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Competition for Export Markets and the Allocation of Foreign Aid: The Role of Spatial Dependence among Donor Countries*

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Abstract:
We account for the competition for export markets among the donor countries of foreign aid by analyzing spatial dependence in aid allocation. We employ sector-specific aid data, distinguishing between first and second stage decisions on the selection of recipient countries and the amount of aid allocated to selected recipients. We find that the five largest donors react to aid giving by other donors with whom they compete in terms of exporting goods and services to a specific recipient country at both stages of their allocation of aid for economic infrastructure and productive sectors. By contrast, evidence for export competition driving aid allocation is lacking for more altruistic donors and for aid in social infrastructure.

Keywords: Aid allocation, sector-specific aid, export competition, spatial dependence.

JEL classification: F35

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1. Introduction

It is widely believed that donor countries use aid as a means to promote their own export interests. Several contributions to the aid allocation literature offer empirical support. Berthélemy (2006) ranks various donor countries according to the elasticity of aid with respect to bilateral exports of the donor to the recipient country. Most of the larger donors are rated 'moderately egoistic' by this criterion. Hoeffler and Outram (2011) find that all top five donor countries (France, Germany, Japan, the United Kingdom, and the United States) provide more aid to trading partners.[1] According to Younas (2008), export-related donor interests continue to be a major determinant of aid allocation in the post-Cold War era.[2]

With few exceptions, however, the aid allocation literature has assumed implicitly "that when a donor makes its ODA allocation it does not consider the ODA that recipients receive from other sources" (Trumball and Wall 1994: 877). If at all, the possibility of competition among donors is accounted for by simply including the aid flows from all other sources among the determinants of the allocation of aid by a particular donor.[3] In other words, each dollar of aid from other sources is treated the same – as if it did not matter whether or not the specific source constituted a relevant competitive challenge for the donor deciding on aid for a particular recipient country.

The principal contribution of this paper is to overcome this limitation of previous aid allocation studies. Expecting that donors compete strategically, we consider it unlikely that each other donor counts the same in a donor's decisions on aid allocation. Specifically, we account for the competition for export markets among the donor countries of the OECD's

[1] In contrast to Berthélemy (2006), Hoeffler and Outram (2011) consider the flow of exports and imports between a donor and recipient country.
[2] However, Claessens et al. (2009) argue that donors have recently become more altruistic. See also Dollar and Levine (2006) who find that many donors have become more selective by targeting recipient countries with better institutions.
[3] Examples include Berthélemy (2006), Powell and Bobba (2006), and Davies and Klasen (2011). In an earlier study, Katada (1997) assesses the links between Japanese and US aid to Latin American countries. Fuchs et al. (2013) analyze commercial and political competition within pairs among the five major donors.

Development Assistance Committee (DAC) by introducing spatial lags that link donor countries according to the extent to which a potential aid recipient country is of similar importance to them as a market for their exports. In other words, the more two donors export to a similar set of recipient countries, the more they compete in their exports with each other and, as a consequence, the more their aid allocation is supposed to spatially depend on each other. Importantly, we assess aid allocation by employing sector-specific aid data, as the impact of export competition is expected to matter more for aid projects in economic infrastructure and production sectors than for aid projects in social infrastructure such as education and health.

In our estimations, we distinguish between donors' decisions on (i) the selection of recipient countries, and (ii) conditional on being selected, on how much aid to allocate to each recipient. Disaggregating between groups of donors and types of aid, we find export driven spatial dependence among the five largest DAC donors at both stages of their allocation of aid for economic infrastructure and production sectors. This stands in contrast to aid for social infrastructure for which there is no such evidence. The group of like-minded and more altruistic donors does not compete in their aid allocation; rather, they seem to specialize in the amount of aid allocated to social infrastructure.

The rest of the paper is organized as follows. Section 2 presents reasons for competition among donors based on their interests in the exports market and the type of aid supplied and derives testable hypotheses within that framework. Section 3 describes the data and methods employed, and Section 4 reports our results. Section 5 concludes the paper.

2. Competition among self-interested donors

Foreign aid may help promote a donor country's trade and export interest in several ways, and the allocation of aid might therefore be directly affected by strategic considerations of this

type.[4] Suwa-Eisenmann and Verdier (2007: 485) survey the recent literature and summarize that "aid flows may affect trade flows, either because of the general effects they induce in the recipient country, or because aid is directly tied to trade, or because it reinforces bilateral economic and political links (or a combination of all three)." In terms of specific mechanisms, it is evident that exporters in a donor country using aid strategically will be primary beneficiaries if aid is tied explicitly, obliging the recipient country to use aid for the import of goods and services from the donor country. It cannot be ruled out, however, that the recipient country has to reduce overall imports if its terms of trade deteriorate due to tied aid (Tajoli 1999).[5] The effect on donor exports then depends on the degree and direction of trade diversion. A particular donor granting tied aid may benefit from higher exports if trade diversion and the resulting increase in this donor's market share are strong enough to offset the negative terms-of-trade effects on overall imports.

Even though the relative importance of formally tied aid has declined since the 1990s,[6] a particular donor may still benefit in terms of higher exports if untied aid generates goodwill for the donor in the recipient country (Silva and Nelson 2012).[7] Djajić et al. (2004: 151-2) argue that "aid in one period may, as a result of habit-formation or 'goodwill' effects, cause a shift in preferences of the recipient country in the following period. Aid can then be seen as an instrument with the power to influence future consumption of the recipient in a direction that is beneficial to the donor." Similar to formally tied aid, goodwill and habit formation might imply trade diversion among donors.

Based on this reasoning, the aid allocation of a donor country is likely to spatially depend on the aid allocation of other donor countries, as a function of the extent to which they compete

[4] See also the discussion in Hühne et al. (2013).
[5] In other words, tied aid may be immiserizing (Kemp and Kojima 1985).
[6] For details, see: http://www.oecd.org/development/untyingaidtherighttochoose.htm#progress; accessed: July 2013.
[7] Arvin and Baum (1997: 78) develop a theoretical model in which "a donor maintains a constant flow of untied aid in order to continually replenish its stock of goodwill." The donor benefits as the stock of goodwill tends to increase future exports.

with each other in terms of exports to a specific recipient country. Put differently, if my main competitors in terms of exports to a specific recipient country increase their aid to this country, I have an incentive to similarly increase my aid to the same country in order to protect my export interests. This results in our first hypothesis:

Export-related self-interest does not necessarily need to play an equally strong role for all donors. As noted in the Introduction, it is mainly the large donors which are widely considered selfish. By contrast, the group of so-called like-minded donor countries – including Canada, Denmark, the Netherlands, Norway, and Sweden – are regarded as more altruistic, focusing on recipient need rather than own export promotion and other strategic aid motives (Neumayer 2003). While the view that not all donors behave the same (Berthélemy 2006) commands considerable support among scholars, this also has important consequences for spatial dependence which have been largely neglected in the literature on aid allocation. Specifically, the distinction between more selfish and more altruistic donors leads to our second hypothesis:

The importance of selfish motives is also likely to vary across different aid categories. The OECD's DAC classifies aid into 'sectors' ranging from social infrastructure (e.g., education, health) to economic infrastructure (e.g., transport, communication) and production sectors (e.g. agriculture, industry) as well as general budget support and food aid. The allocation of

food aid, for example, is more needs-based than aid in other sectors (Neumayer 2005). The same could be true for aid meant to improve basic social services.[8] By contrast, aid projects in economic infrastructure and production sectors are explicitly part of the so-called Aid-for-Trade (AfT) Initiative launched at the WTO Ministerial Conference in Hong Kong in 2005.[9]

Several studies show that AfT helped promote the exports of recipient countries, dismissing the skeptical view that the initiative was only in the donors' self-interest.[10] Nevertheless, there is reason to suspect that spatial dependence is likely to shape the allocation of the major components of AfT. For instance, selfish donors may finance infrastructure projects that serve primarily their own export interests. This would resemble the 'vanguard effect' found by Kimura and Todo (2010) for Japanese aid and its effect on foreign direct investment. Other donors can reasonably be expected to take this into account when deciding on their own aid allocation. In a similar vein, spatial dependence is likely to matter if donors direct aid to projects in production sectors where domestic exporters have important stakes as suppliers of capital goods or intermediaries. This results in our third and final hypothesis:

3. Data and empirical approach

For the present analysis, we use total and country programmable aid as well as sector-specific aid from the OECD's Creditor Reporting System (CRS) as dependent variables. Total aid is the sum of all aid committed, independent of its purpose. Country programmable aid (CPA) is

[8] However, Thiele et al. (2007) find that aid allocation patterns differ even between sectors that are closely related to the Millennium Development Goals.
[9] For details see OECD and WTO (2011).
[10] Recent examples include Calì and Te Velde (2011), Helble et al. (2012) and Hühne et al. (2013).

$$\frac{(\text{aid by donor i to recipient j in sector k in year t})}{(\text{aid by donor i to all recipients j in all sectors k in year t})}$$

Thus, rather than dividing the numerator by all sector-specific aid by donor in a given year, we divide by the sum of total aid (i.e., across all sectors) by this donor in a given year. This implies that the aid shares across recipients for each donor do not necessarily add up to one. This definition allows us to better test for aid competition among donors. To understand why note that the dependent variable of other units enters the spatial lag variable. Dividing by all aid of a donor would result in a large value for the spatial lag variable for another donor who also exports much to a recipient even if the share of aid devoted by the donor to a particular sector is very small. In contrast, our definition would only produce a large value for the spatial lag variable if the donor gave a large share both to this sector and this recipient. This feature is particularly valuable in our setting, because if a donor barely gives any aid in a particular sector, then it cannot be a strong competitor for other donors in this specific sector.

We estimate spatial lag models to analyze the potential influence of aid allocated by other donors to the same recipient. In such a model, for each observation the dependent variable of other observations is included as a right-hand side variable. This variable is weighted using a connectivity variable in a weighting matrix that links dyads with each other. Aid flows from a donor to a recipient are an example of a directed dyad, in which there is a clear source and target and the action originates from the former and is directed towards the latter. In the present context, spatial dependence is assumed to take the form of 'specific source contagion' (Neumayer and Plümper 2010), in which aid by a donor to a recipient depends on aid by

other donors to the very same recipient .[13] Abstracting from all other explanatory variables, specific source contagion is modeled as follows:

$$= \rho \sum_{\neq} \qquad + \varepsilon \tag{1}$$

where is aid of donor to recipient in year , is aid of other donors except donor to the same recipient , and is the weighting matrix which measures the connectivity between donor and donor .

As argued in Section 2, we expect that donors account for the aid decisions of other donors with which they compete for export markets when allocating their own aid. To test this, the connectivity between donor and donor is the product between the share of recipient country in the exports of donor country and the share of recipient country in the exports of donor country . This reflects the assumption that aid from donor to recipient is the stronger influenced by aid from donor to the same recipient the more economically important recipient is for exports from donor donor .[14] Formally:

$$= \frac{\qquad}{\qquad} \times \frac{\qquad}{\qquad} \tag{2}$$

By taking export shares rather than absolute exports as connectivity, we assume that the relative importance of a recipient country for the two donors and is not simply driven by the fact that, for example, larger recipient countries generally trade more than smaller countries. By taking the product of the two donor countries' export shares, we model spatial dependence as being strongest when recipient country is important for both donor countries and . In other words, it is not enough for a recipient country to be important for only one

[13] See Neumayer and Plümper (2010) for other forms of spatial contagion - such as aggregate source or aggregate target contagion, and specific target contagion.

[14] For instance, China is a relatively important country for exports from both Japan and Germany. Therefore, it is assumed that the aid allocation decision of Japan with regard to China is relatively strongly influenced by aid from Germany to China.

donor, which would be assumed if we modeled the connectivity as being additive between the two donor countries' export shares. Also note that as a consequence of connectivity consisting of the product of the two donor countries' export shares, the coefficient of the spatial lag variable, the parameter ρ in (1), no longer directly indicates the degree of spatial dependence among donors. In order to interpret the substantive degree of spatial dependence we have to resort to a more conventional analysis of computing substantive effects. We will do so by calculating by how many standard deviations the dependent variable changes for a one standard deviation change in the spatial lag variable.

The remaining explanatory variables are fairly standard in the aid allocation literature. We account for recipient need by including in constant 2000 USD taken from the World Development Indicators (World Bank 2013). It is expected that less aid is allocated to richer countries. To control for the size of a recipient country, its is taken from the same source. We also include a measure of good governance, namely the score from the Polity IV project (http://www.systemicpeace.org/polity/polity4.htm). This score combines information on the extent to which various democratic and autocratic features are present in the recipient country. Donors often claim to favor more democratic recipients when allocating aid.

To account for the economic self-interest of donors that is additional to and independent of spatial dependence, the variable measures the exports of a donor country to a recipient country as a share of the donor's total exports. Export shares are in principle endogenous if tied or untied 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).

Finally, we consider temporary membership of recipient countries in the United Nations Security Council (UNSC) as a proxy of political interest of donors. There is evidence that governments elected to the UNSC receive more aid than other developing countries (e.g. Dreher et al. 2013). Compared to previously used proxies of geo-political donor motives such as voting patterns in the UN General Assembly, UNSC membership has the advantage that it is likely to be exogenous to variables that are directly related to foreign aid (Dreher et al. 2012).

With the exception of UNSC membership, all time variant variables are lagged by one year to mirror the situation donors face at the time of decision-making and to reduce the potential risk of endogeneity. Summary statistics are presented in Table 1. Note that in order to keep this table manageable, it presents summary statistics for all dependent and spatial lag variables of all samples in which we employ dyadic fixed effects, but for the control variables such statistics are presented only for the sample of total aid by all donors in the second stage estimations.

As noted by Plümper and Neumayer (2010), model specification in the analysis of spatial dependence needs to tackle several challenges in order 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 is included on the right hand side to control for temporal dynamics. The temporally lagged dependent variable can also account for bureaucratic inertia (Allison 1971). This introduces some Nickell (1981) bias given we employ dyad fixed effects. However, the bias converges to zero as the number of time periods increases and our T is quite large. The effect of a common trend in the size of the aid budget, e.g., all donors give more or less aid over time, is removed by normalizing aid commitments per donor-year, i.e. by expressing aid in shares. A set of year dummies additionally controls for a change in

the number of recipients for a given aid budget which would lead to higher or lower average shares for all recipient countries.

Furthermore, the existence of spatial clustering and unobserved spatial heterogeneity, i.e. factors which influence aid allocation decisions of several donors in the same direction but cannot be controlled for, can lead to biased spatial effects. To mitigate the impact of the former, we control for a range of observable factors that might influence donor decisions. To address the problem of unobserved spatial heterogeneity and clustering, all but two models are estimated with dyad fixed effects. This removes all variation between dyads and the estimation is solely based on the within variation of each dyad. While this automatically controls for any time-invariant dyad specific effect, such as cultural and geographic proximity or bilateral relations (for example the United States' large aid to Israel and Egypt), it also removes unobserved spatial heterogeneity and spatial clustering in aid levels.

Spatially lagged dependent variables introduce a certain degree of endogeneity into the estimation model. However, based on Monte Carlo analyses, Franzese and Hays (2007) have demonstrated that ignoring this endogeneity (i.e. estimating what they call a spatial-OLS model) does not produce strongly biased results as long as the degree of inter-dependence is small. This is the case here as will become clear when we report results in the next section.

The process of aid allocation can be modeled 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). In case of being selected, the actual amount of aid is determined in a second step (level stage).[15] Thus, the dependent variable is only partly continuous and has a positive probability mass at the value of zero, which violates the OLS assumption that the expected value of the dependent variable is linear in the explanatory variables.

[15] In particular, smaller donors provide aid to a limited number of recipients so that the dependent variable is zero in many cases.

Following the pioneering work by Cragg (1971), we employ a so-called two-part model, which has been widely applied in the context of aid allocation. It resembles a Heckman sample selection model in also estimating two separate equations for both stages, but it 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.[16] The model estimating the eligibility stage is estimated with a conditional fixed-effects Logit model. The second stage is estimated with a linear fixed-effects estimator with standard errors clustered on dyads.

4. Results

The hypotheses introduced in Section 2 suggest assessing the relevance of spatial dependence in sector-specific aid from distinct groups of donors. Nevertheless, we start with reporting baseline estimations in which we consider all 23 DAC donors and total aid as well as the sum of country programmable aid (CPA) for social and economic infrastructure as well as production sectors taken together (thus excluding general budget support, food aid, debt relief, and humanitarian aid). We expect the effect of spatial lags to be ambiguous in these aggregate estimations as the effects for specific sectors of aid and specific groups of donors might work differently and may cancel each other out.

In Table 2, we present random and conditional fixed-effects Logit estimations for the first stage of the allocation of total aid by all donor countries in columns (1) and (3), respectively. Columns (2) and (4) show random- and fixed-effects estimations for the second stage of aid allocation with the share of recipient in total aid of donor as the dependent variable.

[16] A Heckman sample selection model would in principle be superior since it allows the error terms to be correlated and corrects for this correlation. However, in the context of aid allocation, Alesina and Dollar (2000) and Berthélemy (2006) do not find much correlation between the residuals of the selection equation in the first step and of the allocation equation in the second step. Moreover, the Heckman model depends on the existence of a variable that fulfills the exclusion restriction, i.e. that affects the first stage of aid allocation only, but not the second (level) stage. None of the variables affecting aid allocation is likely to fulfill this restriction.

Columns (5) and (6) show fixed-effects estimations for the first and second stage of aid allocation by all donors, but this time for CPA only rather than total aid. All estimations include the export competition-weighted spatial lags, the full list of control variables introduced in Section 3 and the lagged dependent variable.

Focusing firstly on the random effects results, these are largely in line with common wisdom from the aid allocation literature. Countries that received (more) aid in the past year are more likely to receive aid this year (and receive more aid as well). Poorer countries are more likely to receive aid and receive more aid. The same is true for more populous countries. Major recipients of a donor's exports are not statistically significantly more likely to receive aid, but conditional on being an aid recipient, they receive more aid. The converse is true for more democratic countries, which are more likely to receive aid from a donor, but do not receive statistically significantly more aid. A recipient's temporary membership on the UN Security Council does not seem to have an impact on aid allocation. Most importantly for our analysis, the spatial lag variable is statistically insignificant in both stages of the allocation of total aid pooled across all donors.

Of course, random effects are not an appropriate estimation technique for a spatial lag model. Hence, of greater interest to us are the dyad fixed effects estimation results. Many of the control variable estimates change when fixed effects are included. This is not surprising since dyad fixed effects take out all the between-variation in the data and estimates are exclusively based on the within-variation in each dyad.[17] The lagged dependent variable remains significant in the first stage, but becomes statistically insignificant in the second stage. The bounded nature of the dependent aid variable together with the fact that between-variation dominates within-variation in aid shares may explain this change in results as we move from random to fixed effects. As a country's population increases it becomes more likely to receive

[17] Dreher et al. (2013) on German aid achieve similarly "weak" results on indicators of recipient need and donor interests as we do here when they account for recipient country fixed effects.

countries. In particular the largest donors are a

eligibility for aid in social infrastructure from the large donors. At the same time, consistent with the results for total aid from all donors, we find that as a large donor increases its export share in a country this country becomes less likely to receive aid.[21]

The results so far support our second and third hypotheses. It should be stressed, however, that the insights to be gained from our first-stage results are generally limited. The binary nature of the dependent aid variable has the effect that variation over time is drastically reduced in the selection equation. We lose a large share of dyads completely in the conditional fixed-effects Logit estimations as there is no change in the binary aid variable over time. For example, for the group of large donors and aid in economic infrastructure/production sectors, we lose 1944 out of 8185 dyads. Moreover, one cannot compute meaningful marginal effects in conditional Logit estimations.[22] Against this backdrop, we proceed to the estimations for the second stage of allocating aid among selected recipients.

Moving to the second stage of aid allocation, the dependent aid variable is now defined as the amount of sector-specific aid of donor going to recipient in period , divided by total aid of donor in period . The results on most of the control variables are similar to the corresponding fixed effects estimations for all donors and total aid from Table 2. Interestingly, however, even in this stringent and conservative research design there is still evidence in Table 4 that like-minded donors pursue a needs-based aid allocation strategy (more aid for economic infrastructure/production sectors goes to poorer countries) and a

[21] Consistent with this finding, Dollar and Levin (2006) report negative coefficients on the export variable for three donors among the largest five (Germany, the United Kingdom, and the United States).
[22] The reason is that the marginal effects are dependent on the fixed effects which are conditioned out of the estimations. See http://www.stata.com/statalist/archive/2012-12/msg00889.html

merit-based strategy (countries that become more democratic receive more aid in both types of sectors). No such evidence is apparent for the large donors.

Table 4 provides evidence for export competition driven spatial dependence in the aid allocation by large donors in economic infrastructure/production sectors, but not in social infrastructure. More aid of the former category goes to important export-market recipients that receive more aid from other donors with which donor competes. In substantive terms, a one standard deviation increase in the spatial lag variable is estimated to increase the predicted aid share by .17 standard deviations.[23] This represents a modest, but not negligible degree of spatial dependence. Perhaps surprisingly, we find a negative and significant coefficient for the spatial lag in social infrastructure among the like-minded donors. In substantive terms, a one standard deviation increase in the spatial lag variable is estimated to decrease the predicted aid share by .07 standard deviations.[24] This could indicate that like-minded donors are willing to specialize in their aid allocation. Specifically, like-minded donors could have reduced their social infrastructure aid to a specific recipient when another donor with a particular interest and/or expertise in a recipient country (which correlates with our spatial weights) increased its aid. If so, they would have observed repeated calls to avoid duplication of aid efforts and improve the division of labor between donors, e.g., by mutually agreeing on peers assuming the role of the 'lead donor' in particular recipient-sector combinations.[25]

For the sake of brevity and recalling the qualifications we mentioned above with regard to the first-stage results, we restrict the robustness tests to the second stage of aid allocation. In

[23] (0.942*0.002)/0.011 = 0.17.
[24] (-0.409*0.002)/0.012 = -0.07.
[25] For instance, donors promised in the so-called Paris Declaration of 2005 to render aid more effective by "eliminating duplication of efforts and rationalizing donor activities" and committed themselves "to make full use of their respective comparative advantage at sector or country level" (OECD 2005: paragraphs 3 and 35). However, previous assessments of the actual implementation of the Paris Declaration pointed to large gaps between donor rhetoric and actual behavior until recently (e.g., Nunnenkamp et al. 2013).

Table 5, we employ total trade (exports + imports) rather than export-weighted spatial lag variables. The results are very similar to those reported in Table 4.

In Table 6, we employ a so-called jackknife to the estimations for the large donors: we drop each one of the large donors at a time from the estimations to check whether the results for the large-donor group are dependent on the inclusion of any specific large donor. We find that results are not much affected if the US, the UK or France is dropped from the sample. There is some evidence for spatial dependence in aid for social infrastructure as well if the UK is dropped from the sample, albeit at roughly half the substantive effect of spatial dependence in aid for economic infrastructure/production sectors. More importantly, however, if we drop either Germany or Japan from the sample, then the coefficients on the spatial lag for aid for economic infrastructure/production sectors become statistically insignificant. This is an interesting result: of the large donors Germany and Japan are the most export oriented ones and the results from Table 5 suggest that export-competition driven aid allocation is strongest for these two donors.

In Table 7, we similarly employ a jackknife, but this time to the estimations for the like-minded donors, dropping each one of them from the estimations at a time. Results are very similar to those reported in Table 4 with the exception of the case when Norway is dropped from the sample. In the estimations without Norway, the coefficient for the spatial lag in the allocation of aid for social infrastructure continues to be negative, but is no longer statistically significant, whereas the coefficient for the spatial lag in the allocation of aid for economic infrastructure/production sectors, which was positive but insignificant before, now becomes statistically significant. From this one can infer that Norway does not follow the specialization of like-minded donors in social infrastructure, and it seems subject to donor export competition in the allocation of its aid for economic infrastructure/production sectors.

In Table 8, we check the robustness of our results toward excluding the top decile of recipient countries for which donors compete, i.e. the recipient countries in the top decile of values of the spatial lag variables over the entire estimation period. The purpose of this test is to see whether the countries that are the most important export markets for most donors are the only ones driving the results on spatial dependence in aid allocation. This list of countries includes Brazil, China, India, Indonesia, Thailand and Turkey for aid in economic infrastructure/production sectors and Angola, China, India, Indonesia, Mexico, South Africa and Turkey for aid in social infrastructure. As can be seen from Table 8, results are qualitatively the same. The coefficients for the spatial lag variables are much larger than in Table 4. However, one has to keep in mind that the largest values for these variables have been truncated such that some increase in coefficient size is to be expected and will not fully translate into a corresponding increase in substantive effect. In substantive terms, the effect in column (3) of Table 8 only represents an increase from .09 (baseline model) to .28 standard deviation increases in the predicted aid share following a one standard deviation increase in this truncated spatial lag variable. The estimated degree of spatial dependence is thus significantly larger in this sample, but still relatively modest.

5. Conclusion

It is widely believed that donor countries use aid as a means to promote their own export interests. With few exceptions, however, the large aid allocation literature has ignored spatial dependence among export-oriented donor countries. If at all, the possibility of competition among donors is accounted for by including the aid flows from all other sources among the determinants of the allocation of aid by a particular donor. By contrast, our analysis realistically assumed that it matters whether or not the specific source constitutes a relevant competitive challenge for the donor deciding on aid for a particular recipient country.

Specifically, we accounted for the competition for export markets among the donor countries of the OECD's Development Assistance Committee during the 1995-2011 period by introducing spatial lag variables that link donor countries according to the extent to which a potential aid recipient country is of similar importance to them as a market for their exports. We differentiated between large donors who were supposed to compete strategically and more altruistic (like-minded) donors. At the same time, we employed sector-specific aid data, as the impact of export competition is expected to matter more for aid in economic infrastructure and production sectors than for aid in social infrastructure such as education and health. Finally, we distinguished between donors' first and second stage decisions on (i) the selection of recipient countries, and (ii) conditional on being selected, on the amount of aid allocated to each recipient.

As expected, the evidence for spatial dependence proved to be weak and inconclusive in our baseline estimations when using aggregate (total or programmable) aid data for all donor countries. The estimations supported the view that the effects of spatial lags for specific sectors of aid and specific groups of donors might work differently and tend to cancel each other out when aggregated. In the dyad fixed effects estimations, the evidence for export-competition driven spatial dependence was limited to the first stage of selecting recipient countries; we found no such evidence for the second stage of the allocation of total aid by all donors. The significant effect in the first stage appeared to be attributable largely to the selection decisions of the largest donors with regard to aid in economic infrastructure and production sectors. This supports the hypothesis that large and strategically oriented donors

Most interestingly, the disaggregated estimations for the second stage of deciding on aid amounts among selected recipients pointed to sharply diverging patterns between the allocation of aid in economic infrastructure and production sectors by the large donors and the allocation of aid in social infrastructure by the like-minded donors. In the former case, spatial dependence proved to be significantly positive and quantitatively non-negligible. In other words, the large donors grant more aid in trade-related sectors to important export-market recipients that receive more aid from competing donors. In contrast, we found evidence for negative spatial dependence for aid in social infrastructure from like-minded donors, suggesting that these donors engaged in specialization and coordinating aid efforts in this sector. This finding has important implications for on-going efforts to render aid more effective by reducing the duplication of aid efforts, increasing the specialization of donors and strengthening donor coordination. It appears that progress in implementing the Paris Declaration and the subsequent Accra Agenda for Action of 2008 cannot reasonably be expected from strategically oriented donors with respect to trade-related aid categories. Rather, it rests with the like-minded donors and their allocation of aid in social infrastructure such as health and education whether donor commitments will be fulfilled.

Our estimation results proved to be robust to alternative spatial weights (specifically, to replacing donor exports by bilateral trade in both directions). The results also held when excluding the most important export markets among the recipient countries for which donors compete in their aid allocation, and – with few exceptions – also when excluding one donor at a time from the group of large and like-minded donors, respectively. Nevertheless, the evidence on positive spatial dependence in aid allocation among the large donors seems to depend on the inclusion of the strongly export-oriented donors Germany and Japan in the group of the largest donors. This suggests an important extension in future research once sufficient aid data becomes available for non-traditional donor countries. Various ‘new’ donors, notably China and other Asian countries such as South Korea, are strongly export

oriented, too. This raises the question of whether these donors are also subject to export-market driven competition in their aid allocation such that the allocation behavior of these 'new' donors is more similar to that of the large traditional donors than to that of the like-minded DAC donors.

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Table 1. Summary statistics

Variable	N	mean	s.d.	min	max
Aid dummy (total aid, all donors)	21764	0.552	0.497	0	1
Aid dummy spatial lag (total aid, all donors)	21764	0.008	0.080	0	2.919
Aid dummy (programmable aid, all donors)	23686	0.548	0.498	0	1
Aid dummy spatial lag (programmable aid, all donors)	23686	0.008	0.079	0	2.919
Aid dummy (social infrastr., large donors)	4796	0.721	0.449	0	1
Aid dummy spatial lag (social infrastr., large donors)	4796	0.007	0.073	0	1.960
Aid dummy (social infrastr., like-minded donors)	5180	0.539	0.499	0	1
Aid dummy spatial lag (social infrastr., like-minded donors)	5180	0.006	0.056	0	1.675
Aid dummy (econ. infrastr./prod., like-minded donors)	6241	0.617	0.486	0	1
Aid dummy spatial lag (econ. infrastr./prod., like-minded donors)	6241	0.004	0.034	0	0.919
Aid dummy (econ. infrastr./prod., large donors)	5798	0.476	0.499	0	1
Aid dummy spatial lag (econ. infrastr./prod., large donors)	5798	0.008	0.065	0	1.384
Aid share (total aid, all donors)	23452	0.011	0.028	9.54E-09	0.967
Aid share spatial lag (total aid, all donors)	23452	0.0004	0.003	0	0.073
Aid share (programmable aid, all donors)	20782	0.008	0.020	3.63E-08	0.442
Aid share spatial lag (programmable aid, all donors)	20782	0.0002	0.002	0	0.063
Aid share (social infrastr., large donors)	6255	0.004	0.009	4.05E-08	0.218
Aid share spatial lag (social infrastr., large donors)	6255	0.0002	0.002	0	0.037
Aid share (social infrastr., like-minded donors)	4323	0.006	0.012	8.53E-08	0.183
Aid share spatial lag (social infrastr., like-minded donors)	4323	0.0002	0.002	0	0.028
Aid share (econ. infrastr./prod., like-minded donors)	4680	0.004	0.012	3.20E-08	0.226
Aid share spatial lag (econ. infrastr./prod., like-minded donors)	4680	0.0001	0.002	0	0.029
Aid share (econ. infrastr./prod., large donors)	2970	0.004	0.011	1.29E-08	0.199
Aid share spatial lag (econ. infrastr./prod., large donors)	2970	0.0002	0.002	0	0.029
ln GDP per capita (t-1)	23452	7.900	0.941	4.614	10.358
ln Population (t-1)	23452	16.390	1.579	12.784	21.014
Share of recipient in donor's exports (t-1)	23452	0.012	0.033	0	0.633
Democracy (t-1)	23452	2.582	5.825	-10	10
UN Security Council membership	23452	0.076	0.265	0	1

Table 2. First- and second-stage estimates: All donors, total and programmable aid

Type of aid:	total aid	total aid	total aid	total aid	programmable aid	programmable aid
Estimation technique:	RE	RE	FE	FE	FE	FE
Stage of aid allocation:	first stage	second stage	first stage	second stage	first stage	second stage
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged dependent variable	2.446**	0.580**	1.429**	0.113	1.338**	0.109**
	(0.0496)	(0.0475)	(0.0411)	(0.0660)	(0.0391)	(0.0285)
Export competition-weighted spatial lag (t-1)	0.562	-0.644	5.155*	-0.248	5.815**	-0.00443
	(0.735)	(0.334)	(2.046)	(0.260)	(2.214)	(0.176)
ln GDP per capita (t-1)	-0.361**	-0.00183**	-0.0697	-0.00148	0.0850	-0.00161
	(0.0468)	(0.000311)	(0.146)	(0.00142)	(0.143)	(0.00129)
ln Population (t-1)	0.513**	0.000664*	1.530**	0.000402	0.0110	0.00486*
	(0.0327)	(0.000281)	(0.468)	(0.00340)	(0.443)	(0.00242)
Share of recipient in donor's exports (t-1)	0.299	0.0947*	-8.177*	-0.0288	-7.079	-0.0400
	(2.068)	(0.0374)	(3.773)	(0.0423)	(3.664)	(0.0321)
Democracy (t-1)	0.0184**	2.51e-05	-0.00264	0.000251**	0.0160	0.000201**
	(0.00600)	(3.14e-05)	(0.00891)	(5.76e-05)	(0.00831)	(4.34e-05)
UN Security Council membership	0.0662	0.000154	0.105	0.00121	0.0598	0.000552
	(0.0902)	(0.000827)	(0.0920)	(0.000813)	(0.0877)	(0.000409)
Dyad fixed effects	No	No	Yes	Yes	Yes	Yes
Observations	37,654	23,452	21,764	23,452	23,686	20,782
Number of dyads	2,438	2,142	1,385	2,142	1,510	2,022

Note: standard errors in parentheses (clustered on dyads for second-stage estimations). All estimations include year fixed effects.
** statistically significant at p<.01; * at p<.05.

Table 3. First-stage estimates: Donor groups, sectors of aid

Type of aid:	social	social	econ/prod	econ/prod
Group of donor:	large donors	like-minded donors	large donors	like-minded donors
	(1)	(2)	(3)	(4)
Lagged dependent variable	1.169**	0.909**	1.279**	0.711**
	(0.0983)	(0.0752)	(0.0727)	(0.0723)
Export competition-weighted spatial lag (t-1)	7.973	5.971	12.79*	-0.748
	(7.523)	(4.968)	(5.574)	(1.538)
ln GDP per capita (t-1)	0.471	0.136	0.185	-0.284
	(0.390)	(0.269)	(0.273)	(0.248)
ln Population (t-1)	1.720	1.128	0.772	-0.704
	(1.200)	(0.776)	(0.752)	(0.690)
Share of recipient in donor's exports (t-1)	-23.18	-2.624	-36.07**	8.576
	(19.60)	(8.106)	(11.83)	(6.070)
Democracy (t-1)	-0.00886	0.0348*	0.0485**	0.0483**
	(0.0203)	(0.0156)	(0.0154)	(0.0143)
UN Security Council membership	-0.0505	-0.0508	0.276	0.0812
	(0.226)	(0.171)	(0.172)	(0.156)
Observations	4,796	5,180	6,241	5,798
Number of dyads	306	332	399	369

Note: standard errors in parentheses. All estimations include year and dyad fixed effects.
** statistically significant at p<.01; * at p<.05.

Table 4. Second-stage estimates: Donor groups, sectors of aid

Type of aid: Group of donor:	social large donors (1)	social like-minded donors (2)	econ/prod large donors (3)	econ/prod like-minded donors (4)
Lagged dependent variable	0.0761 (0.0649)	-0.0134 (0.0426)	0.127 (0.0854)	-0.103 (0.0606)
Export competition-weighted spatial lag (t-1)	0.322 (0.228)	-0.409** (0.117)	0.942* (0.375)	0.816 (0.674)
ln GDP per capita (t-1)	0.000306 (0.000635)	-0.00200 (0.00205)	0.000280 (0.00173)	-0.00729** (0.00269)
ln Population (t-1)	0.00370* (0.00172)	0.00912* (0.00427)	0.00510 (0.00375)	0.00373 (0.00650)
Share of recipient in donor's exports (t-1)	0.0423 (0.0361)	0.0157* (0.00776)	-0.130 (0.0850)	-0.0189 (0.0202)
Democracy (t-1)	6.41e-05 (4.30e-05)	0.000220** (7.14e-05)	9.39e-05 (6.21e-05)	0.000215* (9.23e-05)
UN Security Council membership	0.000498 (0.000485)	-0.000871 (0.000598)	0.000946 (0.000713)	0.00175 (0.00134)
Observations	6,255	4,323	4,680	2,970
Number of dyads	517	440	466	365

Note: standard errors clustered on dyads in parentheses. All estimations include year and dyad fixed effects. ** statistically significant at p<.01; * at p<.05.

Table 5. Robustness test: Estimates for trade-weighted spatial lag variables

Type of aid:	social	social	econ/prod	econ/prod
Group of donor:	large donors	like-minded donors	large donors	like-minded donors
	(1)	(2)	(3)	(4)
Lagged dependent variable	0.0790	-0.0136	0.135	-0.101
	(0.0643)	(0.0426)	(0.0855)	(0.0615)
Trade competition-weighted spatial lag (t-1)	0.293	-0.278**	0.795*	0.343
	(0.153)	(0.0886)	(0.328)	(0.371)
ln GDP per capita (t-1)	0.000442	-0.00182	-0.000438	-0.00711**
	(0.000651)	(0.00210)	(0.00152)	(0.00272)
ln Population (t-1)	0.00376*	0.00905*	0.00444	0.00369
	(0.00173)	(0.00426)	(0.00356)	(0.00646)
Share of recipient in donor's trade (t-1)	0.0247	0.0125	-0.0909	-0.0211
	(0.0336)	(0.0119)	(0.0753)	(0.0266)
Democracy (t-1)	6.33e-05	0.000220**	9.88e-05	0.000213*
	(4.30e-05)	(7.14e-05)	(5.94e-05)	(9.26e-05)
UN Security Council membership	0.000500	-0.000855	0.000956	0.00176
	(0.000487)	(0.000597)	(0.000697)	(0.00135)
Observations	6,255	4,323	4,680	2,970
Number of dyads	517	440	466	365

Note: standard errors clustered on dyads in parentheses. All estimations include year and dyad fixed effects. ** statistically significant at p<.01; * at p<.05.

Table 6. Robustness test: Group of large donors jackknives

Excluded donor: Type of aid:	US social (1)	US econ/prod (2)	UK social (3)	UK econ/prod (4)	FRA social (5)	FRA econ/prod (6)	GER social (7)	GER econ/prod (8)	JPN social (9)	JPN econ/prod (10)
Lagged dependent variable	-0.0207	0.0840	0.179**	0.0991	0.0743	0.122	0.0818	0.212**	0.0746	0.120
	(0.0523)	(0.0861)	(0.0414)	(0.0895)	(0.0682)	(0.0923)	(0.0695)	(0.0816)	(0.0743)	(0.133)
Export competition-weighted spatial lag (t-1)	0.281	1.220**	0.414*	0.989**	0.321					

Table 7. Robustness test: Group of like-minded donors jackknives

Excluded donor: Type of aid:	CAN social (1)	CAN econ/prod (2)	DNK social (3)	DNK econ/prod (4)	NTH social (5)	NTH econ/prod (6)	NOR social (7)	NOR econ/prod (8)	SWE social (9)	SWE econ/prod (10)
Lagged dependent variable	-0.0374 (0.0444)	-0.132* (0.0645)	0.100* (0.0449)	0.0893 (0.0999)	-0.0326 (0.0460)	-0.115 (0.0614)	-0.0371 (0.0447)	-0.164** (0.0351)	-0.0255 (0.0458)	-0.0990 (0.0698)
Export competition-weighted spatial lag (t-1)	-0.372** (0.141)	0.0616 (0.272)	-0.344** (0.104)	0.733 (0.643)	-0.407** (0.117)	0.871 (0.701)	-0.471 (0.240)	1.459* (0.681)	-0.469** (0.133)	0.918 (0.751)
ln GDP per capita (t-1)	-0.000945 (0.00164)	-0.00713* (0.00319)	-0.00104 (0.00187)	-0.00612** (0.00222)	-0.00239 (0.00252)	-0.00843** (0.00312)	-0.00288 (0.00303)	-0.00676* (0.00332)	-0.00290 (0.00251)	-0.00638* (0.00300)
ln Population (t-1)	0.00640 (0.00382)	-0.00211 (0.00983)	0.00880* (0.00403)	0.00492 (0.00516)	0.00763 (0.00520)	0.00158 (0.00755)	0.0134* (0.00563)	0.00863 (0.00626)	0.00904 (0.00515)	0.00435 (0.00755)
Share of recipient in donor's exports (t-1)	0.0163* (0.00791)	0.00261 (0.00643)	0.0105 (0.00628)	-0.0197 (0.0200)	0.0178* (0.00772)	-0.0174 (0.0199)	0.0206 (0.0369)	-0.0590 (0.0482)	0.0175* (0.00815)	-0.0230 (0.0224)
Democracy (t-1)	0.000301** (7.86e-05)	0.000302* (0.000135)	0.000146* (6.03e-05)	0.000103* (5.31e-05)	0.000225** (8.44e-05)	0.000247* (0.000112)	0.000281** (9.52e-05)	0.000265* (0.000117)	0.000168* (8.06e-05)	0.000189 (0.000102)
UN Security Council membership	-0.000562 (0.000763)	0.00328 (0.00205)	-0.00136** (0.000475)	0.000302 (0.000707)	-0.00112 (0.000700)	0.00208 (0.00167)	-0.000826 (0.000768)	0.00150 (0.00163)	-0.000403 (0.000640)	0.00215 (0.00152)
Observations	3,307	2,021	3,887	2,715	3,420	2,366	3,233	2,262	3,445	2,516
Number of dyads	341	271	371	328	350	285	346	285	352	291

Note: standard errors clustered on dyads in parentheses. All estimations include year and dyad fixed effects.
** statistically significant at p<.01; * at p<.05.

Table 8. Robustness test: Dropping recipients in top decile of spatial lag

Type of aid:	social	social	econ/prod	econ/prod
Group of donor:	large donors	like-minded donors	large donors	like-minded donors
	(1)	(2)	(3)	(4)
Lagged dependent variable	0.151**	-0.0476	0.0950	-0.177**
	(0.0459)	(0.0424)	(0.101)	(0.0308)
Export competition-weighted spatial lag (t-1)	3.130	1.988	47.17**	-4.877
	(2.664)	(1.715)	(10.91)	(10.49)
ln GDP per capita (t-1)	0.000566	-9.75e-05	-0.00118	-0.00357
	(0.000569)	(0.00224)	(0.000675)	(0.00237)
ln Population (t-1)	0.00366*	0.00901	-0.000752	0.00732
	(0.00165)	(0.00459)	(0.00184)	(0.00489)
Share of recipient in donor's exports (t-1)	0.0271	-0.00943	0.0305	0.00901
	(0.0252)	(0.0200)	(0.0434)	(0.0115)
Democracy (t-1)	5.83e-05	0.000187*	6.93e-05	0.000260*
	(4.36e-05)	(7.72e-05)	(5.11e-05)	(0.000110)
UN Security Council membership	0.000489	-0.000414	0.000398	0.00134
	(0.000503)	(0.000690)	(0.000719)	(0.00144)
Observations	5,753	3,888	4,278	2,691
Number of dyads	482	406	436	340

Note: standard errors clustered on dyads in parentheses. All estimations include year and dyad fixed effects. ** statistically significant at p<.01; * at p<.05.