recipients' needs and merits do not overlap with donors' interests. By merits we mean the recipients' ability to handle huge sums of development aid, proxied by their economic management and human rights governance. It is assumed that either the donor seeks to respond to recipients' needs and merits or to their own interests (which may not benefit the recipients as much). Bermeo (2007) states that in some cases donors' and recipients' intentions coincide, but the recipient may lack the necessary resources to implement the desired program. This is usually the case where donors care about their vested interests in the recipient countries, but also care about the development of the recipient.

[4] $\alpha = 1$ implies there are constant returns to per capita health aid and the donor is advised to give all its aid to that country (Dudley and Montmarquette, 1976).

There is some ambiguity about recipients' needs. The impact of income *per capita* will depend on whether the donors view their aid as substitutes or complements to recipients' incomes (Younas, 2008). For the former, more health aid will be given when *per capita* incomes fall: the impact the impact of health aid on each individual in recipient i will be a decreasing function of income *per capita*. For the latter (complements) health aid will increase with *per capita* incomes: the impact of health aid on each individual in recipient i will be an increasing function of income *per capita*. Increases in health-related need variables like the under-five mortality rate and the prevalence rates of HIV and tuberculosis are indicative of severe deprivation in terms of health. More health aid should then be given to countries that experience such acute deprivations in terms of health. The impact of health aid will thus be an increasing function of these health-related recipient needs.

$0 < |\delta| < 1$ indicates that some recipients' need variables are increasing functions of the impact of *per capita* health aid while others are decreasing functions of the impact of *per capita* health aid. The range just means different donors will place more emphasis on some need variables than others *vis-à-vis* health aid. However, more emphasis placed on a specific need variable does not necessarily result in less emphasis being placed on other need variables. This same argument can be made for recipients' merit and donors' self-interest variables.[5]

We include the population of the recipient country n_i as an independent variable. Ottersen, Kamath, Moon and Røttingen (2014) classify it as a cross-cutting criterion (which affects both recipients' needs and recipients' merits') and it will be interesting to test, and disentangle the effects of population and poverty. Moreover, since interest is in modelling the impact of these variables from a donor's perspective, separating population from income is akin to the World Bank's (and other donors') Performance Based Formulas (PBA) for aid allocation, where population is given a separate weighting.

$0 \leq \tau \leq 1$ is the range of 'biases' in the mind of the donors. By this we mean the elasticity τ is the measure of the donor's perception of the impact of its health aid in countries with different populations (Dudley and Montmarquette, 1976). One of the postulants of the model is that more populous countries experience diseconomies of scale to *per capita* DAH, resulting in lower marginal impacts of health aid. The range shows that for lower values of τ, there is more distortion in the impact donors expect their DAH to have on recipient countries; thus, *per capita* health aid will not have the expected impact on the recipients. Higher values of the elasticity mean the aid allocation process of that donor is better than that of others. Kasuga (2007) describes the aid which responds most to the needs of recipients, 'high-quality aid'.

Recipients' merit variables unambiguously increase donors' utility. These variables capture the perceptions of the donors on the recipients' obligations towards their citizens. Burnside and Dollar (1997) hypothesize that when recipient governments employ better policy instruments, donors and recipients derive more benefits from an additional unit of aid disbursed. Policy instruments here will include economic globalization and human and political rights improvements among others. If a recipient country employs one or more of these instruments, it is perceived as putting a high weight

[5] No monotonic transformation has been done to make the exponents in equation (3) sum up to 1.

on the welfare of its citizens. It is thus likely it will use the aid better so it is optimal for the donor to provide more health aid to such recipients.

The impact of *per capita* DAH also increases with donors' interests in that recipient country. As argued by Bermeo (2007), these self-interest variables are not mutually exclusive to need variables. For example, a donor may trade with a recipient because it wants a suitable market for its exports (Osei, Morrissey and Lloyd, 2004), but also because the donor is a consumer of the recipient's own major exports. These are likely goods in which the recipient country has some comparative advantage (for SSA countries these will most likely include raw materials and primary products). The donor seeks to allocate aid in an expedient manner; meeting recipients' needs while simultaneously enforcing their foreign policy.

The weights θ_i capture the idea of 'strategic development' by donors. Development in some countries is more valuable to the donor than development in other countries for some reasons; geographical proximity to the donor, former colony of the donor, belonging to a strategic region of interest to the donor, amongst other reasons. These weights are realized empirically in the form of unobserved heterogeneity and control variables.

The total impact of aid as the sum of the impact on identical residents of a recipient country can then be written as follows;

$$H = \sum_{i=1}^{k} \theta_i n_i \left(a_i^{\alpha} RN_i^{\delta} RM_i^{\mu} DI_i^{\eta} n_i^{\tau} \right) \tag{4}$$

Since the donor seeks to maximize the sum of the impacts of its DAH allocation to identical recipients of a country, we multiply the utility function by the population of the recipient country (n_i).

The representative donor is limited by a budget constraint of the form;

$$A = \sum_{i=1}^{k} a_i n_i \tag{5}$$

Where A is the fixed, total pool of funds available for distribution to all recipients. A is pre-determined *ex ante*. The maximisation problem of the representative donor can thus be written as;

$$\max_{a_i} M = \sum_{i=1}^{k} \theta_i n_i \left(a_i^{\alpha} RN_i^{\delta} RM_i^{\mu} DI_i^{\eta} n_i^{\tau} \right) \; subject\ to\ A = \sum_{i=1}^{k} a_i n_i \tag{6}$$

The corresponding Lagrangian will be as follows:

$$\mathcal{L} = \sum_{i=1}^{k} \theta_i n_i \left(a_i^{\alpha} RN_i^{\delta} RM_i^{\mu} DI_i^{\eta} n_i^{\tau} \right) + \lambda_i \left(A - \sum_{i=1}^{k} a_i n_i \right) \tag{7}$$

The first-order conditions will then be:

$$\frac{\partial \mathcal{L}}{\partial a_i} = \alpha \theta_i \left(a_i^{\alpha} RN_i^{\delta} RM_i^{\mu} DI_i^{\eta} n_i^{\tau+1} \right) - \lambda_i n_i = 0 \tag{8}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_i} = A - \sum_{i=1}^{k} a_i n_i = 0 \tag{9}$$

where λ_i is the marginal utility (to donors) from a unit of aid *per capita* spent in the recipient country. For donors to maximize impact from allocating DAH the marginal impact should be the same across countries ($\lambda = \lambda_i$); otherwise donors will increase their aid to countries where the marginal utility is higher. The marginal utility of aid will be captured by period effects in our empirical analysis: period effects account for aggregate shocks that are common to all countries at specific points in time, making the marginal utility of aid same for all countries at a time. Solving both first-order conditions and rearranging for the optimal allocation of *per capita* DAH, we get:

$$a_i^* = \left(\alpha\theta_i \frac{RN_i^{\delta} RM_i^{\mu} DI_i^{\eta} n_i^{\tau}}{\lambda_i}\right)^{\frac{1}{1-\alpha}} \quad (10)$$

Taking the logarithms of both sides of equation (10), including lags and adding an error term yields the following equation:

$$lna_{ijt}^* = \beta_0 + \beta_i + \Phi_t + \beta_1 lnRN_{i_{t-1}} + \beta_2 lnRM_{i_{t-1}} + \beta_3 lnDI_{i_{t-1}} + \beta_4 lnn_{i_{t-1}} + \beta_5 lnB_{it-1} + \varepsilon_{it} \quad (11)$$

Where

$$\beta_0 = \frac{1}{1-\alpha} ln\alpha;\ \beta_i = \frac{1}{1-\alpha} ln\theta_i;\ \Phi_t = -\left(\frac{1}{1-\alpha}\right) ln\lambda_t;\ \ \beta_1 = \frac{\delta}{1-\alpha};\ \beta_2 = \frac{\mu}{1-\alpha};\ \beta_3 = \frac{\eta}{1-\alpha};\ \beta_4 = \left(\frac{\tau}{1-\alpha}\right);\ \beta_5 = \left(\frac{1}{1-\alpha}\right)$$

Period effects, represented by a full set of time dummies, are included in the model for three reasons. First, they account for aggregate shocks which may be common to all countries; thus, potentially rendering the marginal impacts of a unit of aid *per capita* same for all recipients. Second, the inclusion of time dummies guards against spurious inference since some characteristics of the data may be common only to certain periods of the sample. Third, Sarafidis, Yagamata and Robertson (2009) posit that the inclusion of time dummies reduces (but does not wipe out entirely) cross-sectional dependence, which is palpable in macro panels like ours.

3. EMPIRICAL LITERATURE REVIEW

3.1 Aid flows across donors and recipients

Alesina and Dollar (2000) model the allocation patterns of 14 bilateral aid donors of the Development Assistance Committee (DAC) of the OECD. They use averaged data (in five-year averages) covering the period 1970 to 1994 and test for donor heterogeneity using panel regression methods. One of their main contributions is the inclusion of a measure of the colonial past of recipients. They find that bilateral aid allocation is influenced greatly by political and strategic interests,[6] as well as recipients' needs. Donors like Germany, Canada, UK, Netherlands and Scandinavian countries respond to recipients' needs while countries like the US and Japan have mixed results. Japan provides more aid to countries with better governance but not to poorer countries. The US, on the other hand, provides more aid to Israel and Egypt, emphasising the long-standing claim of strategic relationships between the US and these two countries. These findings are similar to those of Dollar and Levin (2004); who

[6] Colonial heritage and FDI.

compare 'policy sensitivity' to 'poverty sensitivity' by donors over time. They find that the Netherlands and other Nordic countries respond highly to both policy (good institutions) and poverty (recipients' *per capita* incomes). They also find that other countries like Japan respond more to policy than poverty. This is evident from the huge sums of money the Japanese government disburses to other Asian countries that are relatively well governed but not poor; a finding confirmed by Kilby (2006).

Berthélemy (2006b) uses a panel dataset consisting of 22 OECD bilateral donors, the EU and multilateral donors (which are grouped into a representative multilateral donor). He employs Two-Part and Heckman sample selection techniques to data on 137 developing countries covering the period covered 1980 to 1999. One of the main findings is evidence of a positive 'bilateralism' effect among bilateral donors. This means on average, bilateral donors react positively to the geopolitical dummies and commercial interests, with the effect being larger for the latter. Berthélemy (2006b) clusters donors into different groups; altruistic donors with very low trade intensity coefficients and the less altruistic donors with much higher trade coefficients.[7] The intermediate group can be viewed as the moderately altruistic donors. Even within the different clusters, there is considerable heterogeneity between donors in the way they perceive their commercial interests. This is salient evidence of donor heterogeneity even at highly disaggregated levels.

Delving further into the 'bilateralism effect', Berthélemy (2006b) finds that some regions (MENA and Asia) will receive more bilateral aid in the presence of bilateralism while other regions (Africa) will lose from the presence of bilateralism. This is so because most African countries are smaller trading partners when compared to Asian and Middle Eastern countries; and they trade mainly in primary products. The main finding behind bilateralism is the dominance of trade (commercial interests) over geopolitical (colonial) interests. This result is at odds with previous findings that colonial history significantly influences bilateral donors' allocation patterns (Alesina and Dollar, 2000; Dollar and Levin, 2006).

Regarding the European Commission (EC hereafter) and other multilateral aid, Berthélemy (2006b) finds that the European Commission's allocation is not influenced by recipients' needs. The EC responds more to its geopolitical interests in allocating aid, which is reflected by its preferential treatment towards ACP (African, Caribbean and Pacific) countries with which it has free trade agreements. Other multilaterals, contrarily, respond significantly to recipients' needs in their allocation processes.

Younas (2008) compares motives of bilateral aid donors; altruism as opposed to commercial interests. He uses data for 22 OECD donors and 78 recipient countries over the period 1992 to 2003; first in annual observations, then in three-year averages and estimations are done using Pooled OLS (POLS) techniques[8]. His major contribution to the already existing literature is disentangling the trade variable (representing donors' commercial interests) to a highly disaggregated level. According to the theoretical model he postulates, donors will provide more assistance to the recipient countries with

[7] Altruistic donors include Austria, Denmark, Ireland, Netherlands, New Zealand, Norway and Switzerland. Less altruistic donors include Australia, France and Italy.

[8] Younas (2008) uses Pooled OLS (POLS) to incorporate recipient-specific and time-invariant variables. It should be noted that using fixed effects (which wipe out the long-run aspects of the model), instead of estimating POLS, does not qualitatively change the pattern of his findings.

which they trade more in the goods for which the donors have a comparative advantage. European donors have a comparative advantage in the production of capital goods; and at a much-disaggregated level, Younas (2008) finds that donors provide more aid to countries that import more of their machinery and transport equipment. The results for the other 'usual' variables (like income *per capita*, population, political rights) are in accordance with what we find in the aid allocation literature (Neumayer, 2003b; Berthélemy and Tichit, 2004; Berthélemy, 2006a among others). When he uses three-year averages of aid flows, the most pertinent result is that bilateral donors do not respond to income *per capita* in recipient countries. However, the infant mortality rate, which measures physical hardship, is significant in both specifications (annual and averaged). This provides evidence that donors are partially responsive to recipients' needs. Nonetheless, this can be a crucial reason why most studies find development aid to be ineffective.

'Recipients needs' is often a blend of different variables (measures of economic, as well as, physical hardship) so being sensitive to one or some of its components while simultaneously being insensitive to the other(s) greatly reduces the effectiveness of aid in delivering its expected outcomes. This ineffectiveness, as posited by Doucouliagos and Paldam (2008) can be attributed to poor governance mechanisms, corruption of the ruling elite, and aid fungibility issues in recipient countries. It could also be because donors attach greater priority to their commercial interests; while entirely (or partially) ignoring recipients' needs, as stated above.

Neumayer (2003b) explains aid allocation patterns by four regional banks (African Development Bank, Asian Development Bank, Caribbean Development Bank and Inter-American Development Bank) and three United Nations agencies (UNDP, UNICEF and UNTA). He applies POLS techniques to data from the OECD covering the period 1983 to 2007, in three-year averages. As is recurrent in the literature, the donors considered are heterogeneous in their aid allocation practises. Most donors provide more aid to less populous countries, consistent with other findings in the literature (Alesina and Dollar, 2000; Berthélemy, 2006a among others). For donors that give more aid to more populous countries (the Inter-American Development Bank), they cease to increase aid when the recipients' populations reach a certain threshold.[9] Neumayer (2003b) also finds that development banks are more sensitive to broader economic needs (proxied by recipients' incomes); than human development need (proxied by the infant mortality rate), as opposed to the UN agencies. This might be the case because the regional development banks are more focused on financing big infrastructure projects.[10] As expected, the multilateral agencies considered in this study are insensitive to higher military expenditures and arms imports. This finding chimes with Berthélemy (2006b); in which he states that one would expect multilateral donors to respond less to any political interests in giving aid.

Isopi and Mavrotas (2006) carry out aid allocation analysis using OECD-DAC data covering 20 aid donors and 176 recipients over the period 1980 to 2003. Their main contribution to the literature is the inclusion of an aid effectiveness variable, a measure of good policies which they term 'past outcomes'. Past World Bank projects, as well as other bilateral projects, are evaluated and given scores that vary from highly unsatisfactory (score of 1) to highly satisfactory (score of 6). For the

[9] Neumayer (2003b) finds this population threshold to be 96 million people.
[10] These big infrastructure projects may yield increases in income *per capita* as a by-product of development. It may be the case that the development banks focus on the projects knowing that they will eventually yield economic benefits to the citizens of the recipients.

‘usual’ variables (income *per capita* and population) they find results consistent with what has been found in the aid allocation literature though the results vary in significance, from one country to the other. Regarding the new measure of policy, they find considerable heterogeneity among donors, as expected. While big donors like the US and the UK do not reward recipients based on their past performances,[11] other big donors like France are very keen on rewarding their recipients with more aid given they have had good progress in past projects. Germany, on the other hand, rewards recipients based on their needs and do not consider whether recipients did well in past projects. This is similar to the findings of Knack, Xu and Zou (2014) in which Germany provides aid to poorer (needier) countries and also to countries that have crossed a World Bank exogenously-determined income threshold.

Feeny and McGillivray (2008) model the aid allocation behaviours of bilateral donors to 10 developing countries covering the period 1968 to 1999, using Seemingly Unrelated Regression (SUR) techniques. Their results indicate that both recipients’ needs and donors’ interest variables determine aid allocation among donors. However, the magnitudes of these variables differ markedly among recipient countries. They find evidence of a middle-income bias[12] in countries like Tanzania, India, Kenya and Thailand, while countries like Egypt and Pakistan receive more aid when they experience drops in income *per capita*. The latter result is more palpable in the aid allocation literature (Berthélemy, 2006b; Neumayer, 2003b) though there has been increasing evidence of middle-income bias in the literature (Harrigan and Wang, 2011). Feeny and McGillivray (2008) also find evidence of the ‘bandwagon effect’ among donors for three countries (Egypt, Israel and Thailand). This is the term initially used by Dudley and Montmarquette (1976) to describe a situation in which bilateral donors provide more aid to recipients because those recipients receive more aid from multilateral donors. However, Feeny and McGillivray (2008) also find that for some other countries (Kenya, Morocco, Indonesia) bilateral donors view multilateral aid as substitutes for their own aid: so, they reduce their own aid to these recipients when the recipients receive more aid from multilateral organisations.

3.2 Sector-specific aid allocation

Most aid allocation research is based on general aid, with very few studies focusing on sector-specific aid. However, there have been some few attempts to fill this gap. Lewis (2003) discusses the allocation patterns of global environmental aid by bilateral and multilateral donors. He estimates allocation models using the Two-Part estimator and finds that donors’ self-interests significantly outweigh recipients’ needs in the allocation process. Donors favour nations with whom they have had pervious relations and those with unexploited natural resources.[13] Farooq (2012) explains donor

[11] They find that the US responds more to political and humanitarian needs while the UK responds more to within-country inequality and growth.
[12] More aid is being given to these recipient countries as they experience increases in income *per capita*; with recipient incomes and foreign aid viewed as complements to each other. Middle-income bias can also be interpreted based on the coefficient of a squared GDP *per capita* term. If GDP *per capita* has a negative coefficient while its squared term has a positive coefficient then that will be evidence of a middle-income bias (Harrigan and Wang, 2011).
[13] The idea here is that the more aid a donor gives to recipient countries, the more the recipient countries will have the goodwill to let the donors exploit those natural resources.

allocation patterns for education aid to 146 recipient countries. He employs the Tobit estimator to averaged data (five-year averages) from the OECD's Credit Reporting System (CRS) database covering the period 1973 to 2007. He finds that on average, donors target aid to the recipients with the most need of the education aid. Nonetheless, bilateral donors like France, UK, and Spain tend to favour their former colonies, as well as placing emphasis on factors other than recipients' needs. For the multilaterals, they target the recipient countries with the most need. This is a usual finding in the aid allocation literature; where bilateral donors place more emphasis on their self-interests and to some extent ignore recipients' needs; while multilateral donors respond more to the needs of the various recipients.

There is very scant research on the allocation patterns of donors (bilateral and multilateral) about health aid. Stepping (2015) examines the allocation of health aid by 22 bilateral donors to 160 recipient countries, covering the period 1990 to 2007. Stepping (2015) uses the Two-Part estimator for her analysis; stressing the inherent differences in selection of countries eligible for aid receipts, and the actual amounts of aid received by those countries. This is the first study to comprehensively disaggregate health-related aid into selection and allocation stages, while accounting for donor and recipient-heterogeneity.[14] Stepping (2015) finds that the health-related needs under consideration influence the selection of potential recipients of health aid. However, only the HIV prevalence rate determines the actual amount of funds going to recipient countries. As 'usual' poor countries are more likely to be selected and they are actual recipients of huge aid shares (Clist, 2011; Berthélemy, 2006a find similar results). Stepping (2015) also finds that increases in domestic health expenditures are associated with greater chances of being selected (even after controlling for population size) though health expenditures have no impact on actual allocation. She includes variables measuring donor's characteristics (population and income per capita) and finds that these characteristics are important for both selection and allocation decisions by donors.

Nevertheless Stepping (2015) does not model the selection and allocation decisions of multilateral donors. She also ignores the Public-Private Partnerships (PPPs) in health allocation and as stated by Basu, Stuckler and McKee (2014), these PPPs are increasingly gaining ground in the global health agenda. It would have been interesting to compare the allocation patterns of these PPPs and more traditional bilateral donors.

Fielding (2011) models the responsiveness of health aid to quality of governance in recipient countries. His analysis includes 22 bilateral donors and 109 recipients, covering the period 1995 to 2006. He estimates the allocation of health aid using varying measures of governance (while controlling for epidemiological and economic need, as well as sizes of past aid disbursements) in recipient countries using the system GMM estimator. He finds that donors allocate more aid to countries with higher neonatal mortality rates, even after controlling for other factors of need (like income and HIV prevalence rates) and governance measures. He finds no evidence to support the 'usual' result that donors give more aid to poorer countries. This stands in contrast to what is found in most of the aid literature; where more aid is given to poorer recipients. He also finds evidence in favour of a small-country bias though the magnitudes and significance levels are sensitive to model specification. As regards quality of governance, he finds that countries with better political rights are

[14] In terms of population and *per capita* income.

rewarded with higher aid flows. However, countries with high levels of corruption are also major recipients of aid flows.

The aid allocation literature provides evidence that donors (both bilateral and multilateral) give more aid to poorer and less populous countries. This is confirmed by Doucouliagos and Paldam (2007) in their meta-analysis of development aid allocation. They find that the poverty effect (that is donors giving more aid to poorer countries) and 'small-country bias' are robust to all kinds of model specifications, econometric techniques as well control variables. [15] As pointed out by Doucouliagos and Paldam (2007), no donor states that poverty in a less populous country is more important than poverty in a more populous country. Thus the 'small-country bias' on its own is a deviation from normal aid allocation patterns. This bias cannot be directly linked to other more noticeable biases like historical ties (relationships between colonies and their former colonisers) and strategic and economic relations (trade and political ideologies).

A general pattern found in most studies is multilateral donors being more sensitive to recipients' needs than bilateral donors. For bilateral donors, Germany and the Nordic donors are the most consistent with the humanitarian aid agenda.[16] Others like Japan and France place much emphasis on their economic and strategic interests, though Japan rewards better-governed countries more than France does. The USA, by far the largest donor of health aid and a huge donor of total aid (IHME, 2013, p. 10), has more astounding results. They do not respond to recipients' needs and merits, as well as ignoring their own personal interests. The only logically consistent finding about the USA's allocations is, while controlling for other factors, they give more aid to Israel and Egypt. This confirms the strategic relationship the USA has with these two countries.

Interestingly, there are similarities in findings in the literature even though different econometric techniques have been used. As has been pointed out in the later part of the aid allocation literature, all donors do not give aid to all recipients. Thus, the aid variable in most empirical analyses has limiting observations. Hence OLS techniques provide biased and inconsistent results. This led to the advent of techniques to circumvent this problem; The Tobit estimator, Two-Part estimator and Heckman estimator.[17]

[15] All donors state their eligibility criteria for aid receipts and almost always include poverty reduction as one of their main targets. It is heartening, then, to find that donors allocate more aid to countries with lower incomes. Nevertheless, there is also evidence (albeit small) of a middle-income effect. No matter how small this effect may be, it constitutes a significant bias in aid allocation.

[16] They reward recipients whom they think can use the aid more effectively, countries that are most needy and they do not care much about their personal geopolitical or other interests.

[17] Researchers tend to choose arbitrarily among these methods although they are expected to be guided by data diagnostics in choosing the appropriate estimator. Farooq (2012) and Isopi and Mavrotas (2006) use the Tobit estimator while Stepping (2015) and Clist (2011) use the Two-Part estimator. Berthélemy (2006a) uses both the Two-Part and Heckman estimators. Younas (2008), Neumayer (2003) and Harrigan and Wang (2011) use Pooled OLS (POLS) methods in cases where the aid data are not censored. The system GMM has also become a popular estimator of choice in cases where the aid data are not censored; and when the studies seek to explain the influence of past aid disbursements/commitments on current aid disbursements/commitments.

4. DATA AND DESCRIPTIVE STATISTICS

Guided by the aid allocation literature, explanatory variables are grouped into recipients' needs, recipients' merits, donors' interests and control variables. These variables will be used in the main estimations, as well as in sensitivity analyses.

4.1 Dependent Variable: Commitments or Disbursements?

Most studies in the aid allocation literature use aid commitments rather than disbursements, as dependent variable. The argument is that commitments more accurately portray the intentions of donors (Clist, 2009) and it is from the perspective of the donors that most studies consider. However, in this study we use health aid disbursements. We seek to model the determinants of actual heath allocations, not promises made by donor agencies. This stand can be summed up by an extract from Kristof (2006) which says

"And whatever the impact on economic growth rates, aid definitely does something far more important: it saves lives. Let's not shy away from a conversation about the effectiveness of aid. The problems are real, but so are the millions of people alive today who wouldn't be if not for aid."

Promises to give funds do not save lives; disbursements of the funds do save lives. These disbursements are influenced by the recipients' ability to meet donors' conditionality (Clist, 2009); and the recipients' abilities to manage the aid effectively. This conditionality may be in the form of meeting certain pre-set thresholds in the provision of health services[18]; or also in the form of political conditionality (Carey, 2007): the latter common when donors instruct recipients to implement governance policies in line with donors' thinking. Hence it would be more adequate to model aid allocation in the presence of such conditionality; and test if donors disburse more aid to faltering governments (based on the recipient government's effectiveness), or if they give more aid to needy governments. We also test if donors are more sensitive to their own interests. Thus *per capita* DAH disbursements will be used as the dependent variable. This variable is obtainable from the IHME-DAH (2014) database. DAH is defined as 'financial and in-kind contributions made by channels of development assistance to improve health in developing countries. It includes all disease-specific contributions as well as general health sector support, and excludes support for allied sectors' (IHME, 2009, p. 13).[19]

4.2 Explanatory Variables

4.2.1 Recipients' Needs

Recipients' needs are sub-divided into two groups; broader economic needs and health-related needs.

<u>Broader Economic Needs</u>

[18] For instance, the GAVI Alliance state that besides acute poverty, countries will be eligible for funding if they cover at least 70% of the provision of the DTP3 vaccine (GAVI, 2013).
[19] Details on how the health aid data are obtained can be seen in the IHME (2013) Methods and Annex document.

We use *per capita* income, GDP *per capita* (GDPpc hereafter) of the recipient country as the main measure of broader economic need. This is a widely used measure of recipients' needs in the existing literature (Neumayer 2003a; Berthélemy, 2006b; Clist, 2009; Dollar and Levin, 2006; Isopi and Mavrotas, 2006). Roodman (2008) documents concerns about the endogeneity of *per capita* income: while recipients' income levels may determine how much aid goes to recipients, aid receipts may also increase recipients' incomes. This reverse causality is unlikely to significantly influence results for two reasons. First, health aid is small to shape economic outcomes and institutional conditions in recipient countries (Farooq, 2012). Second, Burnside and Dollar (2004) posit that large amounts of aid are unlikely to have short-term effects on economic and social outcomes, as well as institutional conditions.

Nevertheless, to control for potential endogeneity, we use lagged *per capita* income. A priori, *per capita* DAH is expected to increase as GDPpc decreases (empirically, this represents a negative relationship between *per capita* DAH and GDPpc). Decreasing GDPpc shows the limited ability of the recipient country to address their needs; and most donors' allocation statements (DFID, 2011 for instance) state poverty reduction as one of their main reasons for providing aid. Hence donors are expected to provide more aid to countries with lower incomes; as they view their aid as substitutes to domestic incomes. Nonetheless, some donors may view their health aid as complements to recipients' incomes, making them provide more aid to relatively richer countries (Feeny and McGillivray, 2008). Empirically, this translates to a positive relationship between *per capita* DAH and GDPpc. Data on GDP *per capita* is obtained from the World Bank's *World Development Indicators* (WDI) database.

<u>*Health-related recipients' needs*</u>

The under-five mortality rate (U5MR hereafter), defined as the probability of children dying before the age of five, is a key indicator of severe deprivation in health. DAH is expected to increase as UMR goes up. Like GDP *per capita*, the under-five mortality rate may also suffer from simultaneity bias: the under-five mortality rate influences the amount of health aid recipients receive but more health aid receipts may also help to reduce the under-five mortality rate. Thus, we use the lagged under-five mortality rate to control for potential endogeneity. Data on the under-five mortality rate is obtained from the WDI database.

The prevalence of HIV in the population of those aged between 15 and 49 (HIV hereafter) is also a measure of acute health deprivation (Ottersen *et al.*, 2014). Increases in the percentage of people with HIV shows the burden of the disease on the population. As the percentage of the recipient population infected with HIV increases, donors are expected to increase the amount of health aid provided to the recipient. We get data on HIV prevalence rates from the WDI database.

Another measure of health–related need is the prevalence of tuberculosis (TB hereafter) in the recipient country's population. It is defined as the number of cases of tuberculosis at a given point in time, expressed as the rate per 100,000 populations. Empirical medical research has found that those suffering from tuberculosis are mostly (though not exclusively) those suffering from HIV as well. These two diseases show very high health burdens on the recipients and if their rates are increasing, donors would be expected to provide more health aid to ease the burden. Data on tuberculosis prevalence rates is obtained from the *African Development Indicators* (ADI) database of the World Bank.

There is some ambiguity regarding these health-related need variables and *per capita* DAH. Normatively, increases in *per capita* health aid are expected to match increases in these health-related need variables. Nonetheless, the relationship between the variables and *per capita* health aid can be negative. This is a scenario in which donors allocate more health aid to countries with 'already high' under-five mortality, HIV prevalence and tuberculosis prevalence rates. Kasuga (2007) provides empirical evidence that the USA disburses more health aid to countries with 'already high' infant mortality rates.

4.2.2 Recipients' Merits

Recipients' merits are reflected in a country's 'governance' (Burnside and Dollar, 2000) as well as the quality of its institutions (Farooq, 2012). Carey (2007) posits that bilateral and multilateral donors view and interpret good governance differently. Multilaterals like the World Bank proxy good governance by transparency and accountability, as well as broader economic measures like GDP *per capita* growth, trade openness and fiscal balance. Bilaterals, on the other hand, emphasize human governance; for example, respect of human rights. Burnside and Dollar (2000) suggest that development aid should be given to countries with good policies as they will be able to manage the aid better than countries with bad policies. It is worth mentioning that there is an ambiguous relationship between recipients' merits and recipients' needs. Feeny and McGillivray (2008) state that donors might give more aid to countries with low GDP growth and high trade openness to offset the implications of poor performance (which will be associated with high need). Otherwise, donors might prefer to give more health aid to middle income countries with high growth rates, rewarding them for better economic performance.

The growth rate of *per capita* GDP is an adequate proxy for recipient countries' governance. GDP *per capita* growth is calculated as the rate of change in GDP *per capita* so countries experiencing steady growth in their incomes are 'seen as' making efforts towards their development. They should then receive more aid. However, an alternative argument is that if a country is making huge strides in achieving development that country is not in dire need of aid.[20] Hence the recipient should not receive more aid in this case. On average, SSA countries have lower growth rates than other developing regions for two reasons. First, the inability to raise revenues domestically (Neumayer, 2005). These developing countries are constrained in their abilities to raise taxes and most, have very weak and occasionally outdated tax systems in place (Osei, Morrissey and Lloyd, 2005). Second, there is also the problem of the Samaritan's dilemma. This is a situation whereby it is always optimal for donors to provide aid to recipients. Hence, the recipient exerts less effort *ex-ante* (interpreted here as generating less revenue for health expenditures), knowing that it will receive development assistance from donors. This causes a moral hazard problem which the donors can solve by enforcing *ex-post* conditionality on the recipients. However, White and Morrissey (1997) state that as it is always optimal for the donor to provide aid to the recipient, they provide the aid anyway. Thus, the relationship between *per capita* DAH and GDP growth may be negative or positive; the former when donors provide more health to cover for poor economic performance in the recipient countries, and the latter when donors reward recipients for good economic performance. Data on GDP *per capita* growth is obtained from the UNCTAD database.

[20] See Feeny and McGillivray (2008) for a brief discussion.

A measure of democracy is also included since it reinforces what Carey (2007) posits; that bilateral organisations focus more on human governance. Some donor agencies even state enforcing democracy; through political conditionality, as part of their objectives for providing aid. DFID (2011) state as part of their new results-based allocation policy; supporting the development of local democratic institutions, civil society groups, the media and enterprise. Hence implementing more democratic systems in their country will make some recipients favourites in being selected for, and receiving health aid. We get democracy data from the Polity IV dataset and it ranges from '-10' (least democratic) to '10' (most democratic).

We also include a measure of openness as a proxy for recipients' economic effectiveness. In computing the globalisation index, Dreher (2006) uses trade openness as one of the main components of economic globalization. Openness is the sum of exports and imports as a percentage of the recipient's GDP. The German agency for international development, GIZ, is guided by principles of reducing poverty and promoting equitable forms of globalization in their allocation patterns (GIZ, 2013). Nunnenkamp and Thiele (2006) postulate that aid can be used more wisely in economically stable countries that are more open to trade. Berthelemy (2006) argues against the use of outcome variables like GDP growth and trade openness as measures for recipient merit. However, these outcomes are a result of genuine efforts made towards better economic management and prosperity so they can be used as good proxies for institutional quality. Data on trade openness if obtained from the WDI database.

The immunization rate of measles is also included in the analysis. This measures the percentage of children aged 12-23 months who received vaccines before they were 12 months old. Children are considered immunized if they have received at least one doze of the vaccine. Stepping (2012) states that the immunization rate in any given country can be seen as a proxy for the quality of health systems in said country. High coverage rates of immunization signal a country with high health care quality, which itself shows signs of the country making efforts towards its human development; so they will be more deserving of aid. Nonetheless, high immunization rates may be common in countries able to cater for their health needs. These countries, then, are not in dire need of aid so should not receive more aid. Thus, a positive relationship between per capita DAH and the immunization rate reflects donors rewarding countries with good health systems; while a negative relationship reflects donors provide less DAH to countries with good health systems (hence, less need for DAH). Data on the immunization of measles is obtained from the WDI database.

4.2.3 Donors' self-interest

Bilateral exports from the donor to the recipient are included as the main determinant of donors' interests. This variable has been extensively used a measure of donors' interests in the allocation literature (Isopi and Mavrotas, 2006; Berthélemy, 2006b; Farooq, 2012 among others) since it describes the strength of commercial links between the donor and the recipient country. Berthélemy (2006b) finds evidence that donors provide more aid to countries that have bilateral trade relationships with them. In this case, the effect of trade on *per capita* health aid allocation will be positive. Farooq (2012) states that donors give more aid to important trade partners, maybe because bilateral relationships are closer when trade is high or because donors tend to support, indirectly, their own exports to the recipients. Clist (2009) also finds some evidence that countries like Germany, Sweden and the Netherlands do not choose their trading partners as potential recipients of aid; while the USA provides less aid to its trading partners. In such cases the effect of trade on allocation is negative. There can also be reversed causality regarding DAH and trade; that is increased DAH may also lead to increased trade between the two countries so we lag it by one period. Data for exports comes from the OECD-DAC (2014) database.

4.2.4 Population

As stated earlier population is included independently, since there is no consensus as to its position in the model. Some studies include it as a recipient need variable (Clist, 2011; Feeny and McGillivray, 2008) while others include it as a control variable (Farooq, 2012). Most studies on aid allocation find a bias towards less populous countries (Alesina and Dollar, 2000; Trumbull and Wall, 1994) which can be termed a "small-country bias". Doucouliagos and Paldam (2007) posit that there is no reason to treat poverty in a less populous country as more important than poverty in a more populous country. Hence giving more aid to countries based on their size is indeed a bias. Younas (2008) provides some intuitive arguments as to why this is the case. First, more populous countries experience diseconomies of scale of *per capita* aid which results in low marginal impacts of aid. Second, more populous countries have limited absorptive capacity[21] and cannot handle additional amounts of aid. Third, it is relatively easier for donors to wield political influence in less populous countries than in more populous countries; that is, as the population of the recipient country increases, the marginal political benefit to donors reduces. Nonetheless, some few studies find that donors give more aid to countries with increasing populations, until at least a certain threshold population (Neumayer, 2003b; Feeny and McGillivray, 2008). Thus, there can be a positive or negative relationship between *per capita* DAH and population. Population data is obtained from the WDI database.

4.2.5 Control Variables

Control variables capture the time-constant, recipient-specific effects derived from the conceptual framework. Neumayer (2005) posits that former colonial powers still maintain political, economic and cultural similarities with their former colonies. To capture these colonial and other similar geopolitical effects, we use dummy variables. We include bilateral dummy variables for former colonies of France and the United Kingdom. The dummy variables equal one if the recipient in question is the former colony of the observed donor. Otherwise, it is zero. Following Alesina and Dollar (2000), Clist (2009) and Farooq (2012), cultural similarity is also included, proxied by language similarities. Language is a dummy which takes the value of 1 if the recipient country uses the donor's language as an official language in their own country; and zero otherwise.

4.3 Descriptive Statistics

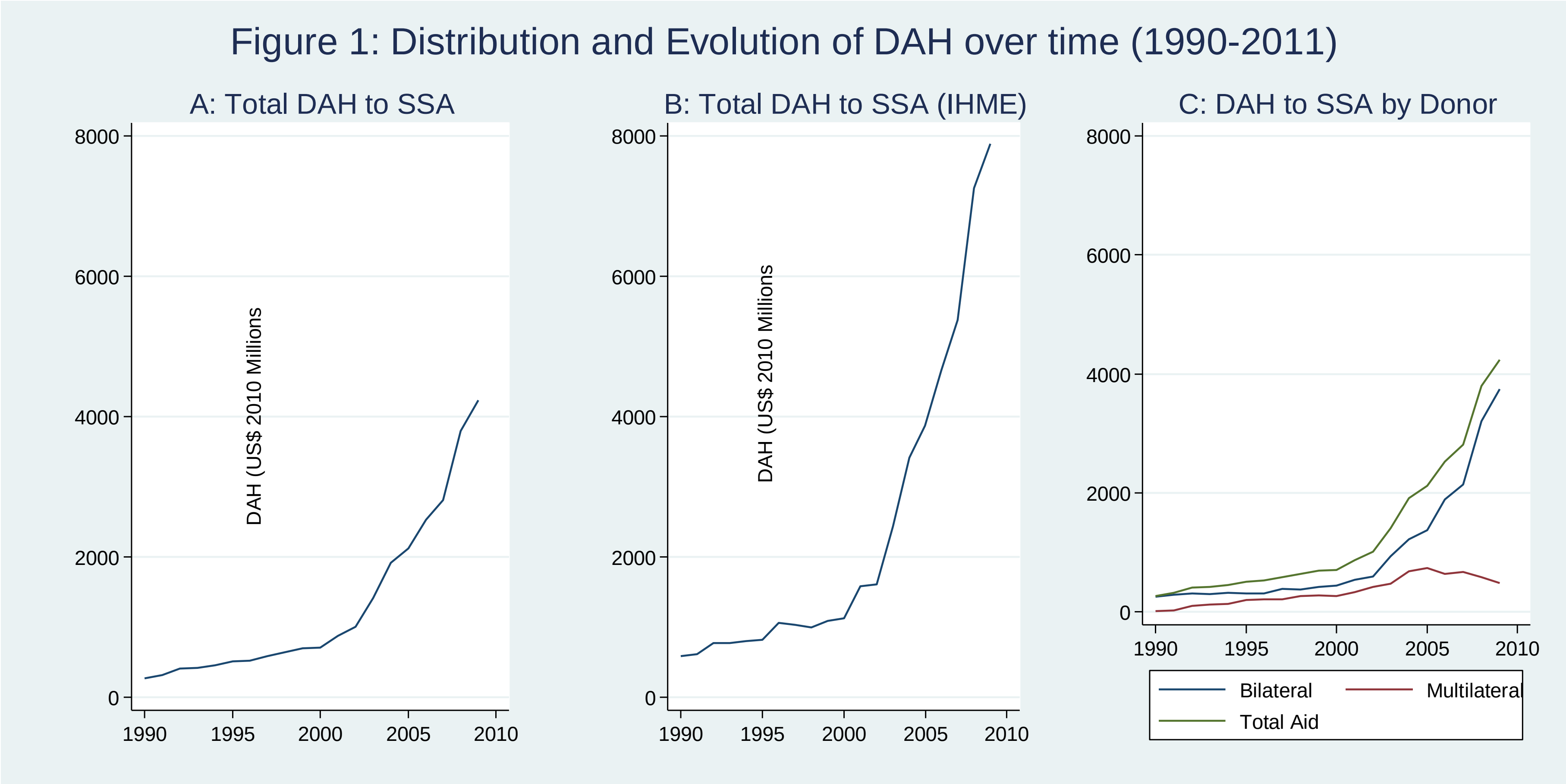
We aim to analyse the determinants of *per capita* health aid disbursements to 44 SSA countries over the period 1990 to 2011. For descriptive purposes, we aggregate all health aid flows into three categories and provide an overview of its composition and evolution; total health aid, total multilateral

[21] They lack the administrative expertise to absorb continuously large amounts of aid.

aid and total bilateral aid. All data are in millions of 2010 US dollars. Total multilateral aid is the sum of health aid disbursements from the European Commission (EC hereafter) and the International Development Association of the World Bank (IDA hereafter) while total bilateral aid is the sum of health aid disbursements from the UK, France, Germany, the USA and Sweden. Total health aid, is the sum of total bilateral and total multilateral aid. IHME (2012) states that the first four bilateral donors (UK, France, Germany and the USA) provided, in absolute dollar amounts, approximately 73% of the total development assistance in 2010. Sweden, on the other hand, was ranked one of the highest in terms of health aid disbursed, as a proportion of GDP (IHME, 2012). These five bilateral donors play a huge role in the international health scene: hence, modelling their allocation patterns is necessary.

Panel A of figure 1 shows that total health aid (based on our sample of five bilateral and two multilateral donors) provided to the SSA region has been increasing throughout the sample period. IHME (2013, p. 23) states that health aid to SSA countries has been on the rise; with the region receiving $8.8 billion in 2011, a 6.1% increase from the value in 2010. This rise in disbursements has been to match the pressing health needs of the region (with the burden of disease increasing dramatically); and, because more low-income countries are found in the SSA region (IHME, 2013, p. 23). Panel B depicts this trend using data from the IHME (2013) report. Panel C shows the evolution of bilateral and multilateral health aid disbursements to SSA countries over the sample period. It is clear from Panel C that health aid disbursements have been increasing steadily over the sample period. The most significant portion is the drastic increase in total and bilateral disbursements from 2003 to 2008. This was before the financial crisis and most bilateral donors were increasing their health aid disbursements to developing countries. Moreover, donors were just fresh from the Millennium Declaration so they were eager to meet up with the targets of the MDGs. There was also an increase in multilateral health aid disbursements between 2003 and 2008 but not as much as for the bilaterals. This confirms IHME (2013, p. 10)'s assertion that bilateral organisations provide more health aid than multilaterals.[22]These increases in health aid disbursements by bilaterals are a result of them trying to meet up with the MDGs as the deadline draws near. Both multilaterals and bilaterals experienced drops in health aid disbursements after 2008, reflecting the effects of the 2008 financial crisis. Health aid disbursements from most donors were cut in the face of budgetary austerity.

[22] The increase in health aid disbursements over the period 2003 to 2008 is not as pronounced for the multilaterals because we include just two multilateral organisations in our analysis. Other multilaterals like the African Development Bank, the International Bank of Reconstruction and Development and United Nations (UN) agencies were not included. Their exclusion, by no means, implies their non-importance.



Source: Panels A and C are based on the IHME DAH (2013) Database. Panel B is based on data obtained from the IHME (2013, p. 78) report.

Table 1: Main Recipients of Health Aid

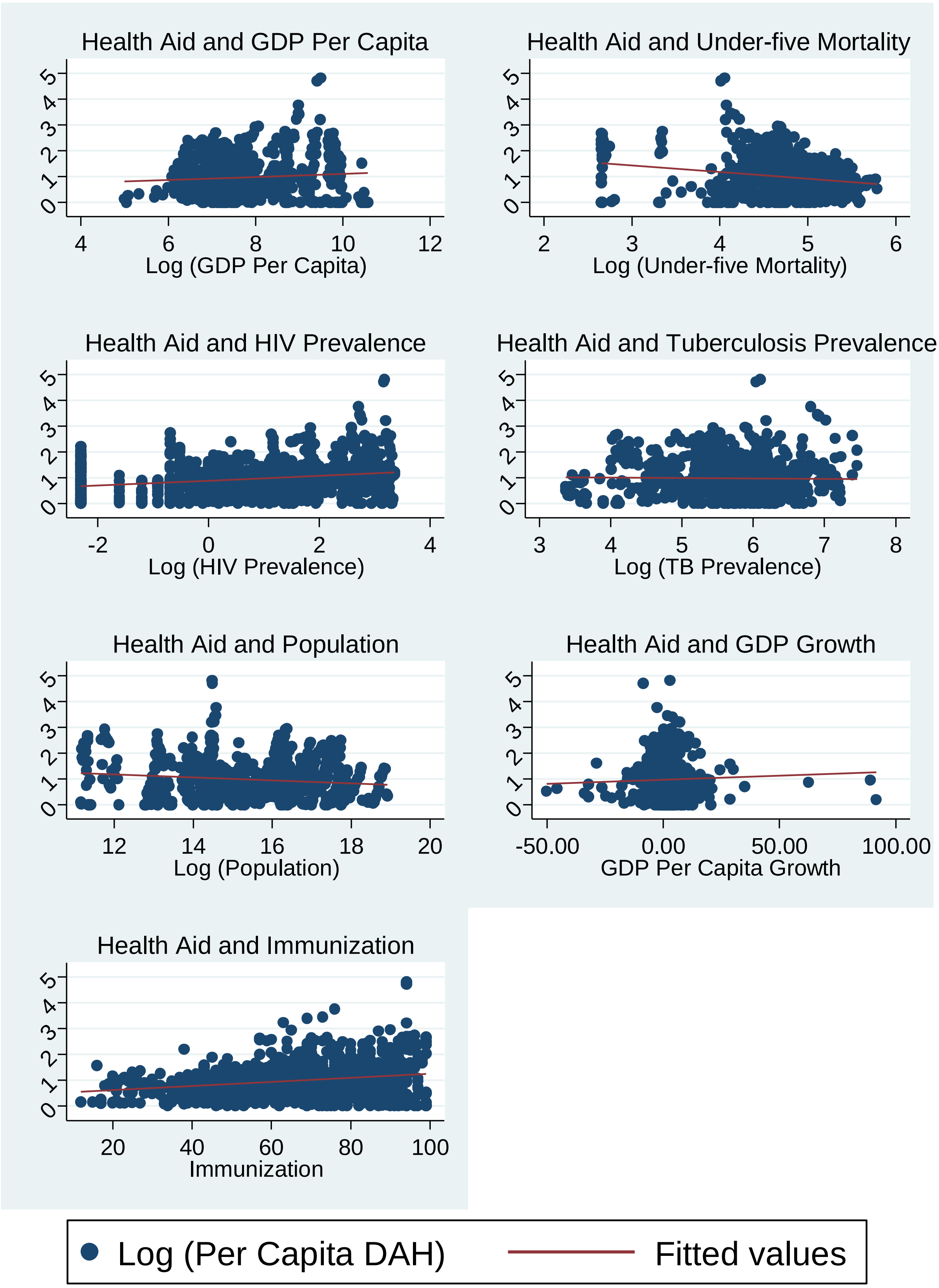
Total Health Aid Flows (millions of $US 2010)				
	Most Received		Least Received	
Rank	Country	Amount	Country	Amount
1	Nigeria	2808.757	Seychelles	8.237
2	Kenya	2256.566	Equatorial Guinea	9.540
3	Uganda	2084.822	Sao Tome and Principe	20.085
4	Tanzania	1866.422	Cape Verde	31.161
5	South Africa	1835.736	Comoros	38.443
6	Mozambique	1466.119	Gabon	54.845
7	Ethiopia	1438.421	Swaziland	55.162
8	Zambia	1406.466	Gambia	58.558
9	Malawi	1110.169	Guinea Bissau	59.094
10	Ghana	936.223	Republic of Congo	73.986

Average *Per Capita* Health Aid flows ($US)				
	Most Received		Least Received	
Rank	Country	Amount	Country	Amount
1	Botswana	315.278	Togo	15.996
2	Namibia	191.601	D.R. Congo	16.966
3	Sao Tome	148.075	Cameroon	17.370
4	Zambia	124.846	Equatorial Guinea	18.089
5	Seychelles	105.286	Ethiopia	19.048
6	Malawi	91.667	Nigeria	19.762
7	Uganda	75.516	Republic of Congo	22.418
8	Mozambique	74.478	Central African Republic	24.309
9	Rwanda	73.771	Burundi	26.700
10	Comoros	71.588	Angola	27.073

Notes: *All figures are in constant $US 2010.*

Table 1 provides an overview of the 10 major/least recipients of health aid disbursements; in absolute $US2010 amounts and in *per capita* terms. The 2nd and 3rd columns of the table show that more populous countries receive more health aid in absolute dollar amounts; with Nigeria receiving most (approximately $US28.1 billion). Other populous countries like Tanzania also received huge sums of absolute health aid ($US18.7 billion). Less populous countries like Equatorial Guinea and Seychelles received smaller amounts of absolute health aid from donors. Health *aid per* capita, on the other hand, goes to the least populous countries. This is consistent with the findings in most empirical studies; in which aid increases linearly with the population of a recipient country (Feeny and McGillivray, 2008). Botswana, by far one of the least populous countries in Africa, receives the most health aid per capita ($US315.28 per person). A plausible argument for this is the fact that more populous countries lack the absorptive capacity to manage huge sums of aid. Hence donors prefer to give more *per capita* aid to small countries as they are assumed to be countries where the aid will be managed better. Nonetheless, less populous countries like Togo, Burundi, and Central African Republic receive less *per capita* health aid as they are badly governed countries.

Figure 2: Scatter plots of *Per Capita* Health Aid and some measures of recipients' needs and merits, 1990-2011



To get a broader picture of how health aid is disbursed in response to recipients' needs and their ability to manage the aid, some bivariate analysis of health aid flows and indicators of need and merit is done. Figure 2 shows scatter plots of logged *per capita* health aid against some measures of need and merit.[23] We also include a linear OLS fitted line to get a richer picture of the relationship between *per capita* health aid and the explanatory variables. The most surprising pattern is that health aid shows a positive relationship with *per capita* incomes. The Performance Based Allocation formula of the IDA, as well as most bilateral donors' policy statements (for example, DFID, 2011), state that more aid should be provided to countries that otherwise cannot cater for their needs (needs proxied by *GDP per capita*). Hence, we would expect more health aid to countries with lower incomes. However, Feeny and McGillivray (2008) state that it is perfectly normal for donors to give more aid to relatively richer countries, as their aid is disbursed to complement recipients' incomes. Moreover, there might be higher labour costs in countries with higher *per capita* incomes so these countries tend to receive more *per capita* health aid from donors.

There is a negative relationship between *per capita* health aid and recipients' population. This means smaller countries receive more health aid *per capita,* as seen in table 1. This negative relationship is consistent with the aid allocation literature (Younas, 2008; Neumayer, 2003b; Harrigan and Wang, 2011 amongst others). Younas (2008) provides some intuitive explanations for this negative relationship, one of which is the fact that marginal impact of aid decreases as population increases. This will be discussed in more detail in the next section.

Ottersen *et al.,* (2014) posit that more health aid should be disbursed to countries with increasing under-five mortality rates. Nevertheless, from the graphical analysis we can see that is not the case; a positive relationship between *per capita* health and the under-five mortality rate is observed. On average, donors provide more health to countries only when their under-five mortality rates have risen to very high levels; not when they are relatively low and just increasing.

Ottersen *et al.,* (2014) also posit that more health aid should be given to countries with higher HIV prevalence and tuberculosis prevalence rates. From our graphical analysis, we can see that the relationship between HIV prevalence and TB prevalence rates and *per capita* DAH is positive. Regarding health aid and recipients' merits, we can see that on average donors provide more aid to countries with better economic policies and to countries investing more in the health of their citizens; proxied by real GDP *per capita* growth and immunization rates respectively.

Correlation coefficients between *per capita* health aid disbursements from the various donors are considered. This is to gauge if there are any "herding" practises in health aid allocation; we ask if donors provide more health just because their "peers" do so as well. Going by table 2 we conjecture that most countries follow the UK's health aid allocation patterns. The correlation coefficients between the UK's *per capita* disbursements and that of other donors are significant for Germany, Sweden and the EC. This is tacit evidence that the UK wields considerable influence in the international health agenda. As regards correlation between need and merit variables, table 3 shows that the correlation coefficients are generally small albeit significant. Including them together in the subsequent multivariate analysis should not lead to problems of multicollinearity. One caveat remains, however. The rate of immunization of measles is negatively and significantly correlated with

[23] See Appendices A1 and A2 respectively for variable definitions and descriptive statistics.

the under-five mortality rate ($r = -0.5418, p < 0.05$) but we include both variables in our multivariate analysis because the rate of immunization of measles is an adequate proxy for effort expended domestically in trying to improve economic conditions. In some way, it is treated as an 'instrument' for government health expenditures; which itself proxies the weight domestic governments place on the welfare of their citizens.

Table 2: Correlation coefficients between *per capita* DAH disbursements across donors

	UK	France	Germany	USA	Sweden	EC	USA
UK	1						
France	-0.0347	1					
Germany	0.0802*	-0.0484	1				
USA	0.0404	-0.0437	0.1533*	1			
Sweden	0.1577*	-0.0574	0.0442	0.1346*	1		
EC	0.1035*	0.0252	0.0728*	0.0534	0.0248	1	
IDA	-0.0518	0.1014*	-0.0132	0.0045	-0.0509	0.0610	1

Notes: ** indicates significance at the 5 per cent level.*

The descriptive analysis in this section is strictly preliminary. A proper multivariate analysis of the determinants of *per capita* health aid disbursements should be carried out, where we would be testing relationships between the key variables and *per capita* DAH.

Table 3: Correlation coefficients between main explanatory variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	1								
(2)	-0.3714*	1							
(3)	-0.5855*	0.4480*	1						
(4)	0.0931*	0.2348*	-0.1175*	1					
(5)	0.0043	0.1588*	0.2487*	0.1724*	1				
(6)	0.1235*	-0.0381	-0.0739*	-0.0212	-0.0007	1			
(7)	0.5311*	-0.4599*	-0.3328*	-0.0014	-0.0196	0.2124*	1		
(8)	0.2272*	0.2955*	-0.5418*	0.2145*	-0.1797*	0.1107*	0.2341*	1	
(9)	-0.0108	0.1456*	-0.1560*	0.1244*	0.0940*	0.0135	-0.0671*	0.0725*	1

Notes: *(1) is GDP per capita, (2) is population, (3) is the under-five mortality rate, (4) is the HIV prevalence rate, (5) is the tuberculosis prevalence rate, (6) is GDP per capita growth, (7) is trade openness, (8) is the immunization rate, (9) is democracy. All variables except GDP growth, immunization and democracy are logged. * indicates significance at the 5 per cent level.*

5. EMPIRICAL MODEL SPECIFICATIONS

We estimate a health aid allocation model using one of two techniques. The choice of the appropriate technique is motivated by the characteristics of the data and data diagnostics. Theoretically, the Tobit estimator is applicable if the underlying dependent variable contains negative values that have been censored to zero in the empirical realization of the variable (Sigelman and Zang, 1999). Since the dependent variable in this paper is health aid disbursements it is normal that there be some negative disbursements; in cases where loan repayments are larger than receipts from international donors. Such instances are relatively few can be censored at zero, easing applicability of the Tobit estimator. Thus, the zero health aid disbursements will now represent actual zero disbursements (no aid) or loan repayments (negative disbursements).

It is also normal that all donors do not give health aid to all recipients every year (Clist, 2009); such that some recipients receive $0 in the form of health aid or total ODA (McGillivray, 2003). If the decision-making processes of donors *can be* modelled then the appropriate estimator will be used (Sigelman and Zang, 1999). If the donor decides on how much it *"wishes"* to contribute then, again, the Tobit estimator will be an appropriate choice. If the donor decides whether to contribute, and then if the first decision is affirmative, decides how much to give; a Tobit estimator will be inappropriate. The $0 observations would not be a result of censoring but of a binary choice. In this case, the Double-Hurdle estimator is more appealing.

The Tobit Estimator

The first estimator we consider is the Pooled Tobit estimator. The Tobit estimator is a special type of double hurdle estimator where ($x_1 = x_2$). The underlying reason for using the Tobit estimator is that the decision on whether to provide aid, and the amount of aid provided are determined by the exact same factors. More generally, consider the following model;

$$y_i^* = \alpha + x_i'\beta + \varepsilon_i \tag{15}$$

Where $y_i = y_i^*$ if $y_i^* > 0$

$y_i = 0$ if $y_i^* \leq 0$

And $\varepsilon_i \sim N(0, \sigma^2)$

where y_i^* is the latent (true) variable, which is only observed for values greater than zero, is a function of the regressors (x_i) and a normally distributed error term. The Tobit estimator then estimates the chance of censoring (for the limited observations) at the same time as estimating the value of y, if uncensored. The model for health aid allocation will be given by:

$$Aid_{ijt}^* = Max(0,\ \beta x_{ij,t} + u_{it}) \tag{16}$$

where $Aid_{ijt} = Aid_{ijt}^*\ if\ Aid_{ijt}^* > 0$ (17)

$Aid_{ijt} = 0\ if\ Aid_{ijt}^* < 0$

where i represents the recipient country, j represents the donor country, and t refers to time. Aid_{it}^* is the quantity of DAH *per capita* disbursements (the latent variable), $x_{ij,t}$ is the set of explanatory variables which vary with the recipient, the donor and with time. β is the vector of parameters associated with the explanatory variables and u_{it} is the random error term. A key assumption for consistency of estimates is that the idiosyncratic error in the Tobit estimator should be normally distributed and homoscedastic. Monte Carlo studies have shown the Tobit estimator to result in inconsistency when errors are non-normal and heteroskedastic (Pagan and Vella, 1989). Nonetheless, lognormal extensions of the Tobit are readily available, and Deaton (1997, p. 89) also discusses a non-parametric alternative to the fully parametric Tobit estimator. In this paper, we are interested in getting the partial effects of independent variables on the unconditional expected value of health aid. The partial effect of any independent variable x_i will be;

$$\frac{\partial E[DAH_{ijt}|x_i]}{\partial x_i} = \Phi\left(\frac{x_i'}{\sigma}\right)\beta \quad (18)$$

The Two-Part Estimator

The Two-Part or Double Hurdle estimator was popularized by Cragg (1971). In the first part, we estimate a Probit model in which donors decide whether to provide health aid to recipients, or not. This decision is a function of recipients' needs, recipients' merits and donors' interest variables. The basic equation of the Probit takes the following form:

$$\Pr\left[DAH_{ijt} = 1\middle|x_i\right] = F(X) = \Phi\left(\alpha_i + \rho_t + \beta x_{ijt-1} + \mu_{it}\right) \quad (19)$$

where i refers to the recipient, j represents the donor and t is time. The dependent variable DAH_{ijt} equals 1 if the country receives health aid (if the latent variable DAH^*_{ijt} is greater than zero), and zero otherwise. Φ is the cumulative standard normal distribution from which the errors of the Probit draw, α_i represents unobserved heterogeneity, ρ_t represent period effects and x_{ijt-1} is a vector of lagged explanatory variables that vary by recipient, donor and time. μ_{it} is the error term.

Based on equation (19), we estimate a pooled Probit in the 1st stage. Given the non-linearity of the conditional mean, the parameter estimates cannot be treated as partial effects so they are not very informative. Interest will then be on partial effects. We are interested in obtaining the partial effects of independent variables on the probability of being chosen to receive *per capita* health aid. The partial effect, which shows the change in the probability of selection to receive health aid, resulting from a change in any independent variable will be;

$$\frac{\partial \Pr[DAH_{ijt} = 1|x_i]}{\partial X_i} = \beta_i \phi(x_{it}\beta) \quad (20)$$

The second stage of the double-hurdle estimator is an OLS model in which the donors decide how much health aid to provide only to the selected countries from the first stage. The allocation equation will be of the form:

$$\ln\left(DAH_{ijt}|DAH_{ijt} > 0\right) = \left[\alpha_i + \rho_t + \beta x_{ijt-1} + \varepsilon_{it}\right] \quad (21)$$

where i refers to the recipient, j represents the donor and t is time. The dependent variable is the logarithm of *per capita* DAH disbursements from donor j to recipient i in year t. α_i represents unobserved heterogeneity, ρ_t represent period effects and x_{ijt-1} is a vector of lagged explanatory variables that vary by recipient, donor and time. ε_{it} is the error term. An appealing feature of the double hurdle estimator is that the variables influencing selection of recipients can (and possibly should) be different from those influencing the amount of health aid recipients get. One crucial assumption here is that the choice of the recipient(s) and the amount of DAH allocated be completely independent of each other. In other words, the error terms in the two equations should be completely independent; that is $Cov\ [\mu_{it}\varepsilon_{it}] = 0$.[24]Nunnekamp and Ohler (2011) state that if the assumption of independence is not met; which is almost always the case, the regression in the second step suffers from selection bias. Results from the 1st stage are, however, not affected. Another key assumption for consistency of the double-hurdle estimator, besides independence in the errors, is that $E(lnDAH\ |DAH = 1, x)$ is linear in x (Cameron and Trivedi 2009, p. 556). This assumption can be tested by using regular model specification tests.

The choice of the appropriate estimator for the model is an issue that most researchers tend to ignore and choose their estimators arbitrarily. Isopi and Mavrotas (2006), Farooq (2012), Berthélemy and Tichit (2004) use the Tobit estimator while Berthélemy (2006a), Clist (2009) use the Double-Hurdle estimator. There are tests for model choice and the analyst should be guided by data diagnostics in choosing the appropriate estimator. A Wald test with a $x^2(N)$ distribution can be used to discriminate between competing estimators. Furthermore, when the model is correctly specified the *Likelihood Ratio* (LR) test can also be used. Drukker (2002) also provides a conditional moments test for normality and homoscedasticity of the residuals from the Tobit estimator.

Recipients' need factors are specific to recipients and they vary over time. Donors' self-interest variables are those observable variables that make recipients special to certain donors. Hence, they are known to donors and recipients, and they vary over time. Recipients' merit variables are treated analogously.[25]The control variables are time-invariant. Our baseline regression will be of the form;

$$\begin{aligned} lnDAH_{ijt} = {} & \alpha_0 + \pi_1 ln(U5MR)_{it-1} + \pi_2 ln(HIV)_{it-1} + \pi_3 ln(GDP\ per\ capita)_{it-1} \\ & + \pi_4 ln(TB)_{it-1} + \theta_1 ln(Exports)_{it-1} + \gamma_1 (GDP\ growth)_{it-1} \\ & + \gamma_2 ln(Openness)_{it-1} + \gamma_3 (Democracy)_{it-1} + \gamma_4 (\text{Immunization})_{it-1} \\ & + \delta_1 (Colony)_i + \delta_2 (Language)_i + \phi_1 ln(Population)_{it-1} + \rho_t \\ & + \varepsilon_{it} \end{aligned} \tag{22}$$

where ρ_t represents period effects (time dummies), α_0 is the constant term, and ε_{it} represents the error term. Some comments on the specification are noteworthy. All explanatory variables are lagged for two reasons. First, the disbursement of aid is subject to time lags. Feeny and McGillivray (2008) and Farooq (2012) state that allocations for any given year are made towards the end of the preceding year. Hence decision-makers in the funding agencies base their allocation decisions on the available information, which is almost always for the penultimate year (Feeny and McGillivray, 2008). Alternatively, donors use the available information to form expectations for the year for which the aid is given (Feeny and McGillivray, 2004).[26] Second, recipients' need, donors' interest and recipients' merit variables are either endogenously or exogenously related to health aid *per capita*. Roodman (2008) states that this might be the case for income *per capita* (as well as under-five mortality, infant mortality rates and bilateral exports), though it is not severe. However, to pre-empt

[24] This independence assumption is directly testable using a Heckman estimator. Since there is no sample selection in our model the Heckman estimator cannot be used to test for independence.

[25] It should be noted here that we use the word factors instead of variables; with various variables making up a factor. For instance, the recipient need factor will comprise variables like income *per capita*, and the under-five mortality rate among others. Factors can be viewed as vectors of variables.

[26] These information and time lags do not apply to time-invariant factors like colonial history, geographical distance, or geographical location of the recipient country.

potential endogeneity from influencing our analysis, we choose to lag all the time-varying explanatory variables by one period.

6. EMPIRICAL RESULTS

6.1 Diagnostic Tests

Based on the assumptions mentioned above, tests will decide between the double-hurdle and Tobit estimators. It should be remembered that the smallest amount of heath aid is \$0 and natural logs are not defined for such observations. To be able to use these observations for our diagnostic tests, we set all censored observations of $lnDAH$ to an amount slightly smaller than the minimum uncensored value of $lnDAH$ (Cameron and Trivedi 2009, p. 546). The diagnostics will be based on normality and heteroscedasticity tests, as well as specification of the linear conditional mean in the 2nd stage of the Two-Part estimator. For the double-hurdle estimator normality and heteroscedasticity tests are done only on the second stage, and can be used for any OLS regression (Clist, 2009). Normality and heteroscedasticity tests for the pooled Tobit are due to Cameron and Trivedi (2009, p. 549-553) and Drukker (2002). Actual data on *per capita* health disbursements from the UK are used for the testing strategy.

Table 4: Diagnostic Tests for Model Selection

Estimator	Tobit		Double-Hurdle	
Test for	Normality	Heteroskedasticity	Normality	Heteroskedasticity
Test Stat	62.63	280.544	21.90	3.51
Probability	0.00000	0.00000	0.0000	0.0611

***Notes**: The Tobit tests for normality and homoscedasticity are conditional moment tests from Cameron and Trivedi (2009, p550-553), and both have a large sample chi-squared distribution. The test for normality of the Two-Part estimator has a Chi-squared distribution, with two degrees of freedom. The test for heteroscedasticity is the Breusch-Pagan/Cook-Weisberg test, with the null hypothesis of constant variance of the error term. The test has a Chi-squared distribution, with one degree of freedom.*

The results (table 4) lead to a strong rejection of normality and homoscedasticity in the Tobit estimator. Non-normality is still evident though the dependent variable has been transformed to logarithms. Normality is rejected in the double hurdle estimator but homoscedasticity is accepted. Nonetheless, Cameron and Trivedi (2009, p. 556) state that neither homoscedasticity nor normality are extremely necessary conditions for consistency of the two-part estimator. The key assumption for consistency of the double-hurdle estimator, besides independence in the errors from the two stages, is that $E(ln\ DAH\ |DAH = 1, x)$ is linear in x (Cameron and Trivedi 2009, p. 556). This assumption can be tested by regressing the dependent variable on predicted values of Y $(\widehat{Y})$ and Y^2 $(\widehat{Y^2})$ and testing that the coefficient of $\widehat{Y^2}$ is not significantly different from zero. The null hypothesis of insignificance of $\widehat{Y^2}$ cannot be rejected. Indeed, the conditional mean of the double-hurdle estimator is correctly specified. This then gives the double-hurdle estimator an advantage over its Tobit counterpart. As two assumptions from the possible three are in favour of the double-hurdle estimator, these results point towards the double hurdle estimator as the appropriate estimator for our analysis.

6.2 Disbursements by Major Donors

6.2.1 Decision Stage

Table 5: Determinants of Health Aid – Selection Stage

	UK	France	Germany	USA	Sweden	EC	IDA
Under-five Mortality Rate	-0.032 (0.047)	-0.031 (0.040)	-0.087* (0.048)	0.079* (0.047)	0.085 (0.052)	-0.025 (0.047)	0.140*** (0.039)
HIV Prevalence Rate	0.028*** (0.011)	0.005 (0.015)	0.033*** (0.010)	0.023** (0.010)	0.090*** (0.011)	0.034*** (0.010)	-0.073*** (0.008)
Tuberculosis Prevalence Rate	0.016 (0.017)	0.124*** (0.026)	-0.042** (0.018)	0.028* (0.016)	0.031* (0.019)	-0.056*** (0.018)	-0.060*** (0.019)
GDP *Per Capita*	-0.219*** (0.021)	-0.007 (0.026)	-0.071*** (0.020)	-0.019 (0.023)	-0.053** (0.023)	-0.054** (0.025)	-0.102*** (0.018)
Population	0.101*** (0.017)	-0.021 (0.024)	0.110*** (0.020)	0.154*** (0.015)	0.009 (0.020)	0.039*** (0.014)	0.099*** (0.010)
GDP *Per Capita* Growth	0.004** (0.002)	0.003 (0.002)	0.0003 (0.002)	0.003 (0.002)	-0.001 (0.002)	0.001 (0.002)	-0.0004 (0.002)
Openness	0.169*** (0.032)	-0.034 (0.032)	0.051 (0.032)	0.014 (0.031)	-0.065* (0.038)	0.102*** (0.037)	0.0001 (0.031)
Democracy	0.003 (0.002)	-0.007*** (0.003)	-0.003 (0.003)	-0.001 (0.002)	0.004* (0.002)	0.003 (0.003)	0.002 (0.002)
Exports	0.049*** (0.011)	0.043** (0.018)	-0.005 (0.015)	0.005 (0.007)	0.071*** (0.010)		
Immunization	0.0004 (0.001)	-0.002** (0.001)	0.001 (0.001)	0.002** (0.001)	0.004*** (0.001)	-0.005*** (0.001)	0.006*** (0.001)
Colony	0.236*** (0.046)	0.108* (0.063)					
Language	0.140*** (0.038)	0.359*** (0.053)		0.084*** (0.031)			
Observations	773	773	773	773	773	773	857
Log-likelihood	-283.76	-293.25	-327.18	-252.69	-306.92	-336.82	-321.81
x^2	486.26	217.98	359.68	223.97	273.84	94.18	355.99

Notes:
(i) We estimate the selection probability (1 = receives health aid; 0 = does not receive health aid) based on a pooled Probit maximum likelihood. All time-varying regressors except democracy, immunization and GDP per capita growth are logged. Heteroscedasticity and correlation-robust standard errors are reported in brackets. All equations include a constant term and a full set of time dummies (none of which are reported).
(ii) All time-varying explanatory variables are lagged one period.
*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*
(iv) The chi-squared statistic is for the test of joint significance of all regressors in the model. The p-values of the test have not been reported but for all donors, the test statistic is significant at 1 per cent.

Here, a pooled Probit estimates the probability of receiving health aid from individual donors; results from which can be found in Table 5. For the health-related need variables, the under-five mortality rate influences selection of recipients for three of the seven donors; Germany, USA and the IDA. For Germany, the relationship is negative while for the other two donors it is positive. A 1% increase in the U5MR will lead to a 0.08 percentage points (pp hereafter) increase in the probability of selection for the USA's health aid and a 0.14pp increase in the probability of selection to receive the IDA's health aid.

The HIV prevalence rate influences selection decisions for all but one of the donors; France. Increases in the HIV prevalence rate lead to higher probabilities of selection to receive health aid from the UK, Germany, USA, Sweden and the European Commission. Contrarily, the IDA chooses countries where HIV prevalence rates are already very high, as argued in section 5. Based on our results, Sweden is most sensitive to this health indicator. A 1% in the HIV prevalence rate leads to a 0.09pp increase in the probability of selection to receive Swedish health aid. A 1% increase in the HIV prevalence rate leads to a 0.03pp increase in the probability of selection to receive health aid from the UK, a 0.03pp increase in probability of selection to receive from Germany, a 0.02pp increase in the selection probability by the USA and a 0.03pp increase in selection probability by the EC.

The tuberculosis prevalence rate is also an important determinant of selection of potential recipients of health aid. All donors, except the UK, are influenced by the tuberculosis prevalence rate in their selection of recipients. France, USA and Sweden choose countries with high tuberculosis rates as potential recipients, with the impact being largest for France. A 1% increase in the tuberculosis prevalence rate leads to a 0.1pp increase in the selection probability of receiving French health aid. A 1% increase in the tuberculosis rate leads to a 0.03pp increase in the selection probability of receiving health aid from the USA and a 0.03pp increase in the selection probability from Sweden. The relationship, however, is negative for Germany, the EC and the IDA. They choose countries with already high tuberculosis prevalence rates as potential recipients of their health aid, as argued in section 4.

GDP *per capita* in the recipient countries is an adequate measure of broader development needs. Five of the seven donors in our analysis choose poorer countries as potential recipients of their health aid; UK, Germany, Sweden, the European Commission and the IDA. The UK responds most to broader development needs as a 1% increase in *per capita* income leads to a 0.22pp reduction in the selection probability of receiving health aid. The IDA reduces its selection probability by 0.10pp after a 1% increase in recipients' *per capita* incomes. With a 1% increase in incomes Germany, Sweden and the European Commission reduce their selection probabilities by 0.07pp, 0.05pp and 0.05pp respectively. This negative relationship is consistent with most of the aid allocation literature (Berthélemy, 2006a; Carey, 2007; Clist, 2009; Angeles *et al.,* 2008 among others).

Five of the seven donors in the analysis choose more populous countries as potential recipients of their health aid; UK, Germany, USA, the European Commission and the IDA. Of all the donors that are influenced by population in their selection decisions, the USA shows the most profound effect. A 1% increase in population is matched by a 0.15pp increase in the selection probability of receiving health aid from the USA. The UK and the IDA increase their selection probabilities by 0.10pp each respectively, while Germany increases its selection probability by 0.11pp after a 1% increase in recipient's population.

Looking at recipients' merit variables, *per capita* GDP growth rate is not an important determinant of health aid allocation. The only donor in this study to reward countries with better economic performance is the UK. From a normative point of view, they see high GDP growth rates as a characteristic of countries working towards self-development. A 1-unit increase in the GDP growth rate leads to a 0.4pp increase in the selection probability of receiving health aid from the UK. Democracy, likewise, is not an important determinant of selection for donors. Only France and

Sweden respond to recipients' levels of democracy in their selection decisions. The results are very different for France as it seems like they tend to punish countries that are more democratic. This may be the case for some plausible reasons.

First, if the French consider other forms of human governance (like media freedom) are more important than the recipient's administrative style then they'll indeed choose countries with low levels of democracy. Second, countries with low levels of democracy may be former colonies of the French (with which they share a language), or strategic trading partners. Hence the French government will have an interest in such countries, irrespective of their governance.[27] Ottersen *et al.*, (2014) state that the French development agency chooses potential recipients of its aid based on their linguistic ties and the income level of the recipient. It is not totally surprising, then, that they choose countries with low levels of democracy as potential recipients of their health aid. Sweden, on the other hand, rewards more democratic governments by choosing them as potential recipients of their health aid.

Regarding trade openness, the UK and the EC choose countries that are more open to trade. A 1% increase in a recipient's level of openness leads to a 0.17pp increase in the selection probability of receiving health aid from the UK while it leads to a 0.10pp increase in the selection probability of receiving health aid from the EC. For the EC, this increase in selection probabilities will most likely be in favour of the countries in EU-ACP trade agreements. Berthélemy (2006b) finds that the EC provides more aid to such countries. However, countries with increasing trade openness are potentially countries with the ability to raise development finance through international trade (exporting and FDI in the recipient countries) so they should not receive more health aid. Sweden, then, does not choose recipients with increasing levels of trade openness. A 1% increase in the level of trade openness leads to a 0.06pp reduction in the selection probability of receiving health aid from Sweden.

The USA, Sweden and the IDA choose countries with high immunization rates as potential recipients of their health aid, with the effect being largest for the IDA. A 1-unit increase in the rate of immunization of measles leads to a 0.6pp increase in the selection probability of receiving health aid from the IDA. [28]Nevertheless, high immunization rates can also be evidence of countries with quite good health systems and with a good record of investing in their people; hence they should not receive health aid as they are not in dire need of it. Empirically, we find that the relationship is negative for France and the EC. A 1-unit increase in the rate of immunization of measles leads to 0.2pp and 0.6pp reductions in the probability of selection to receive aid from France and the EC respectively.

As regards donors' self-interests, only the bilateral donors are considered as bilateral exports are used. Three of the five bilateral donors in this study choose their trading partners as potential recipients of their health aid; UK, France and Sweden. This contrasts with the findings of Clist (2009) and Carey (2007) who state that bilateral trade plays no role in the UK's choice of recipients of total ODA. This

[27] Colonial heritage, bilateral relationships and language similarities are all controlled for in this analysis. Hence, this negative relationship between French selection and democracy may be attributable to unobservable strategic development motives of the French government.

[28] The result is in line with the USA through one of its independent foreign aid agencies, the Millennium Challenge Corporation (MCC). The MCC rewards countries committed to principles of good governance, economic freedom and investment in their citizens (MCC, 2013). The satisfaction of these eligibility criteria is measured by different policy indicators (with immunization rates being one of the main indicators of investment in citizens).

reinforces the motivation of this study, which is that the allocation of health aid is different from the allocation of total ODA. Bermeo (2007) posits that the shift in focus from total ODA to sector-specific aid is most likely to increase the effectiveness of aid as donors now disburse funds to sectors whose performances can easily be tracked.

Moreover, Carey (2007) and Clist (2009) use different period of data in their analyses; as well as different samples from the one in this study. A 1% increase in exports from the donor to recipients leads to a 0.05pp increase in the selection probability for the UK, 0.04pp increase for France and a 0.07pp increase for Sweden.

Time-constant variables are also included in the analysis in the form of dummies; for colonial heritage and language similarities. They are included based on the 'strategic development' argument of Bermeo (2007), as argued in section 2. The only donors in this analysis with former colonies in the SSA region are the UK and France, and they both choose former colonies as potential recipients of their aid. The UK also chooses countries that speak English as their official language as potential recipients of health aid. [29]

6.2.2 Allocation Stage

The results for the allocation stage can be found in Table 6. Here, an OLS model is estimated in which the donors decide how much *per capita* health aid to provide only to the selected countries from the decision stage. In terms of the amount of health aid allocated, only three donors are responsive to recipients' under-five mortality rates; Germany, Sweden and the IDA. A 1% increase in the under-five mortality rate leads to a 0.22% increase in health aid disbursements from Sweden. Contrarily, the relationship between under-five mortality and *per capita* health aid disbursements is negative for Germany and the IDA. They provide more health aid to countries only when under-five mortality is significantly higher, as discussed in section 4.

[29] The Fixed Effects estimator has been ignored in all estimations. This is because controlling for colonial ties and common language captures most of the unobservable characteristics that make some recipients more 'attractive' to donors than other recipients. For example, if the geographical location of a recipient makes it more appealing to a donor; it may also be because that recipient speaks the same language as the donor or because the recipient is a former colony of the donor. Hence, controlling for common colony and language captures much of the unobservable, time-invariability of recipients' characteristics. Estimating a fixed effects logit in the first stage, and a linear fixed effects model in the second stage changes the signs and significance of my main results, hence they are not reported. The results, however, are available upon request.

Table 6: Determinants of Health Aid- Allocation Stage

	UK	France	Germany	USA	Sweden	EC	IDA
Under-five Mortality Rate	-0.127 (0.095)	-0.042 (0.063)	-0.105** (0.048)	-0.130 (0.205)	0.217* (0.113)	0.008 (0.067)	-0.275*** (0.102)
HIV Prevalence Rate	0.043** (0.019)	-0.043** (0.017)	0.038** (0.016)	0.188** (0.048)	0.035* (0.020)	0.037** (0.014)	-0.038 (0.023)
Tuberculosis Prevalence Rate	0.041 (0.032)	-0.007 (0.030)	0.012 (0.020)	0.039 (0.065)	-0.006 (0.036)	0.047** (0.023)	-0.008 (0.039)
GDP *Per Capita*	-0.268*** (0.048)	0.030 (0.053)	-0.006 (0.040)	-0.029 (0.076)	0.049 (0.029)	0.052 (0.036)	0.028 (0.054)
Population	-0.073** (0.030)	-0.119*** (0.034)	-0.062** (0.027)	-0.076 (0.063)	-0.046 (0.034)	-0.072*** (0.015)	-0.134*** (0.025)
GDP *Per Capita* Growth	-0.006 (0.005)	0.0004 (0.002)	0.003 (0.002)	0.010*** (0.003)	-0.0001 (0.003)	-0.002 (0.002)	0.004 (0.004)
Openness	0.146** (0.063)	-0.066 (0.057)	-0.038 (0.048)	0.035 (0.149)	-0.032 (0.044)	-0.007 (0.040)	-0.092 (0.082)
Democracy	0.009 (0.007)	0.001 (0.004)	0.001 (0.004)	0.021** (0.009)	-0.001 (0.003)	0.0003 (0.004)	-0.002 (0.005)
Exports	0.074** (0.030)	0.041 (0.031)	-0.009 (0.019)	0.045* (0.023)	0.008 (0.021)		
Immunization	0.002 (0.002)	-0.001 (0.001)	-0.001 (0.001)	0.003 (0.003)	0.002 (0.002)	-0.002** (0.001)	0.002 (0.002)
Colony	0.236** (0.046)	0.095 (0.071)					
Language	-0.022 (0.069)	0.009 (0.054)		-0.083 (0.123)			
Observations	381	551	442	565	327	616	561
R-Squared	0.529	0.459	0.253	0.399	0.265	0.290	0.450

Notes:
(i) The dependent variable here is logged per capita health aid. The OLS estimator is conditional on receiving per capita health aid. Standard errors are reported in parentheses. All time-varying regressors except democracy, immunization, and GDP per capita growth are logged. All time-varying regressors are lagged one period.
(ii) Clustering is done at the country-year level. This is to purge the regressions of any heteroscedasticity and serial correlation. All equations include a constant term and a full set of time dummies.
*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*

The HIV prevalence rate is a very important variable in the allocation decisions of all donors except the IDA. The partial effect is highest for the USA, indicative of the importance the USA places on the HIV pandemic. A 1% increase in the HIV prevalence rate leads to a 0.19% increase in *per capita* health aid disbursements from the USA. IHME (2013, p. 42) states that over the last decade, the USA and the Global Fund to fight HIV, Tuberculosis and Malaria (GFATM) have consistently been the largest providers of health aid to combat HIV. US bilateral agencies contributed a total of $3.9 billion to the fight of HIV; the United States President's Emergency Plan for Aid Relief (PEPFAR) contributing most. The UK, Germany, Sweden and the European Commission all have a 0.04% increase in actual *per capita* health aid disbursements following a 1% increase in the HIV prevalence rate. France, on the other hand, provides more *per capita* health aid to countries only when their HIV prevalence rates are extremely high.

The tuberculosis prevalence rate is not a significant determinant of health aid disbursements for most donors. Only the EC responds to changes in the tuberculosis prevalence rate in deciding whether to provide more health aid; with increases in the rate matched by increases in health aid disbursements from the EC. In the selection stage the EC chose countries with extremely high tuberculosis prevalence rates as potential recipients. Of those countries, those whose tuberculosis rates are still increasing receive more health aid from the EC. A 1% increase in the tuberculosis prevalence rate leads to a 0.05% increase in health aid disbursements from the EC.

Per capita income was an important determinant of donors' selection decisions but is not a primary determinant of allocation decisions for all donors; except the UK. The UK provides more aid to poorer countries as a 1% increase in *per capita* income leads to a 0.27% reduction in health aid disbursements from the UK. This negative and significant relationship between *per capita* income and aid disbursements has been found in previous studies (Carey, 2007; Clist, 2009; Berthélemy, 2006a; Angeles *et al.*, 2008; Younas, 2008; Harrigan and Wang, 2011 among others).

Though most donors chose more populous countries as potential recipients of their health aid, they disburse less *per capita* health aid to more populous countries. From the more populous countries selected to receive aid, those with increasing populations receive less health aid from the UK, France, Germany, the EC and the IDA.[30] A 1% increase in population results in a 0.19% reduction in health aid disbursements from France, a 0.13% reduction in disbursements from the EC, a 0.07% reduction in disbursements from the UK and the EC, and a 0.06% reduction in health aid disbursements from Germany.

In terms of recipients' merits, only the USA rewards countries with better economic performance (proxied by the GDP growth rate) with more health aid flows. A 1-unit increase in the real *per capita* GDP growth rate leads to a 1% increase in *per capita* health aid disbursements from the USA. Hence the USA is avoiding a moral hazard problem by not being seen as providing more health aid to countries with bad economic performance. More economic globalization, measured by the amount of trade openness in the recipient country leads to more health aid receipts from the UK. A 1% increase in the level of trade openness in the recipient country leads to a 0.15% increase in *per capita* health aid receipts from the UK. The USA provides more health aid to more democratic governments as, normatively, more democratic governments are more transparent and accountable.

As is evident from the selection stage, high immunization rates are characteristic of countries with high quality health services and with the ability and willingness to invest in the development of their people. Hence such countries are not in dire need of health aid so the donor will be better off giving its aid to countries that need it more. A 1-unit increase in the rate of immunization of measles results in a 0.2% reduction in health aid disbursements from the EC.

As regards bilateral trade and strategic interests of donors, the UK responds most to the variables. The UK and the USA provide more health aid to their trading partners. Increases in the amount of exports from the UK to the recipients lead to increases in the amount of health aid provided by the UK and the USA. A 1% increase in the amount of exports from these donors leads to 0.07% and

[30] Younas (2008) provides some intuitive explanations as to why there is a negative relationship between recipient population and aid. These reasons have been discussed in the data section of this paper.

0.05% increases in the UK's and the USA's health aid disbursements respectively. Colonial ties also influence allocation decisions in the UK as they tend to choose, and then provide more health aid to their former colonies.

6.3 What about the erstwhile Millennium Development Goals?

Motivating the thesis focus on health aid is the Millennium Declaration (UN, 2000) which shone spotlight on the pressing health demands in developing regions. Two of the eight previous MDGs explicitly focus on health-related needs considered in this paper; reducing the under-five mortality and HIV prevalence rates. Data on these variables (as well as the tuberculosis prevalence rate) has been available before the Millennium Declaration so it will be tested if the advent of the Millennium Declaration; and the MDGs made donors to give more importance to these three variables conditional on other measures of need, merits and donors' interests. Hence, we will consider only the post-MDG era of health aid allocation.

To test if donors' allocation patterns have indeed been influenced by the Millennium Declaration, Chow tests will be conducted on the sample. Chow tests basically test whether new variables (the interaction terms in this case) have any explanatory power in the new model. First, we create a dummy variable called MD, taking a value of 1 for the years 2000[31] to the end of the sample, and zero otherwise. This dummy variable is interacted with the MDG health-related need variables in our analysis to test for any changes in the importance of these MDG variables over time (precisely after the Millennium Declaration). We report results of the joint tests of significance of the interaction terms, as well as the coefficient estimates of the interaction terms.

The tests of joint significance are done by stage, donor and period; results from which are reported in Table 7. All donors, except Sweden and Germany, show changes in the importance of the MDGs (put together) post the Millennium Declaration. The Swedish government are possibly indifferent to the advent of the Millennium Declaration; not because they do not care about recipients' health-related needs, but probably because they have always viewed these recipients' needs as important to their selection and allocation decisions.[32] In most aid allocation studies, Sweden has always been found to be a need-oriented and 'altruistic' donor (for example, Clist, 2009). The UK, France and the USA are the only donors for whom the MD interaction term is significant at both the selection and allocation stages. We can further gauge these differences, for countries that experience significant changes, using the estimates of the interaction terms (and compare with the base estimates).

[31] We choose the year 2000 as the starting point since it is the year of the Millennium Declaration.
[32] From tables 6 and 7 we can see that the under-five mortality and HIV prevalence rates play important roles in the selection and allocation decisions of Swedish *per capita* DAH.

Table 7: Chow Tests for MD Interactions

		UK	France	Germany	USA	Sweden	EC	IDA
1st stage	**Post-MD**	17.15	30.86	5.09	33.13	0.68	3.97	24.93
		0.0007	0.0000	0.1652	0.0000	0.8768	0.2649	0.0000
2nd stage	**Post-MD**	2.49	2.86	0.13	13.06	1.28	1.85	0.67
		0.0793	0.0491	0.9436	0.0000	0.2939	0.1530	0.5742

Notes: *Wald statistics are reported above, with their corresponding p-values below. For the first stage, the Chow tests have a* $x^2(h)$ *distribution; with* h *being the number of regressors jointly tested. In the second stage, the Chow tests follow an* F*-distribution. These statistics are for the period 2000 to 2011.*

Results for countries with changes in importance are reported in Table 8. For the under-five mortality rate, the UK, France and the USA changed the importance of the variable post the Millennium Declaration at the selection stage. Prior to the Millennium Declaration the UK selected countries only when their under-five mortality rates were extremely high. After the Millennium Declaration, however, the UK increased its probability of selection of countries with relatively low but increasing under-five mortality rates. The USA, contrarily, had higher probabilities of choosing countries with increasing under-five mortality rates as potential recipients. Post the Millennium Declaration, they choose countries only when the rates get very high. At the allocation stage, only the USA shows a significant change in the importance of the under-five mortality rate post the Millennium Declaration. While the USA did not consider the under-five mortality rates in its allocation decisions before the Millennium Declaration, it does consider it in the post-MDG era. The relationship between US *per capita* health aid disbursements and the under-five mortality rate is negative in the post Millennium Declaration era. Just like the US chose countries with already high mortality rates, it gives more aid to countries with very high rates. This is similar to the findings of Kasuga (2007).

The UK, France, the USA, and the IDA give more importance to the HIV prevalence rate in their selection decisions. While the UK and France did not consider the HIV prevalence rate before the Millennium Declaration, the indicator became more significant post the MDG era. Increases in the HIV prevalence rate (reflecting increases in the burden of the disease) lead to increases in the probability of selection to receive *per capita* health aid from the UK and France. Prior to the Millennium Declaration the USA chose recipients with low, but increasing HIV prevalence rates as potential recipients of its aid. However, after the Millennium Declaration it chooses countries with already high HIV prevalence rates. The IDA selects, and disburses more health to countries with already high HIV prevalence rates. Four of the seven donors placed more emphasis on the HIV prevalence rate in the allocation stage; the UK, the USA, Sweden and the EC. Post the MDG era, they all provided more health aid to countries with relatively low, but increasing HIV prevalence rates.

The last variable under consideration is the tuberculosis prevalence rate. Five donors; France, Germany, the USA, the EC and the IDA show significant changes in the importance of tuberculosis prevalence rates in their respective selection decisions. Germany, the USA and the IDA now select countries with relatively low, but increasing tuberculosis prevalence rates as potential recipients of their respective health aid disbursements. France and the EC on the other hand, select countries with already high tuberculosis prevalence rates as potential recipients of their respective health aid. In the allocation stage only France placed increased importance on the tuberculosis prevalence rate after the Millennium Declaration. Analogous to the selection stage, countries with very high tuberculosis prevalence rates receive lower health aid disbursements from France for reasons mentioned above.

Table 8: Tests for Changed Relationships

Step	1	2	1	2	1	1	2	2	1	2	1
	UK	**UK**	**France**	**France**	**Germany**	**USA**	**USA**	**Sweden**	**EC**	**EC**	**IDA**
U5MR	-0.813***	-0.175	0.213	-0.053	-0.339	1.483***	0.141	0.228*	-0.176	-0.053	0.887***
	(0.268)	(0.107)	(0.238)	(0.089)	(0.282)	(0.501)	(0.165)	(0.115)	(0.247)	(0.097)	(0.267)
MD*U5MR	1.156***	0.150	-0.756***	0.012	-0.121	-1.623***	-0.705***	-0.060	0.137	0.095	-0.205
	(0.385)	(0.125)	(0.283)	(0.068)	(0.308)	(0.452)	(0.231)	(0.080)	(0.271)	(0.115)	(0.285)
HIV	0.020	0.001	-0.092	-0.044**	0.122*	0.433***	0.011	-0.014	0.131**	0.012	-0.171**
	(0.058)	(0.018)	(0.081)	(0.018)	(0.069)	(0.132)	(0.031)	(0.033)	(0.056)	(0.018)	(0.060)
MD*HIV	0.264***	0.109*	0.335***	0.003	0.012	-0.491***	0.281***	0.067*	0.032	0.042**	-0.399***
	(0.099)	(0.041)	(0.082)	(0.032)	(0.086)	(0.157)	(0.053)	(0.038)	(0.072)	(0.021)	(0.081)
TB	-0.031	0.064	1.010***	0.029	-0.327***	-0.176	0.043	-0.025	-0.100	0.039	-0.455***
	(0.115)	(0.040)	(0.178)	(0.032)	(0.109)	(0.116)	(0.038)	(0.076)	(0.103)	(0.040)	(0.128)
MD*TB	0.240	-0.060	-0.779***	-0.063**	0.316**	0.570***	-0.047	0.019	-0.273*	0.015	0.370*
	(0.168)	(0.065)	(0.201)	(0.027)	(0.148)	(0.156)	(0.085)	(0.067)	(0.143)	(0.048)	(0.190)

Notes:

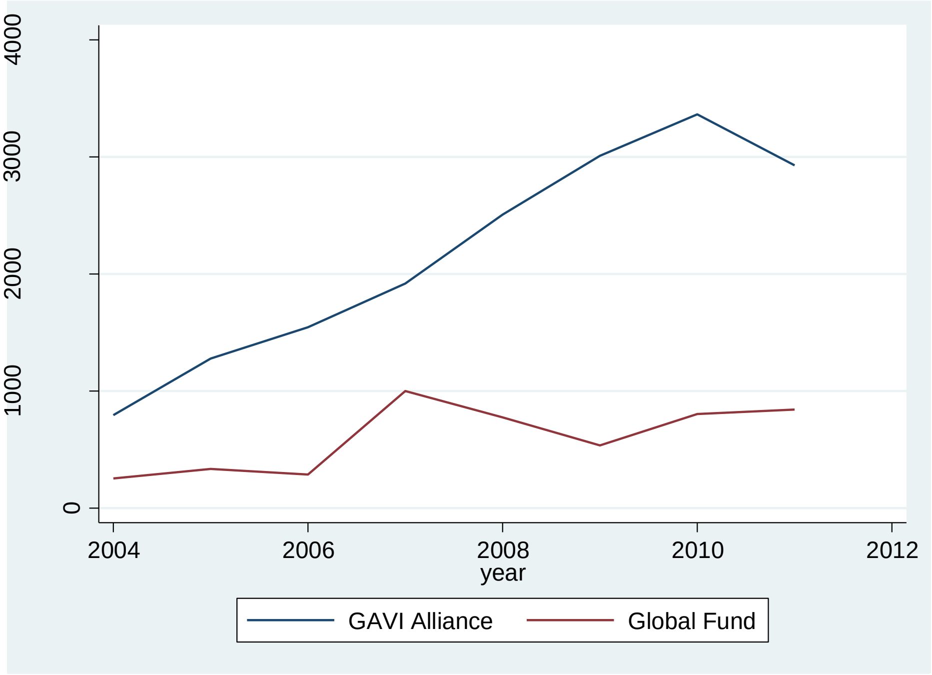
*(i) U5MR, HIV and TB are the under-five mortality, HIV prevalence and TB prevalence rates respectively. These statistics are only for donors that experienced significant changes in the importance of the under-five mortality, HIV prevalence and tuberculosis prevalence rates after the Millennium Declaration (MD). The tests are done by stage, donor and period (post Millennium Declaration period). The coefficients on the interaction terms (not marginal effects) are reported. Robust standard errors are reported in parentheses. ***, **, and * denote significance at 1, 5 and 10 per cent respectively.*

(ii) The number at the top of each column corresponds to the stage of the Double-Hurdle estimator. For example, 1 at the top of the first column corresponds to the 1st stage of the Double-Hurdle estimator (Probit) for the UK.

6.4 Anything new from Polylaterals?

Another novelty of this paper will be to chart the rise of a new type of donor, so called Public-Private Partnerships (PPPs) and investigate the key differences between these and the more traditional bilateral and multilateral donors. The two biggest PPPs in the world are the GAVI Alliance (GAVI hereafter) and the Global Fund to fight HIV/AIDS, Tuberculosis and Malaria (the Global Fund hereafter) and we model the allocation patterns of these two PPPs.[33]The GAVI Alliance has as primary objective, increasing immunization coverage in developing countries (Ottersen *et al.*, 2014). GAVI (2013) states that from its inception in 2000 through 2012, it has committed approximately $7.5 billion in support of immunization of children in developing countries. The Global Fund on the other hand, was created in 2002 to provide grants and services to governments in low-income and middle-income countries in the fight against HIV, tuberculosis and malaria (Blanchet, Thomas, Atun, Jamison, Knaul and Hecht, 2014). IHME (2012) states that a total of $3.3 billion in DAH was channelled through the Global Fund in 2010. Both the GAVI Alliance and the Global Fund have revised their eligibility criteria, with the new funding models set in 2015. However, as the sample in this paper covers the period 1990 to 2011, our analysis will be based on the old funding models.

Figure 3: Aid disbursements by the two largest PPPs



Source: IHME DAH Database 2013

[33] The Bill and Melinda Gates Foundation (BMGF) is also a very influential PPP but we do not include it in our analysis for one major reason; they do not provide development assistance directly to the Sub-Saharan African region (Sridhar and Batniji, 2008). Nonetheless, they provide development assistance by their contributions made through the GAVI Alliance and the Global Fund. Moreover, their funds are disbursed for research, not service delivery (as opposed to GAVI and the Global Fund whose major contributions to improving health are through service delivery).

For the GAVI Alliance, countries with Gross National Income *per capita* (GNIpc hereafter) equal to or below $1.55 are eligible for funding (GAVI, 2013). However, an additional eligibility criterion is that the 3rd doze of the diphtheria-tetanus-pertussis (DTP3) vaccine be equal to or above 70% in recipient countries; or that the recipient governments make efforts to cover the measles vaccine (GAVI, 2013). For the Global Fund, the income threshold for eligibility is adopted from the World Bank's classification (GFATM, 2012). Regardless of the income classification, countries with severe disease burdens are naturally eligible for funding from the Global Fund (Ottersen *et al.*, 2014).[34] The basic eligibility criteria for the GAVI Alliance and the Global Fund are primarily concerned with recipients' needs (in terms of economic development). Nonetheless, additional eligibility criteria relate to commitment by the recipient countries, demonstrated performance and expected effectiveness (particularly for the GAVI Alliance), and increasing health needs in terms of burdens of diseases (predominantly for the Global Fund).

Ravishankar *et al.*, (2009) and Sridhar and Batniji (2008) posit that huge sums of health aid are now being disbursed through these PPPs, as opposed to the more traditional donors. IHME (2013, p. 10) states that disbursements by PPPs grew substantially in 2013; with the GAVI Alliance providing $1.5 billion in 2013 and the GFATM providing $4 billion. Figure 3 shows that health aid provided by these two PPPs has been increasing since their respective inceptions. Hence, an econometric analysis of their allocation patterns is necessary. We analyse the allocation patterns of the PPPs using the Double Hurdle estimator and compare to those of traditional donors.

PPPs' Allocation Patterns

To analyse the allocation patterns of the PPPs, we will take advantage of some of the more sophisticated variables available. To measure recipients' merits, we use the IDA Resource Allocation Index (IRAI). This variable is based on the Country Policy and Institutional Assessment (CPIA), which itself evaluates performance in terms of quality of a country's policy and institutional framework. It ranges from 0 (low effectiveness) to 6 (high effectiveness). Health aid is thus expected to increase as the IRAI increases. CPIA data is publicly available only from 2005 onwards which makes it suitable for the analysis of PPPs. Data for the IRAI variable is obtained from the World Bank's CPIA database.

Instead of GDP *per capita* in purchasing power parity terms as a measure of broader economic need, Gross National Income (GNI) *per capita* atlas method is used. This is what the PPPs use as a measure of recipients' abilities to pay for their health bills (GAVI, 2009; GFATM, 2012). We intend to model, as closely as the possible, the decision making and actual disbursement patterns of the PPPs. All other variables (the under-five mortality rate, the HIV prevalence rate, the tuberculosis prevalence rate and the recipient's population) are similar to those used in the main analysis.

[34] "Severe" means countries with extremely high HIV prevalence, TB prevalence and mortality rates. Empirically, this translates to a negative relationship between the respective variables and *per capita* health aid disbursements; meaning donors will be selecting and/or providing more *per capita* health aid to countries with very high rates.

Table 9: Selection and Disbursement Patterns of PPPs, Bilateral and Multilateral Organizations

	GAVI		GFATM		Bilaterals		Multilaterals	
	Probit	**OLS**	**Probit**	**OLS**	**Probit**	**OLS**	**Probit**	**OLS**
Under-five Mortality Rate	0.121*** (0.033)	0.102 (0.062)	0.148*** (0.047)	-0.334** (0.164)	-0.099* (0.051)	-0.276 (0.451)	0.318 (0.602)	-0.315 (0.296)
HIV Prevalence Rate	0.019 (0.012)	0.003 (0.019)	-0.009 (0.010)	0.191*** (0.029)	0.008 (0.005)	0.512*** (0.131)	-0.040** (0.017)	-0.052 (0.081)
Tuberculosis Prevalence Rate	-0.039* (0.023)	-0.012 (0.024)	-0.063** (0.027)	0.014 (0.056)	-0.003 (0.029)	-0.248 (0.192)	-0.075* (0.042)	-0.006 (0.138)
GNI *Per Capita* Atlas	0.003 (0.015)	-0.056 (0.035)	-0.010 (0.017)	-0.124 (0.092)	-0.052** (0.025)	0.262 (0.223)	-0.038 (0.038)	0.040 (0.246)
Population	0.004 (0.012)	-0.015 (0.019)	0.002 (0.004)	-0.220*** (0.037)	0.071*** (0.025)	1.458*** (0.147)	0.080*** (0.025)	0.758*** (0.113)
IRAI	0.002 (0.024)	0.080** (0.035)	0.004 (0.021)	0.234*** (0.082)	-0.123 (0.033)	0.734* (0.411)	0.180*** (0.057)	0.554 (0.348)
Observations	179	169	179	170	144	170	253	242
R-Squared		0.249		0.465		0.795		0.451
Log-likelihood	-24.72		-17.34		-11.05		-21.45	
$\boldsymbol{x^2}$	59.43		59.99		37.40		6.12	
$\boldsymbol{F}$**-stat**		10.11		11.44		50.06		18.55
$\boldsymbol{E(DAH)}$	0.599	0.162	0.676	0.678	0.707	11.500	0.861	0.949

Notes:

(i) We estimate the selection probability (1 = receives health aid; 0 = does not receive health aid) based on a pooled Probit maximum likelihood. All time-varying regressors except democracy, immunization and GDP per capita growth are logged. Heteroscedasticity and correlation-robust standard errors are reported in brackets. All equations include a constant term and a full set of time dummies (none of which are reported).

i)In the allocation stage, the dependent variable is logged per capita health aid. The OLS estimator is conditional on receiving per capita health aid. Standard errors are reported in parentheses. All time-varying regressors except democracy, immunization, and GDP per capita growth are logged. All time-varying regressors are lagged one period.

*(iii) ***, **, * denote significance at 1, 5 and 10 per cent respectively.*

(iv) The last column represents the expected value (mean) of the dependent variable in each stage.

Results for the selection and allocation decisions of PPPs, bilaterals and multilaterals are reported in Table 9. The under-five mortality rate is a significant determinant of selection decisions by the two PPPs and bilateral donors; while multilateral donors are not influenced by it. A 1% increase in the under-five mortality rate leads to 0.12pp and 0.15pp increases in the selection probabilities of receiving health aid from the GAVI Alliance and the Global Fund respectively. The result is relevant for the GAVI Alliance as their main aim, from inception, is to provide vaccination and immunization services to children in developing countries (Ottersen *et al.*, 2014). On average, bilateral donors choose countries with very high under-five mortality rates as potential recipients of their aid. Nonetheless, in the allocation stage only the Global Fund is influenced by under-five mortality rates in their decisions and the relationship between the variables is negative. The Global Fund provides more *per capita* health aid to countries with already high under-five mortality rates.

The HIV prevalence rate is a significant determinant of selection for the average multilateral donor only. The relationship between the HIV prevalence rate and the probability of selection is negative, meaning they choose countries with extremely high HIV prevalence rates as potential recipients of their health aid. However, multilaterals do not consider the HIV prevalence rate as an important determinant of their actual disbursements of *per capita* health aid. Bilaterals and the Global Fund do provide more health aid to countries with relatively low, but increasing HIV prevalence rates. A 1% increase in the HIV prevalence rate leads to a 0.19% increase in *per capita* health aid disbursements from the Global Fund and a 0.51% increase in *per capita* health aid disbursements from bilaterals. This finding is plausible since the Global Fund focuses on providing services in the fight of HIV, tuberculosis and malaria.

The tuberculosis prevalence rate influences selection decisions of multilaterals, the GAVI Alliance and the Global Fund. The relationship, however, is negative in all cases. This implies that all these donors choose countries with already high rates as potential recipients of their respective *per capita* health aid disbursements. The tuberculosis prevalence rate does not have any significant impact on donors' actual allocation decisions. This empirical finding confirms the growing literature on the bias in GFATM disbursements in favour of HIV (as opposed to tuberculosis and malaria). IHME (2013, p. 10) states that the HIV sector has been an increasing beneficiary of health aid, with other health sectors like tuberculosis, malaria and maternal health receiving less attention. This sustained focus is driven mainly by the Global Fund and the US government; and this has been confirmed in our empirical analysis.

Regarding broader economic need, only bilaterals choose poorer countries as potential recipients of their health aid. On average, a 1% increase in recipients' *per capita* incomes leads to a 0.05pp reduction in the probability of being selected to receive *per capita* health aid from bilaterals. In the allocation stage, *per capita* incomes do not influence any of the donor's decisions on how much aid to allocate. The result is plausible for the PPPs as they have more expansive eligibility criteria; countries below a certain income threshold are naturally eligible for funding by the GAVI Alliance and the Global Fund. As most SSA countries in our analysis are low-income countries, all of them are naturally eligible for aid from GAVI and the Global Fund regardless of the income threshold (Ottersen *et al.*, 2014). Hence the insignificant effect of *per capita* income in determining allocation decisions may reflect a situation where all the countries in the sample are eligible, and receive some health aid, no matter how small.

Both bilaterals and multilaterals choose more populous countries as potential recipients of their health aid. A 1% increase in recipients' population leads to a 0.07pp increase in the probability of selection to receive total bilateral health aid and a 0.08pp increase in the selection probability to receive total multilateral health aid. In the allocation stage, bilateral and multilateral organisations still provide more health aid to more populous countries. On average, a 1% increase in recipients' population leads to a 1.46% increase in *per capita* health aid disbursements from all bilaterals and a 0.76% increase in *per capita* health aid disbursements from multilaterals. While the multilaterals show signs of a small-country bias in allocation[35], bilaterals compensate for increases in population by more than proportionately providing more health aid. The Global Fund, on the other hand, provides more health aid to less populous countries. Increases in population result in lower *per capita* health aid disbursements from the Global Fund. A 1% increase in population leads to a 0.22% reduction in health aid disbursements from the Global Fund. This shows that the Global Fund seeks to provide more aid to countries where they will maximize the impact of their health aid disbursements.

As regards the recipient countries' perceived effectiveness in managing aid, proxied by the IDA Resource Allocation Index (IRAI), only multilaterals choose countries with better policies and institutions as potential recipients of their health aid. On average, a 1-unit increase in a recipient's level of effectiveness leads to an 18pp increase in the selection probability of receiving health aid from multilaterals. This effect is quite large, indicative of the emphasis multilateral donors place on recipients' ability to manage huge sums of aid. Normatively, while bilateral donors may provide health aid partially for non-need or non-merit reasons, it is not the case with multilateral organisations. The latter set the benchmark for appropriate allocation behaviour by choosing better governed countries as potential recipients. At the allocation stage, bilaterals are influenced by recipients' policy and institutional frameworks while multilaterals are not. A 1-unit increase in a recipient's effectiveness score results in a 73% increase in health aid disbursements from all bilaterals. The PPPs also provide more aid to countries where their aid will be better managed. Part of their eligibility criteria states that countries should make considerable efforts in contributing to the improvement of domestic health conditions (GFATM, 2011; GAVI, 2009). Such domestic efforts are proxied by the indices used to build the resource allocation index so it is only normal that as they choose very many countries as potential recipients; they provide more health aid to the most deserving ones. A 1-unit increase in the resource allocation score leads to an 8% increase in health aid disbursements from the GAVI alliance and a 23% increase in health aid disbursements from the Global Fund.

6.5 Robustness Checks

Sensitivity analyses are carried out to test the robustness of our results. First, we check the robustness of the results to the possible endogeneity of the under-five mortality rate. Selection and allocation decisions are estimated using Instrumental Variable Probit (we used internal instruments, with up to two lags of the U5MR as instruments) and Two-Stage Least Squares (2SLS) respectively. Appendix

[35] As the marginal effect of population has an elasticity interpretation, it shows how much the selection probability of receiving health aid increases if population increases by 1% (Neumayer, 2005). If the estimated partial effect is less than one then it means increases in population are matched with less than proportionate increases in the selection probability of receiving health aid. This, then, is evidence of a small-country bias.

tables A1 and A2 show similarities to tables 5 and 6; with few exceptions. At the selection stage, GDP growth becomes a significant determinant of French health decisions as countries with better economic performance become potential recipients of French health aid. From table 5 the under-five mortality rate and the level of trade openness influenced German and Swedish selections respectively. However, allowing for the endogeneity of the under-five mortality rate makes this significance disappear. At the allocation stage, Germany now rewards countries with better economic performance by disbursing more health aid to them. *Per capita* incomes now influence Swedish allocation decisions but the relationship is a positive one. As Sweden is a relatively small donor, they probably concentrate their health aid to smaller and richer countries. The HIV prevalence rate becomes a significant determinant of allocation decisions by the IDA as they disburse more *per capita* health aid to countries where these rates are very high.

Second, the under-five mortality rate is replaced with the infant mortality rate. (appendix tables A3 and A4) The main results are also robust to the use of the infant mortality rate (in place of the under-five mortality rate) but for a few exceptions. At the selection stage, the infant mortality rate is negative and significant for the UK which means the UK chooses countries with already high mortality rates as potential recipients. While the under-five mortality was a significant determinant of selection by the USA, the infant mortality rate does not influence their selection decisions. GDP growth, however, becomes a significant determinant of selection by the USA. Germany now chooses countries that are more liberal to trade as they are seen as countries with the potential to manage, efficiently, huge sums of aid. The tuberculosis prevalence rate loses its importance in Swedish selection decisions. At the allocation stage, the infant mortality and tuberculosis prevalence rates become significant determinants of actual disbursements from the UK. The HIV prevalence rate loses its importance in Swedish allocation decisions while the infant mortality rate is not an important determinant either. The HIV prevalence rate becomes a significant determinant of actual health aid disbursements from the IDA.

Third, we include another measure of broad economic need; donors' non-health aid provided to recipients (appendix tables A5 and A6).[36]The results are not as robust to the inclusion of non-health aid as they are to the inclusion of the infant mortality rate; or to the use of instrumental variables. This is probably because different sectors in any economy are dynamically inter-connected (Osei *et al.*, 2005) so the determinants of health aid allocation will be very similar to the determinants of non-health aid; which now results in an endogeneity problem. Nonetheless, at the selection stage non-health aid is a positive and significant determinant of health aid four all donors except the USA. This is perfectly reasonable as countries chosen as potential recipients of non-health aid will most likely be chosen as potential recipients of health aid. At the selection stage, non-health aid still portrays a complementary relationship with health aid for three donors; the USA, Sweden and the IDA.[37]

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[36] It is possible that this amount might increase regardless of the amount of health aid provided. Alternatively, donors might view non-health aid as a substitute to health aid so any increases in this component of development aid will lead to less health aid being received. We include non-health aid as a measure of recipient need because it captures aid to all other sectors. Most donors state multidimensional objective functions in their aid allocation patterns but they tend to place more emphasis on development needs; so non-health aid will be meeting the development needs of other sectors like education, climate change, infrastructure among others.

[37] Ottersen *et al.,* (2014) state that donor agencies have been urged to provide at least 0.7% of their Gross National Incomes (GNI) in the form of development aid. While not all donors have attained this target; in fact, most have not even come

Fourth, instead of using *per capita* income in Purchasing Power Parity (PPP) terms, GNI *per capita* atlas method is used (appendix tables A7 and A8). The difference between the two measures of income is the latter smooths exchange rate fluctuations by using a three-year average, price-adjusted conversion factor. Moreover, the atlas *per capita* income is the income measure used by the GAVI Alliance and the Global Fund in determining eligibility for their health aid. Thus, we are basically testing if other donors follow the guidelines of these PPPs in their respective selection and allocation decisions. Data for GDP *per capita* atlas is obtained from the WDI database. At the selection stage, democracy becomes a significant determinant of selection by the UK and the IDA. *Per capita* income loses its significance in selection decisions by the EC while the under-five mortality rate also becomes insignificant in determining selection of countries to receive German *per capita* health aid. At the allocation stage, the inclusion of the atlas measure of income causes some major changes for the UK only. The under-five mortality rate, tuberculosis prevalence rate, democracy and the language dummy all become significant determinants of health aid allocation by the UK. Openness, on the other hand, loses its significance. These major changes for the UK may imply that the UK is very influential in the international donors' agenda. Most donors seem to follow the guidelines set by the UK in choosing and allocating their own health aid. Bilateral trade relationships become important for French allocation decisions while population becomes important for the Swedish. The HIV prevalence rate becomes an important determinant of allocation decisions by the IDA.

7. CONCLUSION

In this paper, we examined selection and allocation decisions of development assistance for health (DAH) of nine major donors (five bilateral, two multilateral and two polylateral donors) for 44 Sub-Saharan African countries covering the period 1990 to 2011. We use annual data on health aid disbursements (instead of commitments) to analyse determinants of the actual resource transfers: and include a multitude of factors to capture recipients' need, merits and donors' interests.

We find, as is almost always the case in the aid allocation literature, substantial heterogeneity in donors' behaviour; which underscores the use of the two-part estimator. First, the UK is consistently (in selecting recipients, and disbursing health aid) poverty-sensitive while Germany, Sweden, the EC and the IDA are poverty-sensitive only when choosing potential recipients of their health aid. Second, all donors, except France, choose more populous countries as potential recipients of their health aid while they all (but for the USA and Sweden) provide more health aid to less populous countries. Third, recipients' merits are more important in selection than in actual disbursement decisions. In addition, some donors like the UK choose and provide more aid to better governed recipients while others may view better governed countries as ones not in dire need of health aid; hence they are neither chosen nor given more health aid by donors like France and the EC.

There is also deep-rooted donor heterogeneity regarding the health-related indicators; but two broad generalizations can be made. First, overall, the health indicators are salient for selection of potential

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close, the amounts of development aid they have been providing has been increasing. The 0.7% of GNI is then partitioned to different sectors (like the health sector, education and production sectors among others). Our results then prove that as the GNIs of donor countries are increasing, so are their total aid budgets. Hence the amount of aid available to all sectors increases simultaneously.

recipients, and disbursements. For both selection and allocation decisions; we find evidence of more health aid for countries with low, but increasing health burdens (reflected by the positive relationship between *per capita* DAH and the health-related measure of need); while we also find that some donors choose and disburse more health aid to countries with very high under-five mortality rates and disease burden (a negative relationship between the health indicator and *per capita* DAH). Second, the HIV and tuberculosis prevalence rates are more important determinants of selection than the under-five mortality rate: six of the seven donors are influenced by the HIV (except France) and tuberculosis (except the UK) prevalence rates in their selection decisions. Once selected, the HIV prevalence rate matters most for actual disbursements (for six of the seven donors considered). The USA is most sensitive to the HIV prevalence rate, reflecting their long-standing commitment to alleviate the disease burden across the globe (IHME, 2013). These results imply that health-related variables are salient for donor disbursement behaviour; reflecting the importance donors place on health improvements in developing countries.

Few studies examine the determinants of aid allocation in the context of the MDGs (Thiele *et al.,* 2007; Kasuga, 2007); while other studies model the effects of health aid on health outcomes, then provide estimates on the amounts of aid that will have to be provided for the MDGs to be attained (Mishra and Newhouse, 2009 among others). In this paper, we explicitly model the impact of the Millennium Declaration (hence the attainment of the hitherto MDGs) on donors' allocation behaviour using interaction terms. We find significant, but modest changes over time. Regarding the under-five mortality rate, France and the USA select countries with very high rates as potential recipients while only the USA provides more health aid to countries with extremely high rates; a similar finding to Kasuga (2007). The UK, on its part, chooses countries with low, but increasing mortality rates. All donors excluding the USA and the IDA, choose and provide more health aid to countries with increasing HIV prevalence rates. The IDA choose countries with extremely high HIV burdens as potential recipients of health aid. The EC and France choose countries with already high tuberculosis rates as potential recipients while Germany, the USA and the IDA choose countries with increasing tuberculosis rates as potential recipients.

The emergence of the Public-Private Partnerships (PPPs) in international health scenes has been well documented (Ravishankar *et al.*, 2009; Sridhar and Batniji, 2008; IHME, 2014 among others). With a relatively short period of their existence it is difficult to adequately analyse the evolution of their allocation patterns. However, we make a modest attempt to fill this gap in the allocation literature by analysing the selection and disbursement patterns of the PPPs and compare to the 'average' bilateral and multilateral organisations. There is more homogeneity in the behaviour of PPPs and they are expansive in their selection patterns. This is gleaned from the insignificance of *per capita* income and population; implying that they select countries that meet the basic eligibility criteria and more. They, however, provide more health aid to better governed countries.

Donor heterogeneity is palpable in our analysis, but it does not preclude the possibility that donors share preferences; with health aid allocation being interdependent across donors. Donors have begun to avail of the benefits (the most important of which is a reduction in administrative fragmentation and transaction costs of aid in recipient countries) of coordinating their efforts (for example, the GAVI Alliance, the Global Fund and the Nordic Development Fund are all efforts to streamline foreign assistance for specific purposes). Research into the allocation patterns of major donors, allowing interdependencies between them, is a fruitful area for future research.

In addition, considering the sample period of this study (22 years of data), the time-series properties of the data may be salient. Most of the variables included in the analysis are macroeconomic aggregates which typically display non-stationarity in the long-run. Given the research question we sought to tackle in this paper, stationarity and cointegration properties of the data could not be explored. Furthermore, we accounted for the impact of common shocks by using a complete set of time dummies. However, this approach implicitly assumes that the effects of the shocks are identical across countries; which may be inaccurate given that the dynamic environments into which aid is injected differ substantially (not least due to the different institutional setups across countries). More advanced econometric methods; for example, the recently developed discrete choice Common Correlated Effects Mean Group Estimator (Eberhardt, 2017) will be fit for purpose.

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APPENDIX

Appendix A1: Variable Definitions, Sources and Expected Signs

S/N	Variable Name	Definition	Source	Expected sign with respect to DAH
Health-Related Need Variables				
1.	Under-five mortality rate	This is the probability per 1,000 new births that a new born baby will die before the age of five, if subject to age-specific mortality rates of the specified year. It is a measure of severe deprivation in health.	World Development Indicators (WDI)	Positive
2.	HIV prevalence rate	This refers to the percentage of people aged 15-49 who are infected with HIV. Increases in this rate reflect the burden of HIV on the population.	WDI	Positive
3.	Tuberculosis prevalence rate	The number of cases of tuberculosis (all forms) in a population at a given point in time (the middle of the calendar year), expressed as the rate per 100 000 population. It is sometimes referred to as "point prevalence". Estimates include cases of TB in people with HIV. Published values are rounded to three significant figures. Uncertainty bounds are provided in addition to best estimates.	African Development Indicators (ADI)	Positive
4.	Infant Mortality Rate		WDI	Positive
Broader Economic Need Variables				
5.	GDP *Per Capita* PPP	Gross domestic product divided by midyear population of the recipient country, converted to US dollars using purchasing power parity rates. It is a broad measure of development need by the recipients.	WDI	Negative
6.	GDP *Per Capita* Atlas Method	GNI *per capita* (formerly GNP per capita) is the gross national income, converted to U.S. dollars using the World Bank Atlas method, divided by the midyear population. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.	WDI	Negative
7.	Population	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. The values shown are midyear estimates.	WDI	positive

8.	Non-Health Aid	This is a measure of the amount of aid from a donor to a recipient (or group of recipients) which is not given for health-related purposes. It includes all measures of development aid (humanitarian aid inclusive). It is calculated by taking the difference of total ODA disbursements and DAH disbursements from specific donors to recipients.	OECD/DAC and IHME (2015)	Positive/Negative
		Recipients' Merit Variables		
9.	GDP *Per Capita* growth	Annual average growth rates *Per Capita* GDP.	UNCTAD	Positive
10.	Trade (% of GDP) (Openness)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI	Positive
11.	Democracy	We have measured democracy using The Polity IV dataset. The Polity IV democracy measure ranges from 0 (least democratic) to 10 (most democratic).	Polity IV dataset	Positive
12.	Immunization of Measles	Child immunization measures the percentage of children ages 12-23 months who received vaccinations before 12 months or at any time before the survey. A child is considered adequately immunized against measles after receiving one dose of vaccine.	WDI	Positive
13.	IDA Resource Allocation Index (IRAI)	IDA Resource Allocation Index is obtained by calculating the average score for each cluster and then by averaging those scores. For each of 16 criteria countries are rated on a scale of 1 (low) to 6 (high).	WDI	Positive
		Donors' Interest Variables		
14.	Exports	Amount of bilateral exports between a donor and recipient(s). It is actual exports, not exports as a percentage of GDP	OECD-DAC	Positive
		Control Variables		
15.	Language	This is a dummy variable which takes on the value one if the recipient uses the donor's language as an official language in its country. Zero otherwise.	CIA World Factbook	Positive
16.	Colony	This is a dummy variable which takes the value of one if the country is a former colony of the donor and zero otherwise.	CIA World Factbook	Positive
		Dependent Variable		
18.	*Per capita* health aid disbursements (DAH)	Financial and in-kind contributions made by channels of development assistance to improve health in developing countries. It includes all disease-specific contributions as well as general health sector support, and excludes support for allied sectors.	IHME (2015)	N/A

Appendix A2: Descriptive Statistics

	Variable	Observations	Mean	Std. Dev.	Min	Max
	Log (GDPpc International $PPP)	956	7.62	0.95	5.00	10.57
	Log (HIV Prevalence)	946	0.87	1.45	-2.30	3.36
	Log (TB Prevalence)	968	5.68	0.75	3.37	7.46
	Log (Population)	968	15.54	1.58	11.16	18.92
	Log (Under-5 Mortality Rate)	968	4.76	0.53	2.65	5.79
	Log (Openness)	947	4.18	0.53	2.37	6.28
	Democracy	921	0.55	5.29	-10.00	9.00
	Immunization of Measles	946	67.70	19.13	12.00	99.00
	GDP *Per Capita* Growth	964	1.39	7.64	-50.24	91.97
	Log (Infant Mortality Rate)	968	81.21	29.89	12.20	165.8
	Log (GDPpc Atlas Method)	946	7.37	0.93	5.24	10.42
	IDA Resource Allocation Index	290	3.19	0.53	1.40	4.20
	Log (Total Bilateral Health Aid *Per Capita*)	352	11.50	7.67	0	20.10
	Log (Total Multilateral Health Aid *per capita*)	352	13.37	5.58	0	18.90
	Log (Total Health Aid *Per Capita*)	968	0.98	0.38	0	4.80
UK	Colony	968	0.34	-	0	1
	Language	968	0.48	-	0	1
	Log (Exports)	968	3.39	1.87	-4.61	8.55
	Log (Non-Health Aid)	843	15.45	2.47	9.78	21.94
	Log (Health Aid *Per Capita*)	968	0.13	0.28	0	0.22
Fra	Colony	968	0.36	-	0	1
	Language	968	0.41	-	0	1
	Log(Exports)	968	4.22	1.87	-4.61	8.04
	Log (Non-Health Aid)	932	16.61	1.87	10.07	21.51
	Log (Health Aid *Per capita*)	968	0.18	0.36	0	2.67
Germany	Log (Exports)	968	3.51	1.76	-4.61	9.38
	Log (Non-Health Aid)	915	16.50	1.83	9.22	21.34
	Log (Health Aid *Per Capita*)	968	0.88	0.17	0	1.91
USA	Language	968	0.48		0	1
	Log (Exports)	968	3.61	2.25	-4.61	8.86
	Log (Non-Health Aid)	935	16.46	1.98	7.71	21.23
	Log (Health Aid *Per Capita*)	968	0.38	0.59	0	4.80
Sweden	Log (Exports)	968	1.31	2.27	-8.11	7.37

	Log (Non-Health Aid)	813	14.92	2.18	9.29	19.31
	Log (Health Aid *Per Capita*)	968	0.06	0.15	0	1.29
EC	Log (Non-Health Aid)	949	17.32	1.28	11.62	19.93
	Log (Health Aid *Per Capita*)	968	0.15	0.24		2.22
IDA	Log (Non-Health Aid)	721	17.67	1.46	11.81	20.75
	Log (Health Aid *Per Capita*)	968	0.35	0.45	0	2.58
GAVI	Log (Health Aid *Per Capita*)	352	0.16	0.20	0	0.99
GFATM	Log (Health Aid *Per Capita*)	352	0.68	0.70	0	3.06

Table A1: Determinants of Health Aid- Selection Stage (IV Probit)

	UK	France	Germany	USA	Sweden	EC	IDA
Under-five Mortality Rate	-0.891 (0.061)	-0.036 (0.041)	-0.074 (0.049)	0.103** (0.048)	0.084 (0.054)	-0.036 (0.047)	0.162*** (0.039)
HIV Prevalence Rate	0.034** (0.012)	0.003 (0.015)	0.031*** (0.011)	0.024** (0.010)	0.090*** (0.011)	0.035** (0.010)	-0.075*** (0.008)
Tuberculosis Prevalence Rate	0.013 (0.018)	0.127*** (0.027)	-0.044** (0.018)	0.034** (0.055)	0.034* (0.019)	-0.060*** (0.018)	-0.059*** (0.020)
GDP *Per Capita*	-0.198*** (0.023)	0.002 (0.026)	-0.068*** (0.020)	-0.011 (0.023)	-0.052** (0.024)	-0.056** (0.025)	-0.098*** (0.018)
Population	0.105*** (0.018)	-0.009 (0.024)	0.111*** (0.021)	0.154*** (0.015)	0.019 (0.020)	0.040*** (0.014)	0.096*** (0.010)
GDP *Per Capita* Growth	0.004* (0.002)	0.003* (0.002)	0.0004 (0.002)	0.002 (0.002)	-0.001 (0.002)	0.001 (0.002)	-0.001 (0.002)
Openness	0.170*** (0.033)	-0.038 (0.033)	0.044 (0.032)	0.012 (0.032)	-0.058 (0.039)	0.095*** (0.038)	-0.009 (0.031)
Democracy	0.003 (0.002)	-0.008*** (0.003)	-0.003 (0.003)	-0.001 (0.002)	0.005* (0.003)	0.004 (0.003)	0.003 (0.002)
Exports	0.045*** (0.012)	0.038** (0.018)	-0.004 (0.015)	0.007 (0.007)	0.064*** (0.010)		
Immunization	0.00002 (0.001)	-0.002** (0.001)	0.0004 (0.001)	0.003*** (0.001)	0.004*** (0.001)	-0.005*** (0.001)	0.006*** (0.001)
Colony	0.247*** (0.049)	0.114* (0.063)					
Language	0.145*** (0.040)	0.363*** (0.056)		0.074** (0.031)			
Observations	736	736	736	736	736	736	820
Log-likelihood	1233.99	1222.68	1193.29	1277.58	1211.24	1188.47	1362.25
x^2	426.52	207.32	332.77	210.17	257.90	91.20	336.47

Notes:

(i) We estimate the selection probability (1 = receives health aid; 0 = does not receive health aid) based on an Instrumental Variable (IV) Probit maximum likelihood. All time-varying regressors except democracy, immunization and GDP per capita growth are logged. Heteroscedasticity and correlation-robust standard errors are reported in brackets. All equations include a constant term and a full set of time dummies (none of which are reported).

(ii) All time-varying explanatory variables are lagged one period.

*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*

(iv) The chi-squared statistic is for the test of joint significance of all regressors in the model. The p-values of the test have not been reported but for all donors, the test statistic is significant at 1 per cent.

Table A2: Determinants of Health Aid- Allocation Stage (2SLS)

	UK	France	Germany	USA	Sweden	EC	IDA
Under-five Mortality Rate	-0.115 (0.091)	-0.036 (0.056)	-0.106** (0.046)	-0.087 (0.197)	0.225* (0.116)	0.013 (0.067)	-0.278*** (0.101)
HIV Prevalence Rate	0.051*** (0.019)	-0.044** (0.017)	0.038** (0.015)	0.198*** (0.048)	0.041* (0.020)	0.038*** (0.014)	-0.038* (0.022)
Tuberculosis Prevalence Rate	0.040 (0.032)	-0.011 (0.030)	0.012 (0.020)	0.029 (0.061)	-0.0001 (0.034)	0.049** (0.022)	-0.006 (0.038)
GDP *Per Capita*	-0.269*** (0.047)	0.032 (0.054)	-0.006 (0.038)	-0.016 (0.073)	0.048* (0.028)	0.057 (0.037)	0.030 (0.052)
Population	-0.076** (0.030)	-0.120*** (0.033)	-0.062** (0.027)	-0.079 (0.062)	-0.041 (0.029)	-0.074*** (0.015)	-0.134*** (0.024)
GDP *Per Capita* Growth	-0.006 (0.005)	-0.00004 (0.002)	0.003* (0.002)	0.010*** (0.003)	-0.0003 (0.003)	-0.002 (0.002)	0.004 (0.003)
Openness	0.138** (0.060)	-0.065 (0.057)	-0.038 (0.046)	0.026 (0.149)	-0.030 (0.041)	-0.013 (0.041)	-0.096 (0.078)
Democracy	0.009 (0.006)	0.001 (0.004)	0.002 (0.004)	0.023*** (0.009)	-0.001 (0.003)	0.0002 (0.004)	-0.002 (0.005)
Exports	0.077** (0.030)	0.042 (0.030)	-0.009 (0.019)	0.047** (0.023)	0.007 (0.020)		
Immunization	0.002 (0.002)	-0.0003 (0.001)	-0.001 (0.001)	0.003 (0.003)	0.002 (0.002)	-0.002** (0.001)	0.002 (0.002)
Colony	0.228** (0.102)	0.074 (0.073)					
Language	-0.024 (0.068)	0.035 (0.060)		-0.076 (0.124)			
Observations	370	526	435	540	316	592	557
R-Squared	0.530	0.472	0.252	0.413	0.273	0.285	0.448

Notes:
(i) The dependent variable here is logged per capita health aid. The 2SLS estimator is conditional on receiving per capita health aid. Standard errors are reported in parentheses. All time-varying regressors except democracy, immunization, and GDP per capita growth are logged. All time-varying regressors are lagged one period.
(ii) Clustering is done at the country-year level. This is to purge the regressions of any heteroscedasticity and serial correlation. All equations include a constant term and a full set of time dummies.
*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*

Table A3: Determinants of Health Aid-Selection Stage (Infant Mortality Rate)

	UK	France	Germany	USA	Sweden	EC	IDA
Infant Mortality Rate	-0.140** (0.058)	-0.050 (0.048)	-0.132** (0.055)	0.041 (0.053)	0.070 (0.062)	-0.035 (0.055)	0.174*** (0.045)
HIV Prevalence Rate	0.031*** (0.011)	0.004 (0.014)	0.033*** (0.010)	0.023** (0.010)	0.090*** (0.011)	0.034*** (0.010)	-0.073*** (0.008)
Tuberculosis Prevalence Rate	0.022 (0.017)	0.125*** (0.026)	-0.039** (0.018)	0.029* (0.016)	0.029 (0.019)	-0.056*** (0.018)	-0.063*** (0.020)
GDP *Per Capita*	-0.242*** (0.022)	-0.010 (0.026)	-0.077*** (0.020)	-0.028 (0.025)	-0.056** (0.024)	-0.055** (0.025)	-0.099*** (0.018)
Population	0.108*** (0.017)	-0.021 (0.024)	0.112*** (0.020)	0.157*** (0.015)	0.011 (0.020)	0.040*** (0.014)	0.100*** (0.010)
GDP *Per Capita* Growth	0.005*** (0.002)	0.003 (0.002)	0.001 (0.002)	0.003* (0.002)	-0.001 (0.002)	0.001 (0.002)	-0.001 (0.002)
Openness	0.181*** (0.033)	-0.031 (0.033)	0.060* (0.032)	0.011 (0.032)	-0.066* (0.039)	0.104*** (0.038)	-0.010 (0.031)
Democracy	0.003 (0.002)	-0.007*** (0.003)	-0.003 (0.003)	-0.001 (0.002)	0.004* (0.002)	0.003 (0.003)	0.002 (0.002)
Exports	0.050*** (0.011)	0.043** (0.018)	-0.006 (0.014)	0.005 (0.007)	0.070*** (0.010)		
Immunization	0.0002 (0.001)	-0.002** (0.001)	0.0004 (0.001)	0.002** (0.001)	0.003*** (0.001)	-0.005*** (0.001)	0.006*** (0.001)
Colony	0.242*** (0.045)	0.106* (0.062)					
Language	0.123*** (0.037)	0.360*** (0.053)		0.079** (0.031)			
Observations	773	773	773	773	773	773	857
Log-likelihood	-281.25	-293.01	-326.18	-253.87	-307.70	-336.77	-321.35
x^2	461.33	217.56	355.05	222.98	274.84	93.53	354.34

Notes:
(i) We estimate the selection probability (1 = receives health aid; 0 = does not receive health aid) based on a pooled Probit maximum likelihood. All time-varying regressors except democracy, immunization and GDP per capita growth are logged. Heteroscedasticity and correlation-robust standard errors are reported in brackets. All equations include a constant term and a full set of time dummies (none of which are reported).
(ii) All time-varying explanatory variables are lagged one period.
*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*
(iv) The chi-squared statistic is for the test of joint significance of all regressors in the model. The p-values of the test have not been reported but for all donors, the test statistic is significant at 1 per cent.

Table A4: Determinants of Health Aid- Allocation Stage (Infant Mortality Rate)

	UK	France	Germany	USA	Sweden	EC	IDA
Infant Mortality Rate	-0.283** (0.124)	-0.047 (0.085)	-0.133** (0.060)	-0.287 (0.250)	0.200 (0.130)	0.001 (0.085)	-0.354*** (0.118)
HIV Prevalence Rate	0.046** (0.018)	-0.043** (0.017)	0.039** (0.016)	0.190*** (0.047)	0.034 (0.022)	0.037** (0.014)	-0.037* (0.022)
Tuberculosis Prevalence Rate	0.061** (0.030)	-0.006 (0.030)	0.017 (0.021)	0.050 (0.067)	-0.013 (0.037)	0.047** (0.023)	0.002 (0.038)
GDP *Per Capita*	-0.304*** (0.053)	0.029 (0.057)	-0.011 (0.039)	-0.055 (0.078)	0.048 (0.031)	0.050 (0.036)	0.024 (0.056)
Population	-0.066** (0.027)	-0.120*** (0.035)	-0.061** (0.026)	-0.068 (0.062)	-0.044 (0.034)	-0.072*** (0.015)	-0.136*** (0.026)
GDP *Per Capita* Growth	-0.005 (0.004)	0.00003 (0.002)	0.003 (0.002)	0.010*** (0.003)	-0.0003 (0.003)	-0.002 (0.002)	0.004 (0.003)
Openness	0.178** (0.067)	-0.064 (0.058)	-0.030 (0.046)	0.059 (0.152)	-0.035 (0.049)	-0.007 (0.041)	-0.077 (0.079)
Democracy	0.008 (0.007)	0.001 (0.004)	0.001 (0.004)	0.020** (0.009)	-0.001 (0.002)	0.0003 (0.004)	-0.001 (0.005)
Exports	0.076** (0.030)	0.042 (0.031)	-0.008 (0.019)	0.044* (0.023)	0.005 (0.020)		
Immunization	0.001 (0.002)	-0.001 (0.001)	-0.001 (0.001)	0.002 (0.003)	0.002 (0.002)	-0.002** (0.001)	0.002 (0.002)
Colony	0.265** (0.100)	0.090 (0.074)					
Language	-0.061 (0.066)	0.010 (0.055)		-0.076 (0.124)			
Observations	381	551	442	565	327	616	561
R-Squared	0.551	0.459	0.257	0.405	0.240	0.290	0.456

Notes:
(i) The dependent variable here is logged per capita health aid. The OLS estimator is conditional on receiving per capita health aid. Standard errors are reported in parentheses. All time-varying regressors except democracy, immunization, and GDP per capita growth are logged. All time-varying regressors are lagged one period.
(ii) Clustering is done at the country-year level. This is to purge the regressions of any heteroscedasticity and serial correlation. All equations include a constant term and a full set of time dummies.
*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*

Table A5: Determinants of Health Aid-Selection Stage (Non-Health Aid)

	UK	France	Germany	USA	Sweden	EC	IDA
Under-five Mortality Rate	-0.036 (0.047)	-0.027 (0.038)	0.007 (0.044)	0.023 (0.044)	0.181*** (0.037)	-0.021 (0.046)	0.073 (0.047)
HIV Prevalence Rate	0.014 (0.012)	0.016 (0.015)	0.017 (0.011)	0.010 (0.010)	0.067*** (0.011)	0.031*** (0.010)	-0.031*** (0.010)
Tuberculosis Prevalence Rate	-0.020 (0.019)	0.111*** (0.026)	-0.069*** (0.017)	0.025 (0.016)	-0.007 (0.018)	-0.062*** (0.018)	-0.047*** (0.018)
GDP *Per Capita*	-0.184*** (0.025)	0.013 (0.023)	0.036 (0.026)	0.010 (0.021)	0.087*** (0.022)	-0.032 (0.025)	0.006 (0.018)
Population	0.013 (0.022)	-0.036* (0.024)	0.058*** (0.022)	0.172*** (0.017)	-0.006 (0.016)	0.026* (0.016)	0.086*** (0.018)
Non-Health Aid	0.073*** (0.009)	0.075*** (0.013)	0.109*** (0.013)	0.010 (0.012)	0.092*** (0.005)	0.047*** (0.014)	0.024* (0.013)
GDP *Per Capita* Growth	0.004* (0.002)	0.002 (0.002)	0.001 (0.002)	0.002 (0.002)	-0.003 (0.002)	0.001 (0.002)	-0.002 (0.002)
Openness	0.117*** (0.037)	-0.015 (0.030)	0.031 (0.032)	0.001 (0.033)	-0.052* (0.028)	0.112*** (0.036)	0.028 (0.033)
Democracy	0.006*** (0.002)	-0.008*** (0.003)	-0.009*** (0.003)	-0.001 (0.002)	0.003 (0.002)	0.002 (0.002)	0.003 (0.002)
Exports	0.043*** (0.012)	0.012 (0.018)	-0.049*** (0.017)	0.005 (0.007)	0.014 (0.008)		
Immunization	-0.002* (0.001)	-0.002** (0.001)	0.0004 (0.001)	0.002* (0.001)	0.002** (0.001)	-0.005*** (0.001)	0.004*** (0.001)
Colony	0.183*** (0.047)	0.021 (0.060)					
Language	0.036 (0.040)	0.302*** (0.050)		0.104*** (0.030)			
Observations	686	747	740	752	664	757	565
Log-likelihood	-244.83	-260.34	-267.86	-221.27	-172.52	-308.64	-171.78
x^2	427.69	172.17	346.70	200.41	217.89	107.02	168.97

Notes:

(i) We estimate the selection probability (1 = receives health aid; 0 = does not receive health aid) based on a pooled Probit maximum likelihood. All time-varying regressors except democracy, immunization and GDP per capita growth are logged. Heteroscedasticity and correlation-robust standard errors are reported in brackets. All equations include a constant term and a full set of time dummies (none of which are reported).

(ii) All time-varying explanatory variables are lagged one period.

*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*

(iv) The chi-squared statistic is for the test of joint significance of all regressors in the model. The p-values of the test have not been reported but for all donors, the test statistic is significant at 1 per cent.

Table A6: Determinants of Health Aid- Allocation Stage (Non-Health Aid)

	UK	France	Germany	USA	Sweden	EC	IDA
Under-five Mortality Rate	-0.121 (0.092)	-0.040 (0.062)	-0.100** (0.043)	-0.083 (0.207)	0.220** (0.107)	0.004 (0.068)	-0.263*** (0.079)
HIV Prevalence Rate	0.043* (0.022)	-0.044** (0.017)	0.039** (0.015)	0.194*** (0.047)	0.032* (0.018)	0.040** (0.015)	-0.026 (0.023)
Tuberculosis Prevalence Rate	0.034 (0.036)	-0.014 (0.030)	0.013 (0.021)	0.029 (0.058)	-0.025 (0.035)	0.044* (0.022)	-0.008 (0.036)
GDP *Per Capita*	-0.253*** (0.053)	0.035 (0.051)	-0.012 (0.044)	0.015 (0.078)	0.084** (0.032)	0.050 (0.035)	0.028 (0.052)
Population	-0.084** (0.034)	-0.116*** (0.035)	-0.080** (0.033)	-0.128** (0.057)	-0.070*** (0.029)	-0.078*** (0.018)	-0.200*** (0.031)
Non-Health Aid	0.013 (0.017)	0.019 (0.015)	0.021 (0.018)	0.070* (0.036)	0.049*** (0.010)	0.014 (0.015)	0.071*** (0.020)
GDP *Per Capita* Growth	-0.006 (0.005)	-0.0003 (0.002)	0.003 (0.002)	0.009*** (0.003)	-0.002 (0.003)	-0.002 (0.002)	0.001 (0.003)
Openness	0.146** (0.066)	-0.063 (0.055)	-0.026 (0.047)	-0.0002 (0.146)	-0.033 (0.039)	-0.007 (0.040)	-0.097 (0.074)
Democracy	0.008 (0.007)	0.001 (0.004)	-0.001 (0.004)	0.019** (0.008)	-0.0005 (0.003)	0.0002 (0.004)	-0.003 (0.004)
Exports	0.072** (0.032)	0.030 (0.029)	-0.004 (0.022)	0.041* (0.024)	-0.005 (0.013)		
Immunization	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.003)	0.001 (0.002)	-0.003** (0.001)	0.001 (0.002)
Colony	0.229** (0.112)	0.079 (0.072)					
Language	-0.028 (0.061)	-0.005 (0.053)		-0.085 (0.123)			
Observations	372	545	433	558	325	612	535
R-Squared	0.531	0.453	0.267	0.410	0.361	0.290	0.489

Notes:

(i) The dependent variable here is logged per capita health aid. The OLS estimator is conditional on receiving per capita health aid. Standard errors are reported in parentheses. All time-varying regressors except democracy, immunization, and GDP per capita growth are logged. All time-varying regressors are lagged one period.

(ii) Clustering is done at the country-year level. This is to purge the regressions of any heteroscedasticity and serial correlation. All equations include a constant term and a full set of time dummies.

*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*

Table A7: Determinants of Health Aid-Selection Stage (GNI *Per Capita* Atlas Method)

	UK	France	Germany	USA	Sweden	EC	IDA
Under-five Mortality Rate	0.061 (0.047)	-0.035 (0.043)	-0.072 (0.051)	0.090* (0.047)	0.031 (0.049)	-0.017 (0.049)	0.088*** (0.190)
HIV Prevalence Rate	0.023** (0.012)	0.005 (0.016)	0.024*** (0.011)	0.023** (0.010)	0.096*** (0.011)	0.035*** (0.010)	-0.065*** (0.008)
Tuberculosis Prevalence Rate	0.005 (0.019)	0.126*** (0.027)	-0.041** (0.018)	0.028* (0.016)	0.041** (0.019)	-0.059*** (0.018)	-0.048** (0.019)
GNI *Per Capita* Atlas	-0.111*** (0.023)	-0.007 (0.026)	-0.036* (0.021)	-0.010 (0.022)	-0.102*** (0.022)	-0.038 (0.024)	-0.124*** (0.019)
Population	0.116*** (0.019)	-0.008 (0.027)	0.119*** (0.022)	0.156*** (0.016)	-0.010 (0.020)	0.037*** (0.014)	0.099*** (0.010)
GDP *Per Capita* Growth	0.004** (0.002)	0.003 (0.002)	-0.0001 (0.002)	0.002 (0.002)	-0.0002 (0.002)	0.001 (0.002)	-0.001 (0.002)
Openness	0.101*** (0.031)	-0.036 (0.031)	0.018 (0.032)	0.007 (0.030)	-0.061* (0.035)	0.086*** (0.034)	-0.023 (0.028)
Democracy	0.005** (0.002)	-0.007*** (0.003)	-0.002 (0.003)	-0.001 (0.002)	0.006* (0.002)	0.004 (0.003)	0.004* (0.002)
Exports	0.025** (0.012)	0.043** (0.020)	-0.016 (0.015)	0.005 (0.007)	0.076*** (0.010)		
Immunization	0.001 (0.001)	-0.002** (0.001)	0.001 (0.001)	0.002** (0.001)	0.003*** (0.001)	-0.005*** (0.001)	0.005*** (0.001)
Colony	0.269*** (0.050)	0.116* (0.063)					
Language	0.141*** (0.042)	0.358*** (0.055)		0.083*** (0.032)			
Observations	768	768	768	768	768	768	852
Log-likelihood	-303.37	-292.75	-328.51	-252.55	-295.48	-331.40	-310.59
x^2	432.06	214.00	352.30	222.26	290.90	102.00	362.97

Notes:

(i) We estimate the selection probability (1 = receives health aid; 0 = does not receive health aid) based on a pooled Probit maximum likelihood. All time-varying regressors except democracy, immunization and GDP per capita growth are logged. Heteroscedasticity and correlation-robust standard errors are reported in brackets. All equations include a constant term and a full set of time dummies (none of which are reported).

(ii) All time-varying explanatory variables are lagged one period.

*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*

(iv) The chi-squared statistic is for the test of joint significance of all regressors in the model. The p-values of the test have not been reported but for all donors, the test statistic is significant at 1 per cent.

Table A8: Determinants of Health Aid-Allocation Stage (GNI *Per Capita* Atlas Method)

	UK	France	Germany	USA	Sweden	EC	IDA
Under-five Mortality Rate	-0.115 (0.091)	-0.036 (0.056)	-0.106** (0.046)	-0.087 (0.197)	0.225* (0.116)	0.013 (0.067)	-0.278*** (0.101)
HIV Prevalence Rate	0.051*** (0.019)	-0.044** (0.017)	0.038** (0.015)	0.198*** (0.048)	0.041* (0.020)	0.038*** (0.014)	-0.038 (0.022)
Tuberculosis Prevalence Rate	0.040 (0.032)	-0.011 (0.030)	0.012 (0.020)	0.029 (0.061)	-0.0001 (0.034)	0.049** (0.022)	-0.006 (0.038)
GNI *Per Capita* Atlas	-0.269*** (0.047)	0.032 (0.054)	-0.006 (0.038)	-0.016 (0.073)	0.048* (0.028)	0.057 (0.037)	0.030 (0.052)
Population	-0.076** (0.030)	-0.120*** (0.033)	-0.062** (0.027)	-0.079 (0.062)	-0.041 (0.029)	-0.074*** (0.015)	-0.134*** (0.024)
GDP *Per Capita* Growth	-0.006 (0.005)	-0.00004 (0.002)	0.003 (0.002)	0.010*** (0.003)	-0.0003 (0.003)	-0.002 (0.002)	0.004 (0.003)
Openness	0.138** (0.060)	-0.065 (0.057)	-0.038 (0.046)	0.026 (0.149)	-0.030 (0.041)	-0.013 (0.041)	-0.096 (0.078)
Democracy	0.009 (0.006)	0.001 (0.004)	0.002 (0.004)	0.023*** (0.009)	-0.001 (0.003)	0.0002 (0.004)	-0.002 (0.005)
Exports	0.077** (0.030)	0.042 (0.030)	-0.009 (0.019)	0.047* (0.023)	0.007 (0.020)		
Immunization	0.002 (0.002)	-0.0003 (0.001)	-0.001 (0.001)	0.003 (0.003)	0.002 (0.002)	-0.002** (0.001)	0.002 (0.002)
Colony	0.228** (0.102)	0.074 (0.073)					
Language	-0.024 (0.068)	0.035 (0.060)		-0.076 (0.124)			
Observations	370	526	435	540	316	592	557
R-Squared	0.530	0.472	0.252	0.413	0.273	0.285	0.448

Notes:

(i) The dependent variable here is logged per capita health aid. The OLS estimator is conditional on receiving per capita health aid. Standard errors are reported in parentheses. All time-varying regressors except democracy, immunization, and GDP per capita growth are logged. All time-varying regressors are lagged one period.

(ii) Clustering is done at the country-year level. This is to purge the regressions of any heteroscedasticity and serial correlation. All equations include a constant term and a full set of time dummies.

*(iii) ***, ** and * denote significance at 1, 5 and 10 per cent respectively.*