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## **What Factors Determine the Allocation of Aid to Agriculture?**

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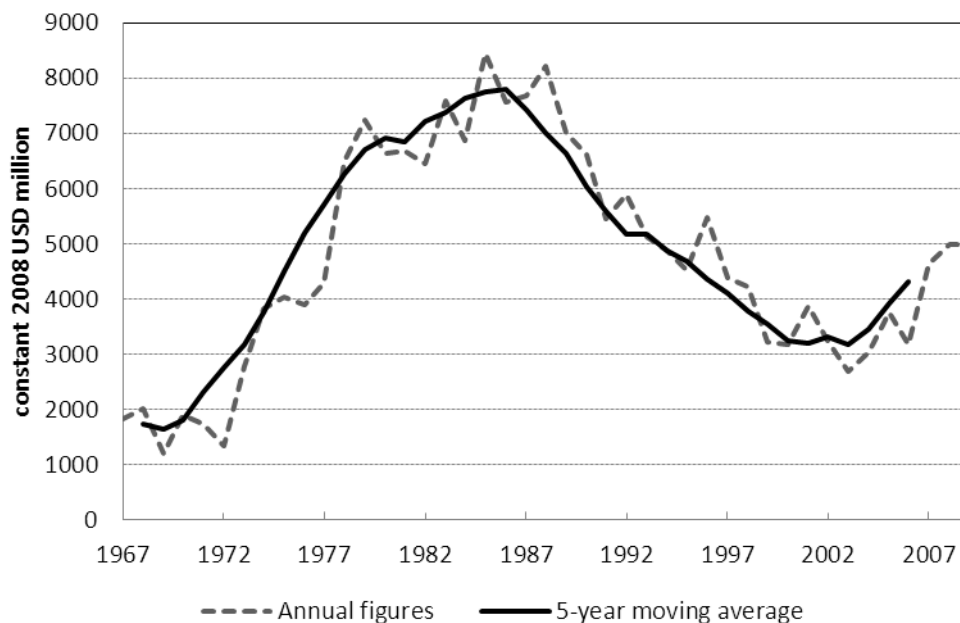
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## 1 Introduction

After a long period of relative neglect, the recent global food crisis has put agricultural development and food security firmly back on the development agenda. A key example of this development was the release the 2008 World Development Report by the World Bank that was fully devoted the theme of “Agriculture for Development” (World Bank 2007). The estimated 100 million rise in food insecure people (FAO 2010) combined with social unrest and political instability in a substantial number of developing countries, has led to a proliferation of new agricultural aid programs by international institutions, bilateral donors and developing countries (see Abbott and Batisti (2009) for a recent overview). During the G8 summit in L'Aquila developed countries pledged to allocate no less than €20 billion to support agricultural development in food insecure regions. As a consequence, aid flows to agriculture have started to increase again after 15 years of decline (Figure 1). Taking into account the present discussions on climate change, energy crisis and food security, a new food price surge in 2011 and the implementation of the proposed intervention programs, aid to agriculture is expected to keep on growing in the future.

**Figure 1: Bilateral aid to agriculture, 1967-2009**



Source: OECD DAC Aid statistics Database.

But what determines the allocation of aid to agriculture? Is it distributed on the basis of good governance and general needs, mainly poverty. Do donor self-interest play a role? Or are agricultural specific factors important such as the state of the agricultural sector and domestic food security issues? Answers to these questions are important for several reasons. First, agricultural aid flows, which are already substantial in a few countries, are expected to become larger in the future. An example is the increasing support of donors to implement the Comprehensive Africa Agriculture Development Programme (CAADP), an Africa-wide initiative to boost agricultural expansion. As new agricultural initiatives by donors are expected to have considerable economic and social impact on recipient countries, understanding how aid to agriculture is allocated

is relevant. Second, although not undisputed, several studies have found that aid is most effective when it benefits poor countries with reasonable adequate institutions and economic policies (Burnside and David Dollar 2000; Collier and David Dollar 2002).<sup>1</sup> This has reinforced the view that aid should be allocated selectively and only should benefit countries with the highest ‘need’ as well as a good governance record. This paper examines whether these criteria also play a role in the allocation of aid to agriculture.

There exists an extensive literature, examining the allocation of aid that goes back to the 1970s (see Neumayer (2003a) for an overview). Almost all work, however, has analysed aggregate aid flows. A notable exception is Thiele *et al.* (2007), who test if sectoral aid allocation is in accordance with the Millennium Development Goals. Another group of studies, which is related to this paper, that also takes a disaggregate approach, investigates the allocation of food aid (Neumayer 2005; Kuhlitz, Abdulai, and Barrett 2010).

This paper is a first attempt to analyse the allocation of aid to agriculture. More specifically, it looks at the aid patterns of three donor countries: USA, Japan and the Netherlands, taking into account donor self-interest, recipient need and governance factors for the period 1995-2008.<sup>2</sup> These countries differ substantially in terms of development policy, aid strategies and geopolitical interests and are therefore interesting to compare. The USA and Japan are known as big aid donors, which tend to pursue their own interest, while the Netherlands is considered as one of the like-minded countries that traditionally regard poverty alleviation as the main aim of aid policy (Neumayer 2003). These differences are also reflected by the CDG’s Commitment to Development Index, which annually ranks the quality of aid policy of 22 major donors. The Netherlands has consistently been a top performer, while the USA has been ranked as mediocre and Japan near bottom.

The paper is organised as follows. In Section 2 I describe the research design, including the main variables, data and econometric models. Section 3 presents the results of the analysis and Section 4 summarises the main conclusions of the paper.

## **2 Research Design**

### ***2.1 Dependent Variable***

The dependent variable is aid commitments to agriculture. All data are taken from the Creditor Reporting System (CRS), the sectorally disaggregated Development Assistance Committee (DAC) database on aid flows. Agriculture is broadly defined as agriculture, forestry and fishing (310) in the CRS. It excludes rural development (classified as multi-sector aid), developmental food aid (general programme assistance) and emergency food aid (humanitarian assistance). It can be further broken down into a number of specific 5-digit categories which can be grouped under (1) agricultural policy; (2) agricultural production; (3) agricultural water resources (4); agricultural inputs; (5) agricultural education, research and services; (6) forestry; and

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<sup>1</sup> Several studies have tested the Burnside and Dollar model and found different results depending on the model specification and time period covered (e.g. Easterly, Levine, and Roodman 2004; Roodman 2007).

<sup>2</sup> The next version of this paper will also include an analysis of several other large donors (e.g. Denmark, France, Germany, UK and Sweden) for comparison.

(7) fishing (OECD-DAC 2010). Most donors will give aid to agriculture on the basis of (country specific) agricultural development strategies that encompass all these categories. For this reason no attempt has been made to investigate aid allocation at lower levels of aggregation.

In the aid allocation research, some authors have used aid disbursements as dependent variable (e.g. Claessens, Cassimon, and Van Campenhout 2009; David Dollar and Levin 2006), while others have used aid commitments (e.g. Neumayer 2003a; Berthélemy and Tichit 2004; Berthelemy 2006). Here, I choose to focus on the latter. As has been pointed out by McGillivray and White (1995), aid commitments best reflect donor decisions because they have most control over it. Aid disbursements, in contrast, also depend for a large part on other factors such as the recipients' administrative capacity to tap into the funds. Hence, they do not purely reflect donor decisions and may therefore distort the analysis.

Aid to agriculture is expressed in constant 2008 US dollars (as presented in the CRS) and logged to make its distribution less skewed. Following Cohen and Levin (2006), I apply a monotonic transformation ( $1 + \text{aid receipts}$ ) to ensure that the observations with zero aid are retained in the analysis. Another option would have been to use aid per capita as the dependent variable as has been done in several other studies. McGillivray and Ockzowski (1992) point out that donors have a fixed aid budget which need to be divided over a set of potential donors. This is most easily done by allocating a share of the total amount of aid available to each recipient country than using aid per capita figures which may result in overshooting or undershooting of the total budget. For this reason, I have decided to use total aid to agriculture as the dependent variable. A measure for rural population is included as independent variable to control for the fact that, all else equal, developing countries with large rural sectors are likely to receive more aid than countries where this sector is small.

## **2.2 Independent Variables**

The allocation of aid depends on the need and merits of developing countries as well as donors' self-interest (Neumayer 2003a). In addition, the last two decades donors and recipients have more and more emphasised the need to improve the effectiveness and efficiency of the aid system. Among others, this resulted in the 2005 Paris Declaration on Aid Effectiveness and the 2008 Accra Agenda for Action in which donors and recipients agreed on standards and guidelines on effective aid. Consequently, donors have become more selective in giving aid and are now also critically looking at corruption, human rights, democracy and the quality of institutions in recipient countries. This is underpinned by Claessens *et al.* (2009), who investigate aid allocation for a large number of donor countries for the period 1970-2004. They find that recipients' policies and institutional environment measured by the World Bank's CPIA index are significant factor in the decision to allocate aid since the 1990s but not before. Nonetheless, despite this development there remain large differences in behaviour across the various donors.

I include a number of variables that capture donor self-interest, recipient need and good governance that are commonly used in the aid literature. In addition I add a few variables that particularly relate to the agricultural sector. Three indicators for recipient need are incorporated in the analysis. The most common variable is income per capita, measured in purchasing power parity and constant 2000 US\$ taken from

the World Development Indicator (WDI) database published by the World Bank. If agricultural aid is allocated to alleviate overall poverty, poor countries are expected to receive more than rich countries. I add three variables that pertain especially to food security and agricultural development. First domestic food supply expressed as the average daily per capita calorie supply in thousand calories is included as a proxy for the state of food security in the recipient country. This variable has also been used by Neumayer (2005) and Kuhlitz *et al.* (2010) in studies on the allocation of food aid. More direct variables for food security that also takes into account access to food, such as undernourishment, would be preferable but these are not available for recent years. Secondly, as a proxy for the performance of the agricultural sector, cereal yield in kilogram per hectare is included. It is assumed that low yield figures are associated with an agricultural sector that is characterised by a larger number of small scale farmers with limited access to inputs (credit, fertilizer, machinery and seeds) and technology (agricultural R&D and extension services). Such countries are expected to receive more agricultural aid, all else equal. Finally, I include rural population as explanatory variable for the size of the agricultural sector in the analysis. This variable reflects the potential target group that may directly benefit from aid to agriculture. Domestic food supply and rural population are taken from FAOSTAT and cereal yield from the WDI database.

Three indicators for donor interest are included. The first is the number of years a recipient country has been a colony of the donor country in the period 1900-1960, taken from Alesina and Dollar (2000). It is well known that many donors maintain close linkages with former colonies for historical, political and commercial reasons. It has for instance been pointed out that lobbying by ethnic groups in the donor country may influence the aid allocation decision (Lahiri and Raimondos-Moller 2000). Colonial status is only included for the Netherlands (Indonesia and Suriname) and the USA (the Philippines). Japan had one colony (Burma) but for this country there is no sufficient information available to include it in the analysis. The second variable is the geographical distance between the capital of the donor and the recipient country (Gleditsch and Ward 2001). This captures the fact that some donors might want to maintain strategic influence in neighbouring countries or regions while others take a more global approach. A final variable for donor interest is the flow of bilateral trade that measures the strength of commercial links between the donor and recipient. In line with comparative advantage, the size of agricultural imports from developing countries to donor countries is much larger than the reverse export flow. Hence, I assume that the potential strategic interest of donor countries lies predominantly in safeguarding the supply of important food and cash crops from developing countries. This is measured by including the value of total Food and Live Animals (SITC 01) a donor country imports from a recipient country as a share of the donor's total imports. Data are taken from the OECD trade database.

In line with Neumayer (2003), two indicators are included for governance. Democracy is measured as the unweighted sum of the political rights and civil liberties indices constructed by Freedom House (2010). Both indices take values from 1 (best) to 7 (worst). A composite measure is created by adding the scores from the two indices and recoding the index so that it ranges from 2 (worst) to 14 (best). Human rights are measured by the Political Terror Scale (PTS) that is based on Amnesty International's annual human right reports as well as the US Department of State's Country reports on human rights practices. Both indices range from 1 (best) to

5 (worst). For the purpose of this paper, I take the simple average and reverse the resulting index so that 1 means worst and 5 best human rights performance.

All explanatory dependent variables except democracy and human rights are logged. Since both the dependent and the independent variables are in log form the coefficients can be interpreted as elasticities in the second stage panel data models. The governance variables are not logged because they are ordinal indicators. It is difficult to interpret a percentage change in democracy and human rights.

### **2.3 Methodology**

The number of developing countries that receive aid varies from donor to donor and over time. Most donor countries only provide aid to a selected number of recipient countries. In particular small donors tend to concentrate their limited means on a relative small number of recipients while big donors are likely to support a wide range of developing countries. This means that the distribution of aid data on a donor by donor basis is truncated, that is to say, characterised by many 'zero' observations and a relatively small number of positive figures. Standard OLS estimation is not suited to deal with the nonlinearity in the dataset.

To address this issue three different econometric strategies have been proposed in the aid allocation literature.<sup>3</sup> The first strategy is the two-part model. In the first part – the selection stage – a probit model is estimated to determine the probability of receiving development aid. In the second part – the allocation stage – a linear regression model is used to investigate what determines the amount of aid developing countries receive from donors. The second model only uses a subsample of observations for which aid is positive. The two-part procedure treats both estimations as independent from each other and therefore assumes that the error terms of both models are not correlated.

The second strategy is Heckman's two-step estimator, which is similar to the two part model except that it corrects for the possible selection bias in the second step. This works best when an exclusionary variable is identified that impacts upon the selection stage but not upon the allocation stage. In practice, however, it is very difficult to identify variables that affect aid eligibility but not the allocated amount of aid.<sup>4</sup>

The third strategy is the Tobit model which uses a one-step approach to take into account the truncated nature of the data. The difference with Heckman's model is that by definition the independent variables have the same impact (both in size and sign) on the probability of obtaining aid and the amount of aid allocated.

Berthélemy and Tichit (2004) and Berthélemy (2006) using a large three dimensional (donor, recipient and time) panel dataset on aid flows find that the differences between Heckman, fixed effects, random effects, OLS and random effect Tobit models are small. Also Neumayer (2005) finds similar outcomes for the two-part model and Heckman's two-step estimator. In this paper I will use the two part model to investigate the allocation of aid to agriculture. A sensitivity analysis (non-reported) using the random effects Tobit model arrives at very similar results.

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<sup>3</sup> See Neumayer (2003a) for a more extensive discussion.

<sup>4</sup> Only a few authors have used Heckman's two-step estimator. See Neumayer (2003b) and Berthélemy (2006) for applications.

For the selection and allocation stages a probit and random effects model are applied, respectively. Both models are estimated with robust standard errors to correct for potential heteroscedasticity and with the inclusion of year-specific time dummies to take into account the trend in overall aid to agriculture (Figure 1). All time-varying explanatory variables enter the models with a one-year lag to account for the fact that policymakers need time to collect and assess information on potential target countries before the decision to allocate aid can be made. The lag also controls for potential reverse causality between aid and some of the independent variables. For example, more aid to agriculture can have positive effects on yield per hectare, calorie supply and through (agricultural) growth on GDP per capita.

The sample covers the period 1996-2008 for which data in aid to agriculture is available. It is restricted to countries on the 2008 OECD DAC list that registers all least developed countries, low income countries and middle income countries eligible to receive official development assistance (ODA).<sup>5</sup> In this way a few high-income countries (e.g. Hong Kong, Israel, South Korea and Singapore) that used to qualify for development assistance in the past are eliminated from the analysis. The DAC Aid statistics database only shows positive aid values. It therefore does not distinguish between eligible DAC countries that do not receive aid in a certain year from a certain donor and countries that no longer qualify to receive aid (both values are recorded as missing). The former group is relevant for the analysis and their values are set to zero. The second group might create a bias and is therefore removed from the sample.

The panel is unbalanced as some explanatory variables have limited coverage for some countries and years. At maximum 112 countries are included for each period.

### 3 Results

The estimation results for the selection state are presented in Table 1. Poorer countries have a higher chance to receive aid to agriculture from Japan and the Netherlands but not from the USA. Also countries with a large rural population have a higher probability to be eligible for aid. A lower calorie per capita supply renders a country more likely to receive aid to agriculture. In contrary to expectations, countries that have a higher cereal yield per hectare receive more agricultural aid from the USA. This finding is explained by the high level of aid to agriculture to Egypt, also one of the countries with the highest yield, before 2002. Only in the case of the Netherlands, colonies have a higher change of receiving aid. Geographical proximity increases the probability of receiving aid to agriculture from the USA but not from Japan and the Netherlands. The impact of agricultural imports on aid eligibility differs between the three donor countries. For the USA a higher share of food and live animals import even decrease the probability of receiving aid to agriculture. For the Netherlands and Japan the coefficient is positive and in case of the latter the effect is significant. With respect to the governance indicators, countries with a high score for democracy are given preference over countries with a poor record by the USA and the Netherlands. In contrast, countries are more likely to receive aid from Japan if they have a good human rights record, while this does not seem to be a factor for the other two donors.

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<sup>5</sup> See <http://www.oecd.org/dataoecd/62/48/41655745.pdf> (accessed 12-02-2011).

Estimations for the allocation stage are reported in Table 2. For none of the donors income per capita is significantly related to the amount of aid to agriculture. In line with expectations, countries with a large number of people living in rural conditions, and indicator for the size of the target group, receive more aid to agriculture. Only for the Netherlands lower domestic food production is a significant factor (at the 10 percent level) in allocating aid to agriculture. For USA and Japan the sign is also negative but not significant. Countries with a higher cereal yield receive more aid to agriculture from the Netherlands and Japan. Similar to findings for the USA in the selection stage, both donors tend to give more aid to countries with high agricultural performance, in particular China, Colombia, Egypt, Indonesia and Vietnam. No significant effects are found for the relationship between colonial status and the amount of aid to agriculture but countries that are closer to the USA and the Netherlands receive more aid to agriculture than other. Similar to the results from the selection analysis, Japan tends to favour countries from which it imports more agricultural products. The opposite is true for the Netherlands and for the USA where a negative or not-significant effect is found. Finally, countries with a good democracy record receive more aid from Japan and the Netherlands while human rights does not seem to be a relevant in the aid allocation decision of the three donor countries.

**Table 1: Selection stage**

	(1) USA	(2) Japan	(3) The Netherlands
Ln(GDP per capita)	-0.042 (0.057)	-0.119 <sup>**</sup> (0.060)	-0.116 <sup>**</sup> (0.055)
Ln(rural population)	0.388 <sup>***</sup> (0.039)	0.250 <sup>***</sup> (0.036)	0.358 <sup>***</sup> (0.037)
Ln(food production)	-1.808 <sup>***</sup> (0.329)	-0.430 (0.352)	-1.226 <sup>***</sup> (0.376)
Ln(yield)	0.192 <sup>***</sup> (0.067)	-0.040 (0.067)	0.056 (0.071)
Ln(colony)	0.092 (0.097)	-	0.232 <sup>**</sup> (0.095)
Ln(distance)	-0.450 <sup>***</sup> (0.093)	0.070 (0.103)	-0.010 (0.097)
Ln(imports)	-0.131 <sup>***</sup> (0.051)	0.152 <sup>**</sup> (0.060)	0.012 (0.054)
Democracy	0.104 <sup>***</sup> (0.016)	0.023 (0.017)	0.100 <sup>***</sup> (0.016)
Human rights	0.011 (0.053)	0.331 <sup>***</sup> (0.057)	-0.021 (0.052)
N	1443	1443	1443
Pseudo R2	0.215	0.283	0.222
Log likelihood	-743.437	-661.276	-714.404

Note: Standard errors in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ ; constant and time dummies not presented.

No single pattern emerges from the analysis. I find that for all three donors, either in the selection and/or the allocation stage, donor self-interest, recipient needs and good governance are relevant elements in the distribution of aid to agriculture. In line with other studies, the Netherlands is the most altruistic donor because, apart from more

aid to former donors, it gives importance to large rural population, domestic food production and democracy. The USA and Japan pursue more mixed strategies taking into account a variety of recipient needs, self-interest and good governance factors. A typical finding for the USA is the importance of geographical proximity. In the case of Japan, I find that the commercial interest is an important factor in both the selection and allocation stage. The strong relation between trade intensity and aid allocation is also found by (2003a) who examines total aid allocation patterns. It seems to be distinctive feature of Japanese aid policy. Also the results for GDP per capita, democracy and human rights are similar to the findings by Neumayer. This suggest that many donors use the same criteria for the allocation of total aid and sectoral aid, including agriculture.

**Table 2: Allocation stage**

	(1) USA	(2) Japan	(3) The Netherlands
Ln(GDP per capita)	-0.245 (0.212)	-0.145 (0.169)	0.091 (0.181)
Ln(rural population)	0.276** (0.133)	0.386*** (0.083)	0.430*** (0.106)
Ln(food production)	-1.392 (1.191)	-0.158 (0.792)	-2.208* (1.144)
Ln(yield)	0.341 (0.279)	0.313* (0.181)	0.550*** (0.200)
Ln(colony)	-0.290 (0.396)	-	0.209 (0.201)
Ln(distance)	-0.743** (0.347)	-0.370 (0.251)	-0.617** (0.304)
Ln(imports)	-0.261 (0.202)	0.397*** (0.133)	-0.370** (0.186)
Democracy	0.055 (0.051)	0.105*** (0.038)	0.109** (0.047)
Human rights	-0.090 (0.160)	0.123 (0.095)	0.172 (0.131)
N	526	957	480
Number of countries (max)	93	110	86
R2	0.218	0.408	0.119

Note: Standard errors in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ ; constant and time dummies not presented.

#### 4 Conclusions

As a consequence of the 2007/2008 food crisis, aid to agriculture has been on the rise again, and is expected to keep on increasing for the near future. In this context, this paper is a first attempt to analyse the allocation of aid to agriculture. In particular it has looked at the aid patterns of three donor countries: USA, the Netherlands and Japan, between 1995 and 2008. It has found that country-level factors, such as income per capita, good governance and trade have an impact on the eligibility of countries to receive aid to agriculture and on the amount of aid allocated. These findings are in accordance with studies that examine total aid patterns. Hence it suggests that support to the agricultural sector by donors are part of broader aid strategies. Nonetheless, donors also seem to take into account sector-specific needs factors as it was found that

aid to agriculture is significantly related to the number of rural people and domestic food production.

Unfortunately, due to lack of recent data it has not been possible to examine the impact of the recent food crisis on aid to agriculture patterns. It would be interesting to know if the behaviour of major donors has changed to anticipate the newly emerged food security problems in a number of developing countries or if old patterns of aid giving prevail. This would be an exciting topic for follow-up research when more recent aid data becomes available.

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