Exploring Spatial Dependence in Bi- and Multilateral Aid Giving Patterns

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Abstract

Even though donor coordination has been an issue since the beginning of modern Official Development Assistance (ODA) from the end of the Second World War, the interest in how ODA flows from different sources complement or substitute for each other has increased in recent years. In 2003, donors committed themselves in the Rome Declaration on Harmonization to a tighter coordination. Concerns about a limited absorptive capacity in the recipient countries, decreasing marginal returns on development projects and governance problems have been catalyst to the discussion. Using the previously unpublished PLAID dataset, the paper seeks to explore whether aid given by some donors to some recipients is affected by, i.e. spatially dependent on, other aid giving and whether ODA funds from different donors to a certain recipient act as substitutes or complements. The econometric approach builds on recent research in the field of spatial dependence in dyadic data.

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1. Introduction

Even though most donor countries regularly failed to reach the goal to spend 0.7 percent of their GDP on aid as it was agreed at the UN General Assembly in 1970, over the last six decades more than 1.75 trillion USD of bilateral and multilateral Official Development Assistance (ODA) have been transferred to developing and emerging countries.[1] Ever since the often cited work of McKinlay and Little (1977) the rationales for donors to provide ODA have been divided into two broad groups: donor interest and recipient need.[2] This distinction captures the idea that donors neither behave entirely selfish nor completely altruistic when allocating aid, i.e. that they pursue their national interests while also taking the need for aid in the beneficiary country into account. The humanitarian view identifies economic assistance as the primary reason for aid whereas in the foreign policy view aid is regarded as a mean to satisfy the interest of the donor (McKinlay and Little 1977). Recipient need, on the one hand, means that more aid should go to countries with the greatest need for poverty alleviation. Furthermore, natural disasters and political or ethnic conflicts can trigger need for (additional) foreign assistance. However, development needs can also be regarded from an aid efficiency point of view. If poverty reduction is the main objective, assistance should be given to countries where it can have the greatest impact. This may depend on the quality of governance and economic policy in the recipient country (Berthélemy 2006).

On the other hand, donor interests encompass a wide range of geopolitical, economic, military-strategic, or cultural interest. These could be achieved by establishing commitment on part of the donor and dependency on part of the recipient. If foreign aid is used to pursue national interests, a donor also has to observe aid allocation decisions by other donors and take changes in their aid giving into account when allocating its own aid. Furthermore, aid by other donors might serve a as a signal for a good investment and reduce the uncertainty on the effectiveness of aid projects. This study examines empirically, whether donors spatially depend on each other in their aid allocation decisions. While there are studies that use the aid commitments of other donors to a given recipient as an explanatory variable, the authors use a unit weighting matrix assuming that all other donors exert the same influence on a particular donor. Obviously, this is a very simplifying assumption as donors differ substantially. For instance, there is no reason to believe that bilateral donors are identically influenced by multilateral organisations and other bilateral

[1] Commitments with grant element greater than 25 percent in constant 2000 USD; Data taken from AidData (2010), Version 1.9.1.

[2] See, for instance Maizels and Nissanke (1984), Berthélemy and Tichit (2004) and Berthélemy (2006) for empirical studies on the relative importance of these two factors for various donors.

donors. The present analysis abandons this strong assumption and allows for variation in influence between different groups of donors. Furthermore, some light is shed on the question why donors act similarly. To distinguish different channels through which spatial contagion works, three recipient-specific weighting matrices are introduced that account for economic, political and military interests of donors. Not only average effects for all donors are reported, but donor-specific effects are estimated. Finally, a previously unpublished dataset is used, so that this analysis extends existing studies in terms of aid flows covered as well as in terms of number of donors and recipients included. The results show that there is evidence for positive spatial contagion, that is, that a donor is influenced by other donors in its aid allocation decisions. ODA transfers by different donors consequently act as complements rather than as substitutes. This might be interpreted as a lack of donor coordination since it provides no indication that donors tend to specialise on a specific set of recipient countries over time. As regards the channels through which contagion works, countries seem to react to changes in the allocation to countries with which they have close political ties if other donors that also have close relations with the same recipient change their aid to this recipient. However, in general considerable differences between donors are found. The reminder of this paper is structured as follows: in Section 2, potential causes of spatial dependence and its consequences are discussed, while Section 3 briefly reviews the relevant literature. Section 4 describes the estimation methodology, the construction of the spatial lags and the dataset used for estimation, while in Section 5 the main results are presented. Section 6 concludes.

2. Origin and consequences of spatial dependence

McKinlay and Little (1977) argue that aid can be used to establish commitment on part of the donor and dependency on the part of the recipient country which can be used to realise different policy utilities. Commitment could either reduce the risk of intervention of a hostile state, incentivise a recipient to stay within the sphere of influence of the donor, or be used to discourage a particular country to move into a rival's sphere of influence. In addition, dependency increases the potential of the donor to control the recipient and influence its behaviour in its own interest.[3] This is true not only for political and military, but also for economic interests. If a country seeks to protect its own national interests through foreign policy, it also has to observe the actions of other countries and their ambitions to secure influence closely. Since ODA is one mean to exert and secure power, donors should also monitor other

[3] For example, Dreher et. al (2007) show empirically that the U.S. uses aid to buy voting compliance in the UN General Assembly.

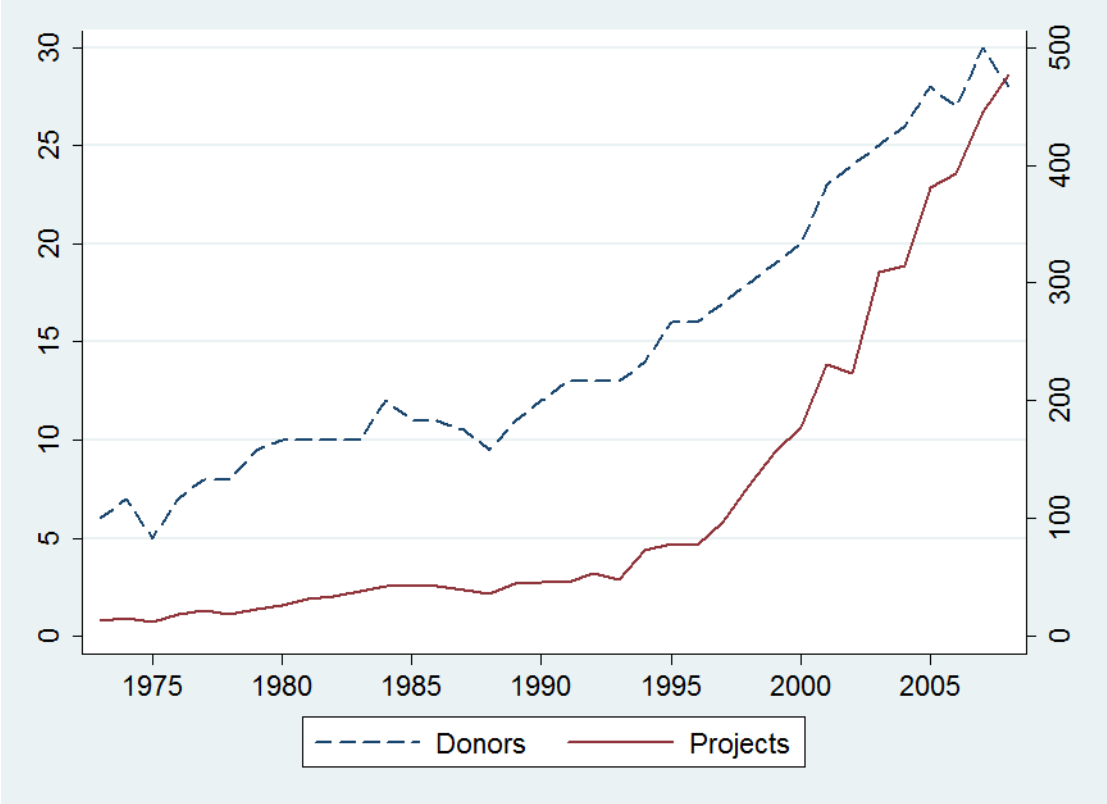
donors' aid allocation decisions and react correspondingly. As Frot and Sanitiso (2009: 25) put it, donors that do not "participate in the aid splurge" may fear to be left out and miss investment and diplomatic opportunities in the future. However, strategic arguments are not the only potential source of spatial dependence. Taking aid allocation decisions involves a great degree of uncertainty as a donor does not have full information on how effectively the money will be used in the recipient country. At the same time, donors are accountable to the national taxpayers for spending their money responsibly. This is why they might follow the example of other donors and give funds to the same countries as this might be a signal for a good investment (Vázquez 2008).[4]

If an analysis finds positive spatial dependence, aid flows by different donors are complements rather than substitutes. The consequences are not necessarily harmful in either case. After emergencies, such as the Tsunami hitting several Asian countries in 2004 or the recent earthquake in Haiti, great amounts of humanitarian aid are required that cannot be provided by a single country. Also, collective debt relief gives leeway to highly indebted countries and reduces the problem of free riding if debt relief by some creditors makes repayment of debt to other non-participating countries more likely. Furthermore, if good governance, respecting human rights and sound economic policy is rewarded, increased aid by several donors can act as an incentive to further promote democracy in the recipient country or induce other developing countries to improve in this field.[5] On the other hand, considerable negative effects of uncoordinated donor behaviour on aid effectiveness could also occur, which can broadly be subsumed under two main arguments: the origin of aid darlings and increased aid volatility. While these are closely interrelated as the latter is partly a consequence of the former, both aspects have their own negative implications. The first set of problems is concerned with the fact that large amount of aid are allocated to a certain country (or sector), which is accompanied by some negative effects, whereas other countries, as much in need (or sectors as underdeveloped), are marginalised and do not receive sufficient financial resources. Cassen (1994) notes that donors show some type of herding behaviour. This is an expression of 'aid fashion' and trends in ODA. On a country level, this leads to aid darlings and orphans, where the former receive much more aid than their economic and political situation would suggest, whereas the latter group receives substantially less. On a sector level, the focus on a few key areas, such as education or democratisation,

[4] Reinhardt (2006) provides a micro-level study that supports this argument.
[5] This is called the selectivity-strategy of aid allocation. See Neumayer (2003) for a discussion of different strategies in this context.

detracts funding from others both across and within countries.[6] This jeopardises sustainable development progress in the neglected areas and potentially leads to an administrative overload in the favoured nations or sectors, due to the mere amount of aid or increased donor fragmentation. One concern regarding the total amount of ODA inflow is the existence of decreasing returns on aid (Dudley and Montmarquette 1976, Lensink and White 2001). Limited absorptive capacities in the beneficiary country will also curtail the potential positive impact of financial transfers, if local administrations are overstrained and if they lack the ability to efficiently manage aid flows (Berg 1997).

Figure 1: Number of donors (left hand scale) and projects (right hand scale) in the median recipient country



Notes: Based on all donors and 149 recipient countries in AidData (2010), Version 1.9.; not corrected for reporting gaps.

If other bilateral and multilateral aid organisations follow the allocation decisions of a given donor, proliferation in the number of donors that are active in a country is a consequence. As can be seen from Figure 1, the number of bilateral and multilateral donors implementing projects in the median recipient country has risen steadily from five in the mid 1970s to 30 in the year 2006. During the same period, the number of projects has increased from twelve in 1975 to 477 in

[6] Anecdotally, a financial director of an NGO interviewed by Reinhardt (2006) stated: "Kids are hot right now. Political dissidence isn't. That makes thinks very complicated for us."

2008. Though, since NGOs are excluded, this underestimates the actual number of donor organisations the median recipient has to deal with.

This increased donor fragmentation might negatively affect the effectiveness of aid projects:[7] First, dealing with a large number of donors increases transaction costs as each donor has its own rules, procedures and reporting requirements.[8] Second, many foreign aid projects are characterised by large fixed costs and high returns to scale. These remain unexploited if each donor works on its own projects (Svensson 2008). Third, donor fragmentation impairs the recipient's financial ability and administrative capacity to govern. This is particularly true for project aid, where the donor works directly with or funds service providers such as schools or medical facilities. Furthermore, donors tend to support only investments and expect the recipient country to supply complementary inputs such as staff or maintenance (Svensson 2008). In addition donors poach for the most talented local experts and are able to attract them by paying salary supplements, which then will no longer be available to the domestic public or private sector (Arndt 2000). Redundancies in the bureaucracies of multiple donors aggravate this problem. Knack and Rahman (2008) find that larger donor fragmentation is associated with worse performance in terms of bureaucratic quality improvements. This is corroborated by Djankov et al. (2009) who find that recipients with highly fragmented donors grow slower than recipient collaborating with fewer donors. They argue that this can be partly explained by the increased corruption in the recipient country which is positively associated with the degree of donor fragmentation. Finally, if the number of donors in a recipient country is large and no single donor has a large share in the aid market, the accountability of each donor will be reduced and they might be less concerned that recurrent expenses caused by today's investment are secured or whether the projects are mutually consistent (Knack and Rahman 2008). Taken together, increased aid inflows and donor fragmentation caused by spatial contagion in aid allocation might lead to a situation, in which the "whole of aid in some sense [is] smaller than the sum of the parts" (Cassen 1994: 175).

The second major problem caused by positive spatial dependence in ODA granting is the increased volatility of aid flows if a change in aid allocation by one donor triggers changes in the

[7] This is not to say that donor monopolies in a recipient countries are a more favourable solution. This could negatively affect aid effectiveness and would increase dependency of the recipient country.
[8] In Tanzania, for instance, the government has to write about 2,000 reports to numerous donors and to deal with more than 1,000 delegations per year (World Bank 2003).

same direction by other donors.[9] The beneficial potentials of aid can be neutralised by high volatility and unpredictability, which impedes planning and effective fiscal and monetary policy (Bulíř and Hamann 2003). Lensink and Morrisey (2000) and Arellano et al. (2009) find significant negative effects of aid volatility on aggregate growth and consumption. Several studies have identified macroeconomic determinants of growth that exhibit a increased volatility as a consequence of greater aid fluctuations, for instance inflation (Fielding and Mavrotas 2005), fiscal policy (Fatas and Mihov 2008), or real exchange rates (Edwards and Wijnbergen 1989). Agénor and Aizenman (2007) show that aid recipients may fall into a poverty trap if unstable sources of funding inhibit governments to invest in projects that require a steady flow of financial resources.

3. Literature review

The determinants of aid allocation have been a popular topic in empirical research on ODA. McGillivray and White (1993) provide an early literature review, a more recent overview can be found in Neumayer (2003). Contrary to the plethora of studies focussing on the different political and economic determinants of aid allocation, work on spatial dependency in ODA allocation is by far more limited. To date only a few studies have addressed this issue, and none of them explicitly applies spatial econometric techniques. Looking at donor-specific studies first, McGillivray and Oczkowski (1992) estimate determinants of British ODA commitments. They find some positive effect of other DAC members' gross disbursements to the same recipient. Tarp et al. (1998) analyse determinants of Danish aid allocation decisions. To control for aid given by other donors, the aggregate ODA commitments from other bilateral and multilateral donors to a specific recipient country is included as a control variable. They find a positive and significant bandwagon effect both in the selection as well as in the allocation stage. Differences between countries with and without former colonial ties in the factors that determine Spanish aid allocation are the focus of Vázquez's (2008) analysis. He finds evidence that countries that receive more aid from other sources are more likely to be on Spain's recipient list, and that in the allocation of the aid budget there is a focus on countries with a higher aid-dependency, but no additional bandwagon effect. The author interprets the positive effect in the eligibility stage as a lack of donor coordination. Lastly, in a study on Italian foreign aid, Maurini and Settimo (2009) exploit the OECD DAC database and analyse absolute net disbursements from Italy to 156

[9] Bulíř and Hamann (2008) find that aid volatility has increased over time. This finding is supported by Kharas (2008) who argues that the costs of volatility are large and that herding behaviour aggravates collective volatility. Negative spatial dependence, on the other hand, has the potential to reduce volatility.

recipients from 1983 to 2006. A Tobit estimation reveals a positive and highly significant effect of other aid to the same recipient for all periods which is robust to the choice of specification.

On the other hand, to the best of my knowledge, only three studies have used a dyadic dataset encompassing various donors and recipients. Berthélemy and Tichit (2004) use a dataset covering 22 DAC donors and 137 recipient countries from 1980 to 1999. The total aid commitments per capita by other bilateral donors are included as a control variable. Over the whole period and sample, there is no conclusive evidence that aid by other donors matters. An analysis of differences between donors reveals a positive and highly significant effect of other bilateral donors' aid for the UK, the United States, Sweden, and Germany and a negative and significant impact on Belgian and Italian ODA. Berthélemy (2006) examines donor-specific determinants of aid allocation using the same dataset. While the main focus of his analysis is to find differences in the importance of donor interest vis-à-vis recipient needs, it is also controlled for the per capita aid committed by other donors. In the allocation equation, the effect of other donors' ODA is positive and significant indicating a complementary relationship between aid commitments from different donors. On average, a one percent increase in the per capita commitment of other bilateral donors is associated with a 0.28 percent increase in the commitment of a given donor. For multilateral assistance, this effect is 0.23 percent. However, once fixed effects are introduced, the effect of bilateral commitments becomes negative and significant and a one percent increase is accompanied by a 0.14 percent reduction in the commitment for a given dyad. Turning to donor-specific determinants, Berthélemy finds evidence that Germany, Canada, Belgium, and Finland regard their assistance as complements to other bilateral donors' ODA, whereas Japan, United Kingdom, United States, France, Italy, and Australia react with an aid reduction if other donors increase their aid commitments to a specific donor. These results are partly in contrast to the ones of the previous study by Berthélemy and Tichit, which indicates that results are sensitive to the estimation method chosen.

Kuhlgatz et. al (2010) examine how food aid allocation is influenced by decisions of other donors. The sample spans 33 years from 1972 to 2004 and covers per capita food aid transferred to 151 recipient countries. They find significant evidence for positive spatial contagion for each of the six major donors and the two multilateral organisations in the study. The authors argue that this complementarity is a sign for donor coordination rather than a lack thereof and is interpreted as a signal that planning authorities cooperate considerably.

Summing up, there is some evidence that the aid allocation of a particular donor is affected by allocation decisions of other donors. Most of the works find a positive relationship. However, all studies that include other donors' aggregate commitments as an explanatory variable have in common that they implicitly use a non-row standardised weighting matrix (or a row-standardised weighting matrix if the average ODA from other donors were used) that contains only ones for all donor-pairs, i.e. each donor gives the same attention to any other donor.[10] This assumption is not adequate if a particular donor observes the aid allocation of some other donors more closely than the actions of others. Furthermore, it is implied that the strength of this spatial dependence does not depend on the strength of the relations between a donor and recipient.

A very different approach is taken by Frot and Santiso (2009) and at the same time, this is the only study that addresses spatial dependence explicitly. Departing from the observation that traders in bonds and equities show considerable herding behaviour, they apply methods developed in the finance literature to aid allocation decisions of bilateral donors. Basically, their herding measure is based on the share of donors that increase their aid to a particular recipient in a year and assumes that in the absence of herding, increases and decreases are randomly distributed. Contrary to numerous existing studies, the decision process is modelled in a way that donors first decide which recipients get more and which get less than in the previous period and then allocate aid in a second step. In the empirical analysis, only the first step is examined. The data is taken from the OECD DAC dataset, which covers 48 years from 1960 to 2007. Based on three year averages, they find a herding size of about 10 percent, indicating that if half of the allocation changes are increases and half are decreases, an average recipient will experience that 60 percent of its donors increase (or decrease) their allocations. Differentiating between bilateral and multilateral organisations, the study finds no evidence for herding among multilateral donors; however, it is left open whether they react to allocation decisions taken by bilateral givers. An analysis of the determinants of herding reveals that a new policy adopted in the recipient country positively affects herding – after such a transition, a country receives funds from 20 percent more donors than the average beneficiary. A positive effect is also found for the occurrence of natural disasters, whereas a transition towards a more authoritarian regime is punished through a higher-than-average proportion of donors reducing their aid during the transition period. The constraint that every donor reacts to aid allocation decisions of all other donors in the same way is still valid. On the other hand, the limitation on decreases and increases neglects differences in the size of the change, i.e. a 50 percent increase is treated as the same as a 0.5 percent increase.

[10] The ODA flows from other donors are usually net of the ODA of a particular donor. This is equivalent to setting all diagonal elements of the weighting matrix to zero.

Even though they show that dropping small changes does not significantly affect the size of the herding measure, the absolute size of the change should play an important role when measuring the presence of spatial dependence.

4. Methodology and Data Description

Data description

The OECD defines official development assistance (ODA) as grants or loans to developing countries that are undertaken by the official sector are given mainly to promote economic development and welfare and contain a grant element of at least 25 percent in the case of loans (OECD 2008). This definition includes administrative expenses in the donor countries, technical assistance and financial flows. For the present analysis, the aid definition is further restricted to country programmable aid (CPA), which excludes humanitarian aid, debt relief, and food aid.[11] This leaves core aid that finances development in a medium to long term perspective and is closer than ODA to representing aid flows that are relevant to the decision-making at donor level (OECD 2009).[12] Furthermore, as argued above, positive spatial dependence for these assistance flows might be beneficial, whereas the consequences in other areas are more likely to be adverse to the economic development progress in the recipient country and to aid effectiveness. Therefore, the exclusion of certain aid elements facilitates interpretation of the results.

The PLAID dataset encompasses information both on commitments and disbursements from 1947 to 2009; however, with the exception of a few donors such as the World Bank, the vast majority of donors start reporting in 1973 or later. Since the purpose of this study is to examine how different donors depend on each other, information on a large number of donors is crucial in order to avoid biased results. Therefore, the study period is constricted to 1973 to 2008, which contains over 99 percent of all observations. In order to keep the sample at a manageable size, several alterations are made: On the donor side, multilateral organisations are replaced by their umbrella organisation and minor organisations with few projects or a very constrained field of activity are deleted. Furthermore, the Arab multilateral organisations Arab Fund for Economic and Social Development (AFESD) as well as Arab Bank for Economic Development in Africa

[11] CPA is defined as total gross ODA net of aid that is (1) unpredictable by nature (humanitarian and debt relief), (2) entails no cross-border flows (e.g., administrative costs), and (3) is not part of co-operation agreements between governments (e.g., food aid) (OECD 2009).

[12] First, all observations with missing information on both the flow type and the grant element are deleted. Then all projects classified as loans at market rates, equity investment, unknown loan type or other official flows are excluded. Finally, all observations with a grant element of less than 25 percent are dropped.

(BADEA) are taken as one donor. Finally, smaller donors with less than 1,000 projects over the whole study period are neglected.[13] Regarding the recipient-sample, projects with missing information in this variable are dropped, as are observations for which no specific country is listed as a recipient. This concerns particularly multilateral organisations and regionally unspecified flows. Additionally, OECD members as recipients are deleted as they are not the main target for ODA. Finally, all recipients with fewer than 100 projects and/or a population of less than 100,000 people are disregarded. This leaves a sample of 26 bilateral and ten multilateral donors on the one hand and 149 recipient countries on the other. Tables A1 and A2 in the Appendix list all countries and institutions included.

ODA commitments rather than the actual disbursements are taken as dependent variable.[14] As argued by Dudley and Montmarquette (1976), these provide a more accurate measure of donor supply than the actual money transfers, which partly depend on the administrative capacity and willingness to accept the funds in the recipient countries (Berthélemy 2006).[15] After dropping a very few number of projects with commitments of zero or less, the data are collapsed to form a donor-recipient-year dataset. Assuming full reporting, all gaps in the dataset were set to zero, but replaced by missings for all donor-years in which a particular does not report any figures. Also, for recipients, who became independent only after 1973 (mainly members of the former USSR), all observations before the independence year are set to missing.[16] After all cleaning up, the dataset contains information from 686,655 projects out of 868,336 projects in the original data (79.1 percent), for which all necessary information is available. In terms of commitments (in constant USD), 1.48 trillion USD out of 1.69 trillion USD (87.6 percent) are used.[17] There is no reason to assume that the reduction is non-random and causes any sample-selection-bias.

Most existing studies use either total amount of aid or aid per capita as left-hand variable; advocates of the former argue that the allocation on a per-capita basis "is both a difficult and cumbersome task" for donors (McGillivray and Oczkowski 1992: 1314). On the other hand, econometricians using per capita aid stress that it automatically controls for country size and

[13] 16 donors are affected, which are mainly developing or small countries such as Monaco, Iceland, and Liechtenstein. Since the situation of Arab donors is analysed separately this restriction is not applied to Arab donors in order to keep a sufficient number of actors.
[14] The OECD defines commitments as "a firm obligation expressed in writing", while disbursements are "the actual transfer of financial resources" (OECD 2002: 292).
[15] Besides this theoretical reasoning, with 50 percent missings information on disbursement is far less complete in the PLAID dataset.
[16] In some cases, aid flows are reported to dependent countries. Here, all years prior to the first positive ODA flow are set to missing.
[17] All estimations are based on the 1.9. version of the dataset.

allows testing for a small-country-bias (Berthélemy and Tichit 2004). However, a donor usually has a fixed aid budget, which is divided among potential recipients. This decision is best approximated if the aid to a particular recipient is expressed as a share of the total ODA allocated by a donor in a given year (Neumayer 2003). This definition has two other virtues (Vázquez 2008): First, it eliminates any bias caused by comparing figures over different years, for instance caused by measurement errors due to fluctuations in domestic exchange rates to the USD. Furthermore, it allows the use of nominal commitments and renders the choice of the correct deflation factor unnecessary. Second, as shares are normalised to one per donor and year, it is insensitive to trends in the size of the aid budget over time, e.g. the widespread reduction of aid budgets in the 1990s.

The set of explanatory variables can broadly be divided into three subsets: the spatial lags, variables measuring donor interest and controls for recipient need. The set of variables that control for recipient need encompasses:

- The *GDP per capita* in constant 2000 USD taken from the World Development Indicators (World Bank 2010) is included as an approximation for different aspects of development of the recipient country.
- To control for the size of a recipient, its *Population* is taken from the World Bank (2010).
- The number of fatalities caused by natural disasters (*Disaster deaths*) is taken from by the Emergency Events Database (EM-DAT 2010) and is expressed as number of deaths per 1,000 people of population. Even though humanitarian aid is excluded in the aid definition used, Frot and Santiso (2009) argue that natural disasters draw attention to the affected country and trigger aid flows from several donors not necessarily only in form of disaster relief but also in form of other long term investments. Accordingly, it is expected that a greater share of ODA is directed to countries that are hit by natural catastrophes.
- As a proxy for democratisation and good governance (*Democracy*), a measure provided by the Freedom House (2009) is included. As argued in the introductory section, a higher degree of democracy should raise the effectiveness of aid and send a positive signal to donors, thus a positive sign of the coefficient is anticipated.

With regard to donor interest, the following set of variables is taken:

- To account for economic interest, the variable *Trade share* measures the relative trade importance of a given recipient for a donor. Trade is defined as the sum of imports and exports and is expressed as the recipient's share in the total trade of a given donor. The

recipient's share as opposed to other normalisation factors such as population or GDP better reflects the relative importance of a single recipient as compared to other potential aid beneficiaries. Furthermore, normalisation by recipients' country size neutralises the fact that larger countries are more important trade partners. These countries should therefore receive more aid if a donor pursues economic interests.[18] Trade (particularly exports) exhibits the risk for a potential degree of simultaneity, in case tied aid increases the bilateral movement of goods. However, since commitments rather than disbursements are used in this context, and as the latter lag behind the former, the risk should be limited (Berthélemy 2006).

- As a measure for the strategic importance of the recipient, its share in the total US military grants is taken (*US military grant share*). Data is provided by USAID (2010). Unfortunately, this information is not sufficiently available for other donors. The underlying rationale is that countries that receive a large share of US military grants are strategically important to Western donors. It is expected that also more ODA is directed to these countries.
- As an approximation for the bilateral political relations, a dummy that takes the value of one if either of the dyad member has dispatched an ambassador to the other member dyad (*Diplomatic representation).* As more assistance should be allocated to countries with which the donor has close political ties, a positive effect is anticipated.
- As a second measure of bilateral relations, a dummy for the existence of a *Military alliance* is included. This variable takes the value of one if the donor and the recipient have signed a defence or an offense pact. The data are provided by Leeds et al. (2002). One argument for giving ODA are strategic rationales; therefore, a positive coefficient is anticipated.
- In the random-effects models, the controls are augmented by a set of time invariant variables which control for different aspects of proximity between donor and recipient: A dummy taking the value of unity if the recipient is a former colony of the donor (*colonial ties*), *distance* is the population weighted distance between donor and recipient and is taken from Head and Mayer (2002), *Religious similarity* measures the similarity based on the shares of five world religions, and *common language* is a dummy taking the value of one if both countries share an official language.

[18] Another point of view is raised by McGillivray and Edward Oczkowski (1992), who argue that policy makers might give more aid to trade partners, who are currently less important, in an attempt to foster trade relationships and promote their ability and inclination to purchase donor exports.

To include bilateral as well as multilateral organisations in the sample, for the variables for donor interest and variables that link a donor with a recipient (e.g., distance and colonial ties) the voting shares of the member states are used as weights to determine bilateral relations between a multilateral organisation and the recipients.[19] This reflects the assumption that in multinational donor institutions the power of a single member state to assert its national interest is determined by its relative influence in votes.[20] With the exception of disaster fatalities, all time variant variables are lagged by one year to mirror the situation allocators of aid faced at the time of decision-making and to reduce the potential risk of endogeneity.

There are several reasons to assume that aid commitments are time dependent, i.e. that the amount of the aid committed in a year depends on the assistance given in the year before. One of them is bureaucratic inertia: aid allocation decisions are the result of bureaucratic procedures, which allow only incremental change as long as there is no pivotal intervention (Allison 1971). Giving aid to a constant set of recipients also minimises administrative costs and efforts, as adding new partner countries involves additional expenses to implement new bilateral mechanisms. Furthermore, administrative efficiency might be increased if learning economies can be realised based on previous experiences in a recipient country (Vázquez 2008). As a donor is likely to be better informed about the economic and political situation as well as the need in a particular country in case this country is already a recipient of bilateral ODA, new aid commitments to this country exhibit less risk than aid to a new beneficiary. By the same token, experiences with the effectiveness of previous aid render it easier for a donor to assess ex-ante the outcome of a potential aid project. Particular dyad specific characteristics, for instance between Spain and many Latin American countries, may also lead to a cooperation which exhibits an increased stability over time. Lastly, sustainable development is a long-term process so that a donor might provide stable assistance over time to a partner as long as the terms of the cooperation are fulfilled. To account for this time dependency and to reduce a potential bias due to temporal dynamics, a one-year lag of aid commitments is included as a control variable.

Calculation of spatial lags

To analyse the potential influence ODA allocated to the same recipient by other donors, a spatial lag model is used, which includes the spatially weighted values of the dependent variable as an independent variable (Anselin 1988). Aid flows from a donor, either bilateral or multilateral, to a

[19] Due to restricted data availability, all voting share information is taken as time invariant.
[20] This is also true for dummy variables (e.g., diplomatic representation, strategic alliance). Thus, they are not dummies any more in the final dataset. However, interpretation is not affected.

recipient are an example of a directed dyad, in which there is a clear source and a target and the action originates at the former and is directed towards the latter. As outlined by Neumayer and Plümper (2010), there are various options to model spatial dependence in such a setting. In the present context, spatial dependence takes the form of 'specific source contagion' (Neumayer and Plümper 2010: 154), in which the aid flow (or the probability of a positive amount of aid in the first stage) between a donor *i* and a recipient *j* depends on the aid flows (and the existence of a positive amount of aid, respectively) of other donors *k* with the very same recipient *j*. For example, the amount of ODA the United Kingdom gives to Ghana depends on the assistance that other donors (e.g., France and Germany) allocate to Ghana. There are other forms of spatial contagion, such as aggregate source or aggregate target contagion, and specific target contagion (Neumayer and Plümper 2010). The aggregate forms of contagion assume that ODA flows between all other dyads, and not only those including recipient *j*, influence the aid from *i* to *j*. Against the background of donor interests in the recipient country it is not reasonable to presume that aid flows by other donors to other recipients influence aid allocation to recipient *j*. Specific target contagion, on the other hand, assumes that the amount of aid a recipient *j* receives from a donor *i* spatially depends on the amount of aid this donor *i* gives to other recipients *m*. In the current analysis it is assumed that developing countries exercise minimal influence over how much aid they receive and so that there is no specific target contagion.[21]

The connectivity between $dyad_{ij}$ and $dyad_{kj}$ is expressed in the weighting matrix. Abstracting from all other explanatory variables, the model reads as follows (Neumayer and Plümper 2010):

$$y_{ij} = \gamma \sum_{k \neq i} w_{pq} y_{kj} + \varepsilon_{ij} \qquad (1)$$

where y_{ij} is the foreign aid of donor *i* to recipient *j*, y_{kj} the aid of other donors apart from donor *i* to the same recipient *j* and w_{pq} is the weighting matrix.[22] The modelling of the strength of spatial dependence between two donors deserves however closer attention. As argued in section 2, it is assumed that donors take the aid decisions of other donors into account when allocating their aid. The basic questions are (1) whether all other donors *k* have the same influence on donor *i* or whether there are some donors that exert more influence than others, and if so, (2) which donors are more influential. To test this, six different weighting matrices are used to construct the spatial lags, which can be grouped into two categories: the first group encompasses weighting matrices

[21] Obviously, given the fixed aid budget, ODA has to be allocated between all potential recipients. This is captured in defining aid to recipient *j* as a share of total aid by donor *i*.
[22] For illustrative purposes, time indices not included.

that are not recipient specific,[23] whereas weights in the second group depend both on the link between donor *i* and recipient *j* as well as donor *k* and recipient *j*. Specifically, the three weighting matrices in the first group are:

- *All donors*: This is a very basic unit matrix, which consists of only ones for all non-diagonal elements.[24] This implicates that all donors exert the same degree of influence. For instance the impact of the dyad Germany-Ghana on UK-Ghana is the same as the impact of the dyad France-Ghana. Such a weighing matrix simply measures the aggregate amount of aid from other donors in a given recipient country (if matrix is not row-standardised) and the average amount of aid, respectively, with a row-standardised matrix.
- *Same group*: Now bilateral and multilateral donors are distinguished. The matrix contains a one if both donor *i* and donor *k* are either bilateral or multilateral and zero otherwise. It is assumed that multilateral organisations are only influenced by the aid decisions of other multilateral institutions and bilateral donors only by other bilateral donors.
- *Same subgroup*: Here donors are classified into five groups: Arab donors, the Big Western donors, the like-minded countries, other bilateral donors, and multilateral donors (see Table A1 for a classification of donors). In this weighting matrix, donors are assumed to be impacted only by other donors in the same subgroup.

In the second group, the influence of donor *k* on donor *i* regarding aid to recipient *j* depends on the link between the donor *k* and recipient *j* on the one hand and the link between donor *i* and recipient *j* on the other hand. These links can be modelled as substitutes or as complements. The former assumes that the strength of connectivity between $dyad_{ij}$ and $dyad_{kj}$ is positive even if only one of the links (i.e. between *i* and *j* or between *k* and *j*) is non-zero, whereas for a complementary relationship both links must be positive. Mathematically, substitutes are expressed by the sum of the two links, and complements by their product. In the present analysis, a complementary relationship is assumed, that is, $dyad_{ij}$ is influenced by $dyad_{kj}$ if, and only if, both the $link_{ij}$ and the $link_{kj}$ are non-zero:

$$w_{pq} = w_{(ij)(kj)} = link_{ij} * link_{kj} \qquad (2)$$

The weighting matrix, which determines the influence of aid flows from donor *k* to recipient *j* on the aid flow from donor *i* to recipient *j* is the product of the link between donor *i* and recipient *j* and donor *k* and recipient *j*. This reflects the assumption that aid to a given recipient is only influenced by aid from other donors to the same recipient if this recipient is of importance for the

[23] For these, the weighting matrix w_{pq} is equal to $w_{ik} = w_{ki}$.
[24] The diagonal elements of all weighting matrices are set to zero since a donor cannot spatially depend on itself.

donor. More specifically, when looking at economic considerations that determine aid allocation, aid by donor *i* to recipient *j* is the stronger influenced the more economically important recipient *j* is for donor *i*. On the other hand, the strength of influence of another donor *k* is the higher, the more economically important recipient *j* is for this donor *k*.

To represent the different aspects of donor interest discussed above, three different measurements are taken as a link:

- *Bilateral trade*: To account for economic interest, the product of the two trade shares is taken. $Link_{ij}$ is the share of recipient *j* at the total trade of donor *i*, whereas $Link_{kj}$ is the share of recipient *j* at the total trade of donor *k*. The value in the respective cell of the weighting matrix is the higher, the more important in terms of trade recipient *j* is both for donor *i* and donor *k*. For instance, China is a relatively important trade partner of Japan (18.65 percent of Japan's total trade in 2007 is with China) and South Korea (20.58 percent of South Korea's total trade). Therefore, it is assumed that the aid allocation decision of Japan with regard to China is relatively strongly influenced by the aid from South Korea to China. The element of the weighting matrix is 0.1865 * 0.2058 = 0.038. On the other hand, Ghana's trade share in Japan's total trade is 0.018 percent, and 0.023 in Korea's, respectively. The corresponding element in the weighting matrix therefore is 0.018 * 0.023 = 0.000414.
- *Military alliance*: This matrix is for testing the hypothesis that a donor is more heavily influenced by other donors if a particular recipient is strategically important for both donors. As described above, the variable is coded as one if the both countries of a dyad formed a military alliance and zero otherwise. The weighting matrix contains the value of one, if and only if, both donor *i* and donor *k* have a military alliance with recipient *j*.
- *Diplomatic representation*: This measure is a proxy for close political relations. As with military alliance, the link is the existence of a diplomatic representation between both dyad members, measured by a dummy (see the variable description for details).

For the ease of interpretation, all weighting matrices are row-standardised, i.e. each cell of the matrix is divided by its row sum. This results in a new row-standardised weighting matrix in which the weights in each row add up to one. The spatial lag is now the weighted average of the lagged depended variable in other dyads. As noted by Plümper and Neumayer (2010), model specification in the analysis of spatial dependence needs to take into account several specific issues. This is to avoid biased results and to draw causal inference rather than simply catching

spurious effects. First, the one-period time lag of the dependent variable that is included on the right hand side controls for temporal dynamics. The effect of a common trend, e.g., all donors give more or less aid, is removed by normalising the ODA commitments per donor-year to one, i.e. by expressing aid in shares rather than in absolute values.[25] In addition, common shocks, i.e. events that influence all donors simultaneously, might feign spatial dependency. The most important external shock is the occurrence of a natural disaster, which is accounted for. Furthermore, the existence of spatial clustering and unobserved spatial heterogeneity, i.e. factors which influence aid allocation decisions of several donors but which cannot be controlled for can lead to biased spatial effects. To mitigate the impact of the former, the model specification is as broad as possible to control for a wide range of observable factors that might influence donor decisions.[26] To address the problem of unobserved spatial heterogeneity, all models are estimated with dyad fixed effects. This removes all variation between dyads and the estimation is solely based on the with-in variation of each dyad. While this automatically controls for any time-invariant dyad specific effect, such as cultural and geographic proximity or bilateral relations (e.g., the United States' large ODA to Israel and Egypt), it also removes unobserved spatial heterogeneity and spatial clustering in ODA levels (Plümper and Neumayer 2010). The inclusion of fixed effects also changes the tested hypothesis instead of examining spatial dependence in the size of ODA, now spatial dependence in the changes in ODA over time is analysed. In the present context, this is reasonable and more in line with Frot and Santiso (2009). Spatially lagged dependent variables exhibit a certain degree of endogeneity as an external shock that cannot be controlled for in a given dyad affects other dyads via the spatial lag and is reflected back to the original dyad on the same way. However, this bias should be less pronounced in aid shares than in aid levels. More importantly, the spatial lags are lagged by one year which further mitigates the problem.

Estimation Methodology

The process of aid allocation can be modelled as a two-step decision: In the first step, a donor country decides to which of all potential recipients it will allocate any positive amount of aid (eligibility stage, gate-keeping state). In case of a positive answer, the actual amount of aid is determined in a second step (level stage).[27] The preferred estimation method is a two-part model,

[25] In the first stage, a t-1 set of period dummies is included.

[26] However, there is a clear trade-off between the comprehensiveness of the model specification on the one hand, and the problem of data availability and multi-collinearity on the other.

[27] Vázquez (2008) proposes a three-step model, in which the first step is the decision of a government on the size of the ODA budget. Also this stage can be subject to spatial contagion if the amount dedicated to ODA in one country

which has been widely applied in the context of aid allocation, which is estimated in two steps and is based on the assumption that the two stages are independent of each other, i.e. that there is no correlation in the error terms of both regressions.[28] When analysing aid allocation, this might be a reasonable supposition, since the first step, i.e. the decision which countries will be partner countries, is more political and regularly influenced by the government (as pointed out by Tarp et al. (1998) for the Danish aid policy), whereas the second step, the actual allocation is determined by the aid administration. Eventually, the model estimating the eligibility stage reads as follows and is estimated via a random-effects Probit model:

$$Pr(Y_{ijt} = 1) = F(\alpha_0 + \beta_1 Y_{ij(t-1)} + \gamma' X_{ijt} + \pi' Z_{ijt} + \delta' T_t) \quad (3)$$

where Y_{ijt} is a dummy taking the value of one if recipient *j* gets any positive amount from donor *i* in period *t*.[29] $Y_{ij(t-1)}$ is the one-year lag and indicates whether the same recipient received ODA from the same donor in the prior period. The spatial lags described above are included in $X_{ijt.}$ Z_{ijt} contains the control variables. Finally, T is a t-1 set of period dummies to capture aggregate effects such as the total amount of aid allocated. F stands for the cumulative standard normal distribution. The parameters α, β, γ, π, and δ are to be estimated. The estimation equation for the second stage is as follows:

$$Z^*_{ijt} = \alpha_0 + \beta_1 Z_{ij(t-1)} + \gamma' X_{ijt} + \delta' Z_{ijt} + \delta' Y_{ijt} + \varepsilon_{ijt} \quad (4)$$

where Z^*_{ijt} is the share of recipient *j* at the total ODA of donor *i* in period *t*. Since in the allocation stage the actual amount of aid given is estimated, only observations with $Z^*_{ijt} > 0$ are included in the analysis. $Z_{ij(t-1)}$ again is the one-year lag of the dependent variable and ε_{ijt} is the error term. In both stages, the main interest of the analysis lies in the coefficient of the spatial lags γ. Estimating the dynamic model in equation (4) with a fixed effects model introduces a Nickell (1981) bias; however this bias diminishes as the number of periods T gets large and the dataset covers the period from 1973 to 2007.

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depends on the aid budget in other donor countries. However, as this decision is affected by a completely set of determinants, it is ignored in this analysis. See e.g. Hopkins (2000) and Round and Odedokun (2004) for studies.

[28] The Heckman sample selection does not rely on this assumption, but requires a so-called exclusion restriction, i.e. a factor that influences only aid eligibility, but not the actual amount of aid allocated. Such a variable is hard to find. Furthermore, as shown by Manning et al. (1987), the potential bias of the two-part model is likely to be minor in typical situations. In the context of ODA allocation, Alesina and Dollar (2000) and Berthélemy (2006) find not much correlation between the residuals of the selection equation in the first step and of the allocation equation in the second step. They conclude that the linear estimation in the second step is as good as the Heckman estimation.

[29] Some others, such as McGillivray (1992) and Vázquez (2008) define a country as an aid recipient only if the aid received exceeds a given threshold, e.g. one percent of Spanish ODA in Vázquez (2008). However, the choice of this cut-off point is arbitrary as there is no guiding theory.

5. Main Results

Table 1 displays the results of the eligibility stage, estimated by a random-effects Probit model. Briefly looking at the control variables first, it can be seen that the probability that a certain country receives aid from a given donor is higher if the same donor allocated ODA to this recipient in the last year. As expected, richer countries are less likely to get aid, as are more distant countries. Nations with a larger population, a better performance in terms of good governance and countries that receive a higher share of US military grants are more likely to be rewarded with aid. The same is true for recipients that are similar to the donor in other aspects (common language or religion) or share colonial ties with the donor. The overall size of the aid budget of a donor increases the probability that a certain recipient receives aid, indicating that bigger donors tend to support a larger number of recipients. No evidence is found that natural disasters or the trade relationship matters in the first stage. A military alliance with the donor seems to reduce the probability to be on a donor's recipients list. This is odd as there is no explanation for this; however, a dummy variable is a very crude measure for the military ties between two countries. The results for the regional dummies are not shown, but there is evidence that a country in Europe and Central Asia and in Middle East and Northern Africa all else equal is less likely to receive aid than a Sub-Saharan nation. The effects of the spatial lags are by and large as anticipated. A country is more probable to get aid if other donors give aid to the same country. This holds true if one only looks at other bilateral or multilateral donors (same group) as well as for a finer distinction between donors (same subgroup). In model IV two spatial lags are included together. After controlling for aid decisions by all other donors, there is still evidence that a donor specifically is influenced by other donors in the same subgroup. In line with the expectations, the size of both coefficients gets smaller. For the recipient-specific weighting matrices, the trade and the diplomatic representation link are positive and significant, but not the military alliance link. Combing them into one model (VIII), the first two lags remain positive and significant, while the military alliance becomes negative and significant. This is again counter-intuitive as there is no reason to believe that a recipient should be less likely to receive aid from one military alliance partner if it receives ODA from another alliance partner.

Table 1 around here

The estimation results for the second stage, in which the donors allocate ODA to all recipients that were selected as partner countries in the first stage, are shown in Table 2. The dependent variable is recipient *j*'s share at the total ODA commitments of donor *i* in year *t*. To improve

model fit and for ease of interpretation, the natural log of the share is taken. Consequently, also the spatial lags are calculated by multiplying the logged share with the respective weighting matrix. Since the estimated model includes a time-lag of the dependent variable, the coefficients displayed are merely the short-run effects. The long-term effects need to take into account the coefficient of the lagged dependent variable. Again a brief look at the control variables first. As in the first stage, the one-year lag is positive and highly significant in all specifications, indicating that a 10 percent increase in last year's share is associated with a 1.5 increase in the contemporary share. A similar effect, but with a negative sign, has *GDP pc*. The coefficient of *Population* is negative and significant at the 1 percent level; however, since the estimate is not statistically different from 1 in all specifications, there is no conclusive evidence for a small country bias in aid allocation, i.e. a population increase by 1 percent is associated by roughly the same increase in the aid share. A change in *Democracy* as well as changes in *Diplomatic representation* is rewarded with a higher share of assistance. No significant effect is found for *Disaster deaths* and *Trade share*. However, the fixed effects estimator, which is necessary in for spatial lags as outlined above, solely relies on within-variation. This variation over time is very limited for time consistent variables such as *Military alliance* or the *Trade share*. Estimating a model without spatial lags with random-effects instead of fixed-effects reveals a positive and highly significant effect of trade (elasticity of 0.126). Also, *Military alliance* becomes positive and significant – recipients with such an alliance receive a by 29 percent higher ODA share than other countries. Turning to the spatial lags, there is consistent evidence of spatial dependence at least for the non-recipient specific weighting matrices. If other donors on average increase the share to a recipient by 1 percent, a given donor raises its share by 0.26 percent in the short-run and by 0.31 percent in the long-run. The lower coefficients for the spatial lags that use the "same group" and "same subgroup" weighting matrices indicate that a donor is in fact less influenced by similar other donors than by the average of all donors. As anticipated, the size of the coefficients becomes smaller when two spatial lags are incorporated into one model (IV). The relative size of the coefficients corroborates the finding that all other donors exert to strongest influence. For the spatial lags using a recipient-specific weighting matrix, only the link *Diplomatic representation* is positive and significant.[30] If other donors raise their ODA share to a given recipient with which they have a diplomatic relation on average by 1 percent, a donor that has also such a relation with the same recipient increases its share to this recipient by 0.17 percent in the short-run and 0.19 percent in the long-run.

[30] In model V, the spatial lag using the trade link as a weighting matrix is only marginally insignificant (p-value: 0.102).

Table 2 around here

Summing up, there is evidence for positive spatial dependence between donors – and no signal for negative spatial dependence which would indicate some kind of donor specialisation on specific countries. Yet, it is less clear through which channels spatial dependence works. Most importantly, aid to important trade partners seems not to be influenced by changes in the aid allocation by other donors that also have a strong trade-connection with the same recipient.

After the end of the cold war, the global distribution of power changed considerably. This could affect the aid allocation decisions of donors in general but also the degree of spatial contagion as strategic considerations in aid giving might have become less pronounced after the breakdown of the USSR, while the transformation of former communist countries to market economies could have strengthen economic interest in ODA allocation. This could be estimated by running separate regressions on the pre- and post 1990 sample; however, this would be not efficient since not all information is used. Instead, two interaction terms are introduced: An interaction between the variable of interest, i.e. the spatial lag, and a dummy taking the value of unity for the years before 1990 and an interaction between the same spatial lag and a dummy taking the value of one after 1990.[31] These interactions terms show the elasticity for the years before and after the end of the cold war, respectively. Table 3 shows the estimation results for the allocation stage; to save space, only the relevant coefficients are displayed, the set of control variables is the same as in Table 2. In line with Berthélemy and Tichit (2004), evidence is found that spatial dependence has increased since 1990. For instance, the short term elasticity of the spatial lag with the unity weighting matrix ("W: All donors") is 0.26 and positive significant for the period after 1990, while the coefficient is lower and insignificant for the years during the cold war. For the spatial lags with recipient-specific weighting matrices, only the one with the "Diplomatic representation" weighting matrix is significant in the second sub-period.

Table 3 around here

So far, only average values for all donors have been analysed. In the following, the extent of spatial dependence is scrutinised for specific donors and donor groups, respectively. As above,

[31] This approach has the advantage that the elasticities can be compared directly. Another possibility would be to include the spatial lag without interaction, the interaction term as well as a dummy taking the value of one in the post-cold war period. The coefficient of the interaction term would then show the difference in the elasticity between the post-1990 period and the whole period, which is not the focus of interest.

two interaction terms are included: On the one hand, the spatial lags are interacted with a dummy taking the value of one for a specific donor (group) and zero otherwise. On the other hand, they are interacted with a dummy equal to one for all other donors and zero otherwise. This estimates two different elasticities for the donor (group) of interest as compared to the remaining donors. Figures 2a to c present the coefficients and the 95 percent confidence intervals of the interaction term of the spatial lag and the dummy for a particular donor. For space reasons, only results for a selected donors and three of the weighting matrices are shown. Regarding the weighting matrix "same subgroup" (Figure 2a), a positive and significant effect has been found for all donors (Table 2). However, as it becomes clear from the graph, the effects differ widely across different donors. The highest short-term elasticity, 0.73, is found for Australia, which is – despite being estimated rather imprecisely – statistically significant at the five percent level.[32] For bilateral donors, as compared to multilateral donors, the estimated elasticity is 0.178. By the same token, The Big Western donors and the like-minded donors exhibit positive spatial dependence. The average effect presented in Table 2 is clearly driven by bilateral donors, as none of the multilateral organisation shows evidence for positive spatial dependence. Interestingly, when looking at the average spatial dependence of all other donors (W: all donors), the effect for the World Bank becomes negative and significant, suggesting that its ODA is directed to countries which receive fewer aid by other donors.

While the overall effect of the spatial lag with the trade share link is positive, but not significant, there is some evidence for positive spatial dependence for a few countries (Figure 2b). Yet, apart from Germany, these are not found in the group of Big Western Countries. Rather, with Denmark and Sweden two countries from the group of Like-minded countries are among the donors with the highest elasticity. For bilateral donors in general, only a very small effect (0.06 percent) is found, whereas elasticity for the World Bank is negative (-0.17 percent) and significant. Finally, the positive and highly significant effect of the spatial lag with the diplomatic representation link as a weighting matrix is driven by a small subset of six countries such as Switzerland, Spain, and Germany. Again, the elasticities for bilateral donors in generals as well as for Big Western donors and Like-minded donors in particular, are positive and significant at the five percent level. For the group of Arab donors, no evidence for spatial dependence is found with any of the weighting matrices used.

[32] Only short-term effects are reported; however, since the coefficient on the time-lag is virtually the same over all regressions, the shift between long- and short term effect is proportional for all donors.

6. Conclusion

The aim of this paper was to analyse how the aid allocation by one donor is influenced by the ODA distribution of other donors. Spatial dependence can occur if a donor uses foreign aid given by other donors as a guiding line for its own decision in order to reduce the uncertainty about the effectiveness of aid projects. Furthermore, aid is at least partly given for strategic reasons. If competing countries use their ODA to secure national interests, every country will respond to this behaviour by adapting its own aid allocation. The decision process is modelled as a two-step procedure, in which a donor in the first step compiles the recipient list, i.e. the set of countries that will receive aid. In the second step, the aid budget is distributed to these countries. Spatial dependence is analysed in both stages. In the first stage, there is comprehensive evidence that the probability that a donor gives some positive amount to a certain recipient is higher if this recipient also receives aid from other donors. This result holds true after controlling for various aspects of recipient need. The estimation results for the second stage suggest that the aid allocation of other donors matters; however only limited evidence for strategic interaction among donors is found. Looking at single donors or donor groups, it is shown that multilateral organisations act more independently of other donors than bilateral donors. The most interesting point, however, is what is not found in any model or specification: negative spatial dependence, which would indicate that aid flows by one country are a substitute rather a complement to foreign aid by other donors. In fact, there seems to be considerable herding as aid increases (decreases) to a given recipient trigger reallocations by other donors in the same direction. This might be interpreted as a lack of donor coordination, at least there is no evidence that donors tended to specialise on a certain set of recipients over time. However, positive spatial dependence on a donor-recipient level needs not necessarily negate donor coordination as it does not provide any insights in how aid flows by various donors to one recipient are dovetailed on a micro-level. This analysis is only a first step to better understand how aid allocation decisions are influenced by others and to draw a more complete picture of factors that determine how donors spend their aid budgets. Further research is needed on a finer resolution; A starting point would be an analysis of spatial dependence on a sector level. Furthermore, this analysis is based on the assumption that recipients are not able to greatly influence the amount of aid they receive and that characteristics of other recipients do not affect aid to a given recipient. Implicitly, this means that aid flows by a given donor to a given recipient are not influenced by aid from the same donor to other recipients. This assumption should be tested in future work by including spatially lagged characteristics of other recipients into the estimation equation, whereby the spatial weight depends on the degree of similarity between the recipients.

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Appendix

Table A1: Donor classification

Weighting matrix:	*Same group*	*Same subgroup*
Kuwait (1973-2007) Saudi Arabia (1975-1980, 1982-1999, 2002-2005) United Arab Emirates (1973-1987, 1998-2004, 2008)	Bilateral donors	Arab donors
France (1973-2008) Germany (1973-2008) Italy (1973-1977, 1980-2008) Japan (1973-2008) United Kingdom (1973-2008) United States (1973-2008)		Big Western donors
Canada (1973-2008) Denmark (1973-2008) Netherlands (1973-2008) Norway (1973-2008) Sweden (1973-2008)		Like-minded countries
Australia (1973-2008) Austria (1974, 1976-2008) Belgium (1973-2008) Finland (1974-2008) Greece (2002-2008) Ireland (2000-2008) Republic of Korea (1991-2008) Luxembourg (2001-2008) New Zealand (2002-2008) Portugal (1983-1985, 1987-2008) Spain (1988-2008) Switzerland (1973-2008)		Other bilateral donors
EC (European Community, 1973-2008) AFDB Group (African Development Bank, 1973-2008) ASDB (Asian Development Bank, 1973-2008) Arab Multilateral Organisations[1] (1973-2008) EBRD (European Bank for Reconstruction and Development, 1991-2008) IADB (Inter-American Development Bank, 1973-2007) IMF (International Monetary Fund, 1981-2008) OPEC (Organization of Petroleum Exporting Countries, 1976-2000, 2002-2007) United Nations (1978-1986, 1988-2008) World Bank (1973-2008)	Multilateral donors	Multilateral donors

Notes: Years in brackets indicate data availability; [1] Arab Fund for Economic and Social Development (AFESD) and Arab Bank for Economic Development in Africa (BADEA).

Table A2: List of recipients

Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bahrain, Bangladesh, Barbados, Belarus, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros, Democratic Republic of Congo, Republic of Congo, Costa Rica, Cote d'Ivoire, Croatia, Cuba, Czech Republic, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Fiji, Gabon, The Gambia, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iran, Iraq, Israel, Jamaica, Jordan, Kazakhstan, Kenya, Kiribati, Democratic Republic of Korea, Republic of Korea, Kuwait, Kyrgyz Republic, Lao, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Qatar, Romania, Russian Federation, Rwanda, Saudi Arabia, Senegal, Serbia, Serbia and Montenegro, Seychelles, Sierra Leone, Singapore, Slovak Republic, Slovenia, Somalia, South Africa, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Syrian Arab Republic, Taiwan, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, Uruguay, Uzbekistan, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe

Table 1: Eligibility stage (first stage) random-effects Probit results for all donors

Model	I	II	III	IV	V	VI	VII	VIII
Dummy: positive aid allocation (t-1)	1.026***	1.014***	1.011***	1.009***	1.038***	1.039***	1.045***	1.037***
	(59.70)	(59.15)	(59.17)	(58.93)	(60.62)	(60.62)	(60.90)	(60.60)
W: All donors (t-1)	1.071***			0.469***				
	(18.69)			(7.19)				
W: Same group of donors (t-1)		0.933***						
		(22.56)						
W: Same subgroup of donors (t-1)			0.905***	0.752***				
			(26.09)	(18.97)				
W: Trade share link (t-1)					0.338***			0.288***
					(10.36)			(7.85)
W: Diplomatic representation link (t-1)						0.316***		0.205***
						(8.26)		(4.72)
W: Military alliance link (t-1)							-0.0605	-0.214***
							(-1.22)	(-4.12)
GDP per capita (log, t-1)	-0.116***	-0.127***	-0.131***	-0.117***	-0.143***	-0.141***	-0.161***	-0.136***
	(-9.56)	(-10.64)	(-10.93)	(-9.67)	(-11.68)	(-11.47)	(-13.16)	(-11.06)
Population (log, t-1)	0.0455***	0.0462***	0.0593***	0.0467***	0.0779***	0.0834***	0.0839***	0.0783***
	(5.52)	(5.64)	(7.32)	(5.69)	(9.54)	(10.21)	(10.28)	(9.59)
Disaster deaths	-0.00762	-0.00904	-0.0114	-0.008	-0.0136	-0.0172	-0.0178	-0.0139
	(-0.42)	(-0.48)	(-0.62)	(-0.44)	(-0.74)	(-0.92)	(-0.95)	(-0.75)
Democracy (t-1)	0.00893***	0.00973***	0.00983***	0.00822***	0.0126***	0.0133***	0.0145***	0.0123***
	(3.68)	(4.06)	(4.08)	(3.41)	(5.14)	(5.45)	(5.91)	(5.04)
Trade share (log, t-1)	0.00618	0.00959*	0.0104*	0.00881*	0.00947*	0.00844	0.00978*	0.00961*
	(1.44)	(2.22)	(2.39)	(2.03)	(2.16)	(1.95)	(2.22)	(2.22)
US military grant share (t-1)	0.0031	0.00334	0.00457*	0.00396	0.00418	0.00420*	0.00438*	0.00379
	(1.41)	(1.57)	(2.14)	(1.83)	(1.96)	(1.97)	(2.07)	(1.76)
Diplomatic representation (t-1)	0.239***	0.253***	0.240***	0.234***	0.250***	0.124***	0.260***	0.164***
	(12.27)	(12.85)	(12.41)	(12.14)	(12.74)	(5.06)	(13.18)	(6.46)
Military alliance (t-1)	-0.342***	-0.358***	-0.383***	-0.353***	-0.408***	-0.406***	-0.407***	-0.311***
	(-8.54)	(-8.99)	(-9.42)	(-8.70)	(-10.11)	(-10.02)	(-9.37)	(-7.07)
Total ODA of donor (log)	0.143***	0.143***	0.132***	0.135***	0.141***	0.137***	0.140***	0.140***
	(33.39)	(33.50)	(31.13)	(31.57)	(32.85)	(32.45)	(32.78)	(32.73)
Common language	0.193***	0.198***	0.200***	0.201***	0.193***	0.183***	0.182***	0.187***
	(5.32)	(5.45)	(5.48)	(5.53)	(5.29)	(5.00)	(5.01)	(5.14)
Distance (log)	-0.244***	-0.244***	-0.251***	-0.251***	-0.241***	-0.247***	-0.240***	-0.241***
	(-11.90)	(-11.88)	(-12.32)	(-12.29)	(-11.80)	(-12.00)	(-11.69)	(-11.81)
Religious similarity	0.00129**	0.00123**	0.000893*	0.000938*	0.00123**	0.00131**	0.00136***	0.00120**
	(3.15)	(3.00)	(2.21)	(2.31)	(3.02)	(3.20)	(3.32)	(2.95)
Colonial ties	0.157*	0.162*	0.136*	0.142*	0.148*	0.143*	0.148*	0.148*
	(2.51)	(2.53)	(2.08)	(2.19)	(2.34)	(2.27)	(2.33)	(2.35)
Observations	105,122	105,122	105,122	105,122	105,122	105,122	105,122	105,122
Number of dyads	4,800	4,800	4,800	4,800	4,800	4,800	4,800	4,800

Notes: Dependent variable: dummy taking the value of unity if a donor allocates any positive amount of aid to a recipient; Coefficients displayed; Coefficients on t-1 year dummies, five regional dummies and the constant not shown; Robust standard errors; Z-values in parenthesis; W: denotes the weighting matrix used for calculating the spatial lags; * statistically significant at 0.05, ** 0.01, or *** 0.001 level.

Table 2: Allocation stage (second stage) fixed effects estimation results for all donors

Model	I	II	III	IV	V	VI	VII	VIII
ODA share (t-1)	0.153***	0.152***	0.153***	0.152***	0.155***	0.154***	0.156***	0.154***
	(15.36)	(15.33)	(15.37)	(15.31)	(15.52)	(15.46)	(15.63)	(15.47)
W: All donors (t-1)	0.258***			0.168***				
	(5.96)			(3.32)				
W: Same group of donors (t-1)		0.198***						
		(5.96)						
W: Same subgroup of donors (t-1)			0.160***	0.106***				
			(5.98)	(3.43)				
W: Trade share link (t-1)					0.0407			-0.0179
					(1.64)			(-0.66)
W: Diplomatic representation link (t-1)						0.166***		0.181***
						(5.08)		(5.02)
W: Military alliance link (t-1)							-0.00085	-0.0329
							(-0.02)	(-0.91)
GDP per capita (log, t-1)	-0.151*	-0.155*	-0.174*	-0.151*	-0.197*	-0.178*	-0.206**	-0.181*
	(-1.97)	(-2.03)	(-2.30)	(-1.99)	(-2.57)	(-2.34)	(-2.67)	(-2.38)
Population (log, t-1)	-0.88***	-0.95***	-1.01***	-0.89***	-1.08***	-0.97***	-1.11***	-0.98***
	(-8.98)	(-10.31)	(-11.04)	(-9.10)	(-11.63)	(-10.24)	(-12.12)	(-10.27)
Disaster deaths	-0.0638	-0.0653	-0.0637	-0.0625	-0.067	-0.0652	-0.0683	-0.0656
	(-0.96)	(-0.98)	(-0.96)	(-0.94)	(-1.01)	(-0.98)	(-1.03)	(-0.99)
Democracy (t-1)	0.0211**	0.0208**	0.0207**	0.0208**	0.0205**	0.0203**	0.0200*	0.0203**
	(2.71)	(2.68)	(2.65)	(2.68)	(2.62)	(2.62)	(2.55)	(2.61)
Trade share (log, t-1)	0.0224	0.0208	0.0211	0.0205	0.0262	0.0232	0.0264	0.0227
	(1.16)	(1.08)	(1.09)	(1.06)	(1.35)	(1.20)	(1.33)	(1.18)
US military grant share (t-1)	0.00672	0.0068	0.00712	0.00634	0.00823	0.00752	0.008	0.00737
	(0.95)	(0.96)	(1.00)	(0.89)	(1.17)	(1.06)	(1.15)	(1.04)
Diplomatic representation (t-1)	0.242**	0.245**	0.234**	0.240**	0.231**	0.295***	0.230**	0.303***
	(3.20)	(3.22)	(3.08)	(3.16)	(3.03)	(3.82)	83.01)	(3.91)
Military alliance (t-1)	-0.265	-0.274	-0.313*	-0.283	-0.304*	-0.266	-0.365*	-0.279
	(-1.77)	(-1.82)	(-2.08)	(-1.89)	(-2.02)	(-1.77)	(-2.33)	(-1.84)
Constant	14.54***	15.75***	16.73***	14.70***	18.16***	16.21***	18.59***	16.35***
	(9.57)	(11.13)	(12.06)	(9.69)	(12.79)	(11.14)	(13.41)	(11.18)
Observations	27,897	27,897	27,897	27,897	27,892	27,900	27,938	27,892
Number of dyads	2,915	2,915	2,915	2,915	2,915	2,915	2,915	2,915
R-squared	0.053	0.053	0.053	0.054	0.052	0.053	0.052	0.053

Notes: Dependent variable: Recipient *j*'s share at donor *i*'s total ODA in year *t* (in logs); W: denotes the weighting matrix used for calculating the spatial lags; Robust standard errors clustered on dyads in parentheses; * statistically significant at 0.05, ** 0.01, or *** 0.001 level.

Table 3: Differences in allocation stage elasticities before and after 1990

Model	I	II	III	IV	V	VI
ODA share (t-1)	0.153***	0.152***	0.153***	0.155***	0.154***	0.156***
	(15.36)	(15.30)	(15.36)	(15.52)	(15.46)	(15.61)
W: All donors (t-1) x Post_1990	0.260***					
	(5.91)					
W: All donors (t-1) x Pre_1990	0.215					
	(1.55)					
W: Same group of donors (t-1) x Post_1990		0.213***				
		(6.27)				
W: Same group of donors (t-1) x Pre_1990		(0.05)				
		(-0.553)				
W: Same subgroup of donors (t-1) x Post_1990			0.172***			
			(6.04)			
W: Same subgroup of donors (t-1) x Pre_1990			0.0501			
			(0.77)			
W: Trade share link (t-1) x Post_1990				0.0442		
				(1.72)		
W: Trade share link (t-1) x Pre_1990				-0.0109		
				(-0.14)		
W: Diplomatic representation link (t-1) x Post_1990					0.170***	
					(5.06)	
W: Diplomatic representation link (t-1) x Pre_1990					0.0935	
					(0.93)	
W: Military alliance link (t-1) x Post_1990						0.0314
						(0.78)
W: Military alliance link (t-1) x Pre_1990						-0.118
						(-1.87)
Observations	27,897	27,897	27,897	27,892	27,900	27,938
Number of dyads	2,915	2,915	2,915	2,915	2,915	2,915
R-squared	0.053	0.054	0.054	0.052	0.053	0.052

Notes: Control variables as in Table 2, Coefficients not shown to save space; Dependent variable: Recipient *j*'s share at donor *i*'s total ODA in year *t* (in logs); W: denotes the weighting matrix used for calculating the spatial lags; Robust standard errors clustered on dyads in parentheses; * statistically significant at 0.05, ** 0.01, or *** 0.001 level.

Figure 2a: Coefficients (+ 95% confidence interval) of spatial lag (W: same subgroup) for selected specific donors and donor groups

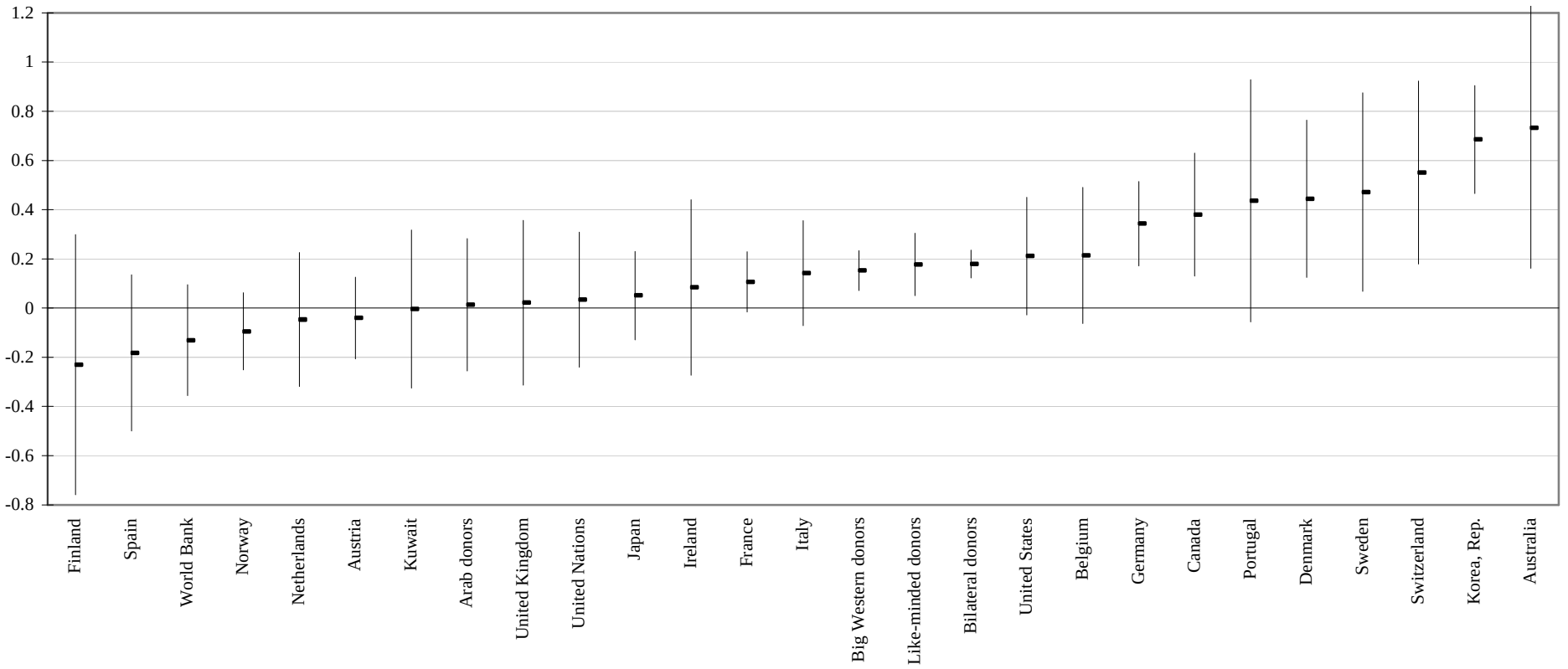

Figure 2b: Coefficients (+ 95% confidence interval) of spatial lag (W: trade share link) for selected specific donors and donor groups

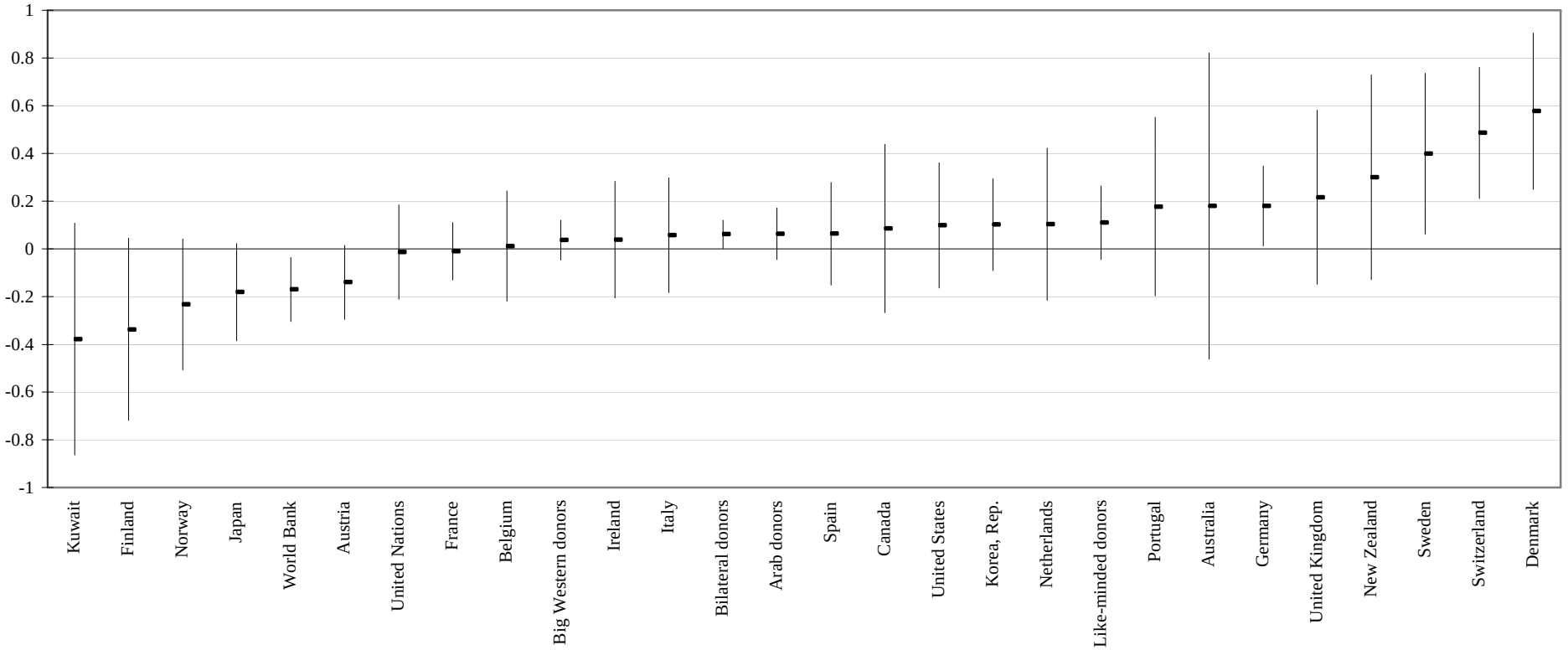

Figure 2c: Coefficients (+ 95% confidence interval) of spatial lag (W: diplomatic representation link) for selected specific donors and donor groups