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Abstract

In this study we compare the impacts of official finance coming from the largest donors of African countries on bilateral trade flows between the donor and the recipient. Applying a gravity model approach, we distinguish between development finance and other official flows We find that official finance from all the donors stimulates export of goods to Africa, while trade flows in the opposite direction are fostered in the case of China and Europe, but not for the US. Despite some claims in the literature that aid from China aims at securing import of natural resources, we find evidence that countries receiving Chinese aid raise their bilateral export of manufactured goods and not of primary commodities. Finally, while for Europe and the US official flows other than development assistance play a bigger role in shaping trade flows, China primarily uses highly concessional and development oriented flows.

Keywords	aid-trade relation; gravity model; China; official development assistance; other official flows
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Corresponding Author's Institution	Universitat Autonoma de Barcelona
Order of Authors	Marina Sutormina, Marta Marson, Ivan Savin
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The authors also declare no conflict of interest.

Marina Sutormina, Marta Marson, and Ivan Savin

Highlights:

1. Compare the role of official finance (OF) on bilateral trade flows

2. Distinguish between official finance flows (ODA or OOF) and type of goods traded

3. OF stimulates exports from Africa only for China and Europe

4. Countries receiving OF from China raise bilateral export of manufactured goods

5. While for Europe and the US OOF shapes trade flows, China uses ODA-like finance

How different aid flows affect different trade flows: Evidence from Africa and its largest donors

Marina Sutormina,[a] Marta Marson,[b] and Ivan Savin[a,c,d]

[a] GSEM, Ural Federal University, Russian Federation

[b] Department of Economics, University of Insubria, Italy

[c] Institute of Environmental Science and Technology, Universitat Autònoma de Barcelona, Spain

[d] **Corresponding author:** ICTA-UAB, Edifici Z, UAB Campus, 08193 Bellaterra, Spain; ivan.savin@uab.cat, phone: +34-93-5868779

Abstract

In this study we compare the impacts of official finance coming from the largest donors of African countries on bilateral trade flows between the donor and the recipient. Applying a gravity model approach, we distinguish between development finance and other official flows We find that official finance from all the donors stimulates export of goods to Africa, while trade flows in the opposite direction are fostered in the case of China and Europe, but not for the US. Despite some claims in the literature that aid from China aims at securing import of natural resources, we find evidence that countries receiving Chinese aid raise their bilateral export of manufactured goods and not of primary commodities. Finally, while for Europe and the US official flows other than development assistance play a bigger role in shaping trade flows, China primarily uses highly concessional and development oriented flows.

Keywords: aid-trade relation; gravity model; China; official development assistance; other official flows

1.Introduction

There are many reasons that explain why aid promotes exports of donors to the recipient countries, but the question is whether it also promotes export from the recipient countries and what kind of export. In the UN declaration on the Sustainable Development Goals 2030 (SDG), one of the targets of SDG-8, the one about economic growth, is to "Increase Aid for Trade (AfT)[1] support for developing countries".[2] Since development is about structural change and industrialization (Lewis 1954, Szirmai 2012), and international trade has a main role in it (Prebisch 1984), official finance in general and development finance particularly are expected to contribute to economic diversification of recipient countries to sustain their economic growth (OECD/WTO 2019). Being rich in resources but poor in capital and technologies, African countries usually have a comparative advantage in exporting primary commodities. Therefore, increasing their export of manufactured goods is very important for them to diversify their economy and reduce their dependence on volatile commodity prices.

A related question in this context is whether donors allocate their aid according to development needs of recipients or own commercial interests, such as own export support. If we compare development goals of the development agencies of the largest donors, we will not see much difference in their motivation.[3] Despite recent criticism mostly focused on China (Naim, 2007), self-interest is important both for traditional donors (like the US and Europe) and new donors (China).

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[1] AfT is a part of ODA and includes technical trade assistance, trade related infrastructure and capacity-building to improve production and export capacities (Stiglitz and Charlton 2006, Cali and Te Velde 2011).

[2] UNDP (2015). "Transforming our world: the 2030 Agenda for Sustainable Development" https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-8-decent-work-and-economic-growth.html#targets

[3] USAID's mission is "to support partners to become self-reliant and capable of leading their own development journeys (…) promote American prosperity through investments that expand markets for U.S. exports" (USAID n.a.). China's statement related to their "win-win" strategy tells that "China's foreign aid policy… is suited both to China's actual conditions and the needs of the recipient countries" (CIDCA 2011). Main European donors also stress mutual interest, like "more prosperous world for people in developing countries and in the UK too" (DFID n.a.), "France's development policy contributes to France's global reach and influence" (AFD n.a.) and "help (German) companies to achieve their strategic sustainability goals (…) in developing countries and emerging economies" (GIZ n.a.).

The aim of this paper is to analyze the relationship between international trade and bilateral official finance (development aid and other official flows)[4] and contribute to the understanding of the questioned role of financial aid from developed countries to developing world. Whether official funding facilitates bilateral trade between donor and recipient country has received increasing attention of policy-makers and academic researchers in the aid for trade literature. Considering that Africa is one of the main recipients of international official finance, Liu and Tang (2018) have recently compared the impacts of foreign aid flows from the US and China on their bilateral trade flows to African countries. We build on this work extending it in three major aspects. First, we use disaggregated trade flows, i.e. manufactured goods and primary commodities, to shed more light on the structural change dynamics implied by their trade relations. For example, does aid from China promote mainly trade in primary commodities or manufactured goods? Second, we add to the comparison of the US and China also European donors represented through UK, Germany and France as biggest trade partners and aid providers to Africa. This way we broaden the analysis and can assess to what extent major DAC donors, main European donors and the US, are similar. Third, next to Official Development Assistance (ODA) and ODA-like development finance, we also investigate the role of Other Official Flows (OOF) in their effect on trade relations. This is important because China provides about half of its official finance in the form of OOF and traditional donors also have substantial OOF flows, particularly European countries.

We formulate gravity-type models for bilateral trade flows between African countries and their major donors, augmented with flows of official finance testing for the period 2000-2014. As disaggregated trade and OF flows contain many zero observations, we rely on the

[4] We use the term “aid” or Official Development Assistance (ODA) in this paper when we refer to the narrow (OECD-DAC) definition of concessional types of funding with development objectives. As China is not a member of the DAC, we sometimes use ODA-like to refer to flows which comply with the ODA requirements. When we refer to official finance that does not qualify as ODA, we use the term Other Official Flows (OOF). Finally, when we refer the sum of ODA and OOF, we use the term Official Finance (OF).

Pseudo-Poisson Maximum Likelihood (PPML) estimator with country-pair fixed effects following Santos Silva and Tenreyro (2006). PPML can estimate gravity models directly in their non-linear form, avoiding the problematic log-linearization.

Our findings support the hypothesis that official finance positively affects donors export, but according to our results there are different financial flows that traditional and new donors use to achieve this goal. China, as a non-DAC donor, is still using ODA-like flows as the main instrument to promote its export, while DAC-donors are moving away from tied aid promoting their exports through OOF.[5] Furthermore, the hypothesis that China provides "rogue aid" (Naim 2007) stimulating import of natural resources from Africa, like in the so called Angola mode,[6] has not been confirmed. On the contrary, we find a positive relationship between official finance (ODA-like flows) from China and imports of manufactured goods from Africa.

The paper is organized as follows. In Section 2, we review the literature on aid allocation, trade facilitation and on connection between aid and trade flows, as our analysis links all these parts of the economic literature, and formulate our research hypotheses. In Section 3, we describe the dataset and the choice of empirical strategy employed. Section 4 contains our estimation results, while Section 5 concludes.

2. Literature review

Our literature review is divided into three subsections. Firstly, we summarize the connection between aid and growth; than we briefly present main points from literature on aid allocation; and finally, we review the studies on the aid - trade nexus specifically.

[5] Tied aid is aid offered under the condition that it must be used to procure goods or services from the country providing the aid. Untying ODA is encouraged by OECD and DAC (OECD DAC 2019), but still common for funding form China. Export credits, instead, are common for both sources of funding. Please note that our sources of data do not allow to distinguish between tied and untied aid.

[6] The so-called Angola mode refers to the case where loans from China (often devoted to the development of the extractive sector) have to be paid back in oil or other natural resources by the recipient country (Bräutigam, 2009).

2.1. Aid and growth

One of the most important questions in development economics is whether and how foreign aid helps countries to grow. The literature on the impact of aid on development of recipient countries is extensive, and we provide below a short summary of it.

First of all, there is no robust evidence of either a positive or negative effect of foreign aid inflows on the economic growth of poor countries. The seminal study on aid impacts is that of Burnside and Dollar (2000). These authors analyzed 56 countries over the period 1970-1993 and concluded that aid has a positive impact on growth in developing countries with "good" fiscal, monetary, and trade policies. These results are challenged, however, by authors who used the exact same model specification, but either added more data (Easterly et al. 2003) or used a better definition of aid, namely ODA including concessional loans (Easterly 2003). For the case of Africa, Gomanee et al. (2005) focused on the transmission mechanisms through which aid affects growth. Using a sample of 25 countries from Sub-Saharan Africa over the period 1970-1997, they found a positive sign for the aid effect. Investment was identified as the most significant transmission mechanism, though they also considered effects through financing imports and government spending. Loxley and Sackey (2008) included 40 member countries of the African Union in their study on the effect of aid on per capita income growth. Considering the period between 1973 and 2004, their results also indicate a positive relationship between aid and economic growth via investment. Arndt et al. (2010) found a positive impact of aid on growth in 1960-2000 period for 78 countries sample. Later Arndt et al. (2015) using extended dataset covering the period 1960-2007 identified a positive impact of aid on growth through human and physical capital accumulation, demonstrating the positive impact of aid on the industrial sector in the recipient economies, and hence, on economy diversification in the long run. Donaubauer et al. (2016) using data for 81 aid-recipient countries covering the 1990–2010 period showed

that aid targeted at infrastructure not only increases the recipients' endowment of infrastructure but also helps them to attract higher FDI inflows.

However, other studies point to a negative effect of aid on growth. Malik (2008) examined the effect of aid in promoting growth in the 6 poorest African countries (Central African Republic, Malawi, Mali, Niger, Sierra Leone and Togo). Analyzing periods between 1965 and 2005 depending on the country, the author concluded that in five out of the six countries there is a negative relationship between aid and growth in the long run. Rajan and Subramanian (2011) analyzed two samples of developing countries (32 countries in the 1980s and 15 countries in the 1990s) and found that aid inflows have systematic adverse effects on the country's competitiveness as reflected in the lower relative growth rate of export industries. They provided some evidence suggesting that the channel for these effects is the real exchange rate appreciation caused by aid inflows. Also other authors found that aid has a Dutch disease effect on the terms of trade of recipient countries resulting in a negative impact on traded goods and on growth (Younger 1992; Arellano et al. 2005; Prati and Tressel 2006). Another recent study on the growth effect of aid analyzed a sample of 50 countries in 1960–2006 and found that aid has insignificant impact on per capita income in most of the cases, but it is negative and significant in highly aid-dependent countries (Nowak-Lehmann et al. 2012).

As for comparison between China and traditional donors in their impact on African countries, financing from China has been found to exhibit a positive effect on economic performance, while financing from the World Bank has not (Dreher et al. 2016). Dreher et al. (2017) compared China and traditional donors in their effect on GDP growth in African countries, finding ODA from both sources having a positive impact on development, while the same does not apply for OOF. Likewise, Wako (2018) analyzed ODA for traditional

donors and ODA-like[7] flows for China and found an overall positive effect of aid from China on GDP, but a negative impact on the institutional quality (measured by civil liberties and political rights), which may in turn reduce GDP growth in the long run. He also obtained similar results for traditional donors taken all together, and for some of them, like Sweden, Australia, Portugal and Belgium, also when taken alone. Marson and Savin (2019) compared official finance from traditional donors and China over 2000-2014 in their impact on the development indicators of African countries, such as infrastructure development, governance, external debt sustainability and countries' dependence on natural resources. They found similar results for China and traditional donors in their impact on all the development indicators but external debt. Furthermore, they identified a positive synergy effect from the presence of both donor types for external debt of recipient countries, but negative synergy effects for recipients' quality of governance, infrastructure development and economic diversification.

Last, Habiyaremye (2016) examines whether the Angola-mode deals have reinforced resource dependence and impeded export diversification in African countries. He finds instead that the resources-for-infrastructure swap deals helped African countries to reduce existing infrastructure bottlenecks and increased their diversification capacity.

2.2 Aid allocation

The literature typically argues that DAC members favor poorer recipient countries in aid allocation, while non-DAC countries do not (e.g., Berthélemy 2006). This applies even to DAC donors that are widely perceived to be less altruistic, notably the United States (Dollar and Levin 2006). According to Claessens et al. (2009), bilateral ODA from DAC has become more consistent with income levels (poorer countries receive more aid) and recipient policies (better policies are rewarded with more aid) in the late 1990s. However,

[7] Since China is not in the OECD-DAC, nor even among DAC reporting countries, financial flows from China satisfying the ODA conditions (promotion of the economic development and grant element of at least 25 per cent) are referred to as ODA-like. Additionally, financial flows, which are not satisfying the ODA conditions, are referred to as OOF-like.

some studies point to a considerable gap between the DAC rhetoric of rewarding good governance and their actual allocation behavior. For example, there is evidence on the missing link between corruption and aid from traditional donors by Alesina and Weder (2002).

Another important feature of aid from DAC donors is its conditionality. Conditions attached to DAC aid can take different forms including political conditions (liberalization, respect and control of human rights) and economic conditions (encouraging privatization and reducing budget deficit). Recipient countries denounce conditionality as a violation of their national sovereignty (Gilpin and Gilpin 1987), however, they did not have much choice other than compliance if they wanted to get financial assistance from DAC donors (Gilpin and Gilpin 2001). The emergence of new donors offers an alternative source of funding. Mwase (2011) finds that BRIC countries allocate aid to developing countries with weak institutions and governance, which could be perceived as risky to finance. China, by far the largest non-DAC donor, provides aid following its principle of non-interference. According to this principle, Chinese aid allocation should be independent of regime type or governance quality in the borrower country. The presence of China as an alternative donor creates competition to traditional donors for recipient countries. Thus, Hernandez (2017) found that the World Bank in Africa delivers loans with significantly fewer conditions to recipient countries, which are assisted by China. In contrast, the World Bank's conditionality is rarely affected by aid inflows from DAC donors. But it is open to debate whether and in which respect the allocation of aid is likely to differ between DAC and non-DAC donors.

Turning to self-interest of donors, major DAC countries have often been berated to provide aid as a means of promoting bilateral trade or rewarding political allies (Alesina and Dollar 2000). Also Berthélemy (2006) classified France, Japan, and the United States to be egoistic donors. At the same time, it appears to be common wisdom that major new donors are no more altruistic. While China is the chief villain among new donors in the literature,

political considerations may also affect the allocation of aid by regional powers such as Brazil and the Republic of South Africa. Also, Asian donors such as India (Manning, 2006; Woods, 2008), gulf countries (Villanger, 2007), and Venezuela (Manning, 2006 and Naim, 2007) have been blamed for commercial and political selfishness. Woods (2008) even noted that a quest for energy security, enlarged trading opportunities, and new economic partnerships is common to most non-DAC donors.

Dreher et al. (2011) compared 16 new donors (China excluded) with 22 DAC donors over the period 2001-2008 demonstrating that both groups of donors have no preference for less corrupt or more democratic regimes, and that for both groups commercial self-interest (e.g., by promoting its biggest trade partners) is not the main determinant. Dreher and Fuchs (2015) confirmed these results by comparing China with DAC and other non-DAC donors over 1996-2005. Later Broich (2017) investigated whether African authoritarian regimes receive more Chinese development finance than democratic ones and found no evidence for this. He showed that two major determinants of Chinese development finance are recognition of Taiwan and English language as one of the three most common in the recipient country.

Recently Dreher et al. (2018) have demonstrated that much of the controversy about Chinese “aid” stems from a failure to distinguish between China’s Official Development Assistance (ODA-like) and more commercially oriented sources and types of state financing. Using a new database on China’s official financing commitments to Africa from 2000 to 2013, they have shown that the allocation of Chinese ODA is driven primarily by foreign policy considerations, while economic interests better explain the distribution of less concessional OOF-like flows.

There are several reasons why China’s economic interests might play a central role in its allocation of OF. While OOF contribute a very large share of Chinese OF, qualitative research suggests that China Exim Bank and the China Development Bank (two of the

largest sources of Chinese OOF) prioritize “bankable” projects and screen loans based on commercial criteria (Bräutigam 2009; Corkin 2011; Yu 2013; Sun 2014). China has also adopted a “going global” strategy to promote national exports and stimulate business for Chinese firms overseas (Bräutigam 2011). Official financing purportedly facilitates the implementation of this strategy by helping Chinese firms to gain a foothold in new markets where they can export goods and services, and secure future contracts (Chen and Orr 2009). Finally, China has a strong interest in securing access to the natural resources that it lacks at home (oil, minerals and timber) in order to sustain domestic economic growth and stability. Thus, China can provide aid to the region for the sake of those resources (Tull 2006; Davies 2007; Naim 2007; Kobayashi 2008; Halper 2010).

2.3 Aid and trade

There is a growing literature aiming to estimate the impact of foreign aid on trade flows. Many papers show a positive impact of aid on donor’s export to African countries, while its role on the export from recipient country is much less clear (Nelson and Juhasz Silva 2012; Nowak-Lehmann et al. 2013; Pettersson and Johansson 2013).

Early discussions on the aid-trade relationship date back to the transfer paradox, which states that if one country transfers wealth to another, the result - once prices reach their new equilibrium - is better for the giver and worse for the recipient. This states that foreign aid can be beneficial to a donor and detrimental to a recipient, and this result is mediated by trade (Martínez-Zarzoso et al. 2014). All the more, it is surprising that empirical evidence on this issue is rather limited and has produced conflicting results (Papanek 1972; Bauer 1981; Yano and Nugent 1999).

Later on, the literature focused on examining whether aid can promote overall exports of recipients. For example, Munemo et al. (2007) investigated a sample of 84 developing countries (unbalanced panel) and found a positive relationship between aid and exports. However, in a sample of 72 recipient countries (balanced panel), this relationship becomes

statistically insignificant. Kang et al. (2010) presented results for 30 recipient countries utilizing data for the period 1966–2002. They found a positive relationship between aid and exports for 13 countries and a negative relationship for 17 countries. Brenton and von Uexkull (2009) studied the effectiveness of export development programs and found evidence of a positive relationship between technical assistance for trade and developing countries' exports. However, authors suggest that the better performance of aid-for-trade programs is mainly because technical assistance is directed towards industries that are already set to take off. Ferro et al. (2011) found that aid to services (transportation, information and communications technologies, energy, financial services, and business services) has a positive effect on manufacturing exports of developing countries across regions and income-level groups.

More related to our work, Helble et al. (2012) examined the link between aid for trade and bilateral trade flows using a period of 16 years for 40 donor countries and about 170 country trading pairs. They investigated the link between aid spent on trade facilitation and recipients' exports and imports from their trading partners using a gravity model. In most cases, aid-for-trade facilitation is associated with recipient exports than their imports. In contrast, 'other' types of aid (different from AfT) are more strongly associated with recipient imports.

Johansson and Pettersson (2009) and Pettersson and Johansson (2013) also use a gravity model and found a positive relationship between aid and exports. In a gravity model for 184 countries between 1990 and 2005, they showed that bilateral aid is positively correlated with donors' and recipients' exports. The partial correlation between bilateral aid and bilateral trade is present in different export sectors (ores and metals; fuels; food; agricultural raw materials; manufacturing and various minerals), suggesting that no specific industry is driving the results. The aid-trade link is particularly strong for donor exports to Sub-Saharan African countries.

There is a variety of aid mechanisms promoting the exports from donors to recipients. Given the importance of tying aid, the literature distinguishes between foreign aid that is tied – where recipients are formally obliged to reciprocate by buying donor's export – and aid that is untied, where there is no such formal obligation. Arvin and Choudhry (1997) and Arvin and Baum (1997) differentiated tied aid from untied one and found that also untied aid is a catalyst of donors' exports, because untied aid generates a stock of goodwill for a donor. This demonstrates that bilateral aid can enhance bilateral trade also through reputation, mutual trust and support, goodwill and familiarity between trading partners (Arvin and Baum 1997; Arvin and Choudry 1997; Pettersson and Johansson 2013, Nowak-Lehmann et al. 2012). Nowak-Lehmann et al. (2013) explore if aid enhances trade also through more visible outcomes, such as creation of customer relations, distribution channels and a better adaptation to the formal and informal market environment. They analyzed 123 countries in the period 1988–2007 and found that effect of aid on recipient countries' exports is insignificant, but has a positive and significant impact on donors' exports.

The latest paper by Liu and Tang (2018) investigated the impact of aid from the US and China on trade flows between the donors and African countries. Their evidence reveals that the two donors' export is strengthened by aid to African partners. Importantly, China's aid shows a positive effect on its imports from Africa, while the aid from the US exhibits little impact on the imports from Africa. The authors interpret this as evidence that China's aid to Africa better serves the mutual benefit of the donor and recipient country, despite its aid is often tied (Wang and Ozanne 2010).

Based on the literature reviewed we pose the following research hypotheses:

Hypothesis 1. *Official finance has a positive impact on donors' export of manufactured goods to Africa both for traditional donors (European countries and USA) and China.*

We start by testing the widely confirmed positive role of foreign funding on donors' export. We also emphasize the role of funding for manufacturing, as donors typically export manufactured goods while importing primary commodities.

Hypothesis 2. *China's official funding has a positive impact on import of primary commodities from Africa, while funding from traditional donors (European countries and USA) does not affect it.*

Hypothesis 2 follows the literature describing China as a "rogue" donor that provides aid in exchange for natural resources (Tull 2006; Naim 2007). In our study we can compare to what extent official finance from the three major donors promotes bilateral import of primary commodities from Africa.

Hypothesis 3. *OOF as less concessional flows have stronger impact than ODA on trade flows of the donors with the recipient countries.*

Hypothesis 3 is based on two interrelated arguments. The first states that if a donor is willing to promote its export of manufacturing or secure import of primary commodities, ODA is not the main option because it should serve development objectives in the first place. The second argument reflects the orientation by DAC members towards untying development aid (OECD DAC 2019), i.e. that African countries receiving ODA should not have a formal obligation to spend the money on the donors' export. Note that since China is not a DAC member – it did not adopt the OOF ODA classification, i.e. has no commitments to untie its aid – the arguments do not necessarily hold in its case.

3. Data and methodology

3.1 Model specification

Gravity model of trade has been known since the work of Jan Tinbergen (1962) telling that the size of bilateral trade flows between any two countries can be approximated by a "gravity equation" analogous to the Newtonian theory of gravitation. Just as planets are

mutually attracted in proportion to their sizes and proximity, countries trade in proportion to their respective GDP and proximity. In its general form, the model has the following form:

$$X_{ij} = G \cdot S_i \cdot M_j \cdot \varphi_{ij}, \quad (1)$$

where X_{ij} is the monetary value of exports from *i* to *j*, M_j denotes all importer-specific factors that make up the total importer's demand (such as the importing country's GDP) and S_i comprises exporter-specific factors that represent the total amount exporters are willing to supply. G is a variable that does not depend on *i* or *j* such as the level of world trade liberalization. Finally, φ_{ij} represents the ease of exporter *i* to access market *j* (that is, the inverse of bilateral trade costs).

Concerning the theoretical foundation of the gravity equation, important contribution was made by Anderson and van Wincoop (2003), who demonstrated that controlling for relative trade costs is crucial for a well-specified gravity model. Their theoretical results show that bilateral trade is determined by relative trade costs. These so-called "multilateral trade-resistance" (MTR) terms have to be taken into account because countries are surrounded by other large trading economies which should be included in the analysis. Intuitively, this relationship can be explained very simply: the more difficult is trade of regions *i* and *j* with other regions, the more incentives are created for bilateral trade between *i* and *j.* There are several ways to solve the problem of omitted variable bias arising from ignoring MTR terms. The most popular technique was first used in the work of Harrigan (1996) – inclusion of individual fixed effects of countries *i* and *j* in the analysis. This way, the estimates of coefficients of other variables in the model become unbiased and consistent.[8] Similar approach to control for multilateral resistance and heterogeneity of the countries was used by Baldwin and Taglioni (2006) and Nowak-Lehmann and Martínez-Zarzoso (2013). In

[8] MTR indicators change over time, so the individual effects of the exporter/importer can vary over time as well. However, when analyzing relatively short periods of time, one can assume that MTR is stable (Baldwin and Taglioni 2006). In our case testing gravity equation for each donor separately, it is the only option as otherwise the number of time-varying country pair fixed effects equals the number of observations.

addition, we include time dummies to account for global shocks – such as business cycles and oil price changes – and to avoid spurious correlation caused by inappropriate deflation (Baldwin and Taglioni 2006). Our gravity model is specified as follows:

$$Y_{ij,t} = exp\left[\left(lnGDP_{j,t}\right)^{\alpha_1} \left(lnGDP_{i,t}\right)^{\alpha_2} \left(OF_{ij}\right)^{\alpha_3} \left(X'\right)^{\alpha_n} \left(\varphi_t\right) \left(\gamma_{ij}\right) \left(\mu_{ij,t}\right)\right] \quad (2)$$

where $Y_{ij,t}$ stands for trade (import/export) between donor *i* and recipient *j* in period *t*;

$lnGDP_{i,t}$ $(lnGDP_{j,t})$ indicates logarithm of GDP of the recipient (donor) country;[9]

OF_{ij} – bilateral net official funding from donor *i* to recipient *j* either lagged by one year ($OF_{ij,t-1}$) or taken as a sum over the three preceding periods ($\sum_{n=1}^{3} OF_{i,j,t-n}$). This is done to limit the problem of reverse causality*;*

X – set of controls including regional trade agreements and bilateral investment treaties (see Section 3.2);

φ_t – time dummies;

γ_{ij} – country-pair fixed effects.

Given the multiplicative nature of the gravity equation, the standard procedure for estimating it is to obtain a log-linear equation that can be estimated by Ordinary Least Squares. However, there is a problem, which comes from the fact that many zero trade flows and official finance flows will be dropped out from the estimation as the log of zero is not defined. In other words, in the log-linear form of gravity model important information contained in zero observations is lost, which leads to inconsistency of the estimates. This problem is particularly pronounced for our study since we deal with disaggregated flows of trade and official finance. Thus, depending on model specification (the donor we consider, export or import of manufacturing/primary commodities, and the type of official flows: OOF or ODA) we can lose up to 77% of observations.

[9] We take logarithm of GDP to simplify interpretation of the coefficient later on. Also, because GDP data is always positive we do not risk to lose any observation, which is not the case for some other variables in our model.

There are few alternative approaches that have been used to handle the problem: (i) truncating the sample by dropping the observations with zero trade; (ii) adding a small constant to the value of trade before taking logarithms; (iii) estimating the model in levels; and (iv) using non-linear methods of estimation. Approach (i), however, gives correct results only if the zeros are randomly distributed which is hardly the case both for trade and aid flows; (ii) and (iii) are incorrect if an OLS estimation method is used, because (ii) gives inconsistent estimates and (iii) is not supported by theoretically founded gravity equations that present a multiplicative form. To follow (iv), we use the non-linear Pseudo-Poisson maximum likelihood (PPML) estimator. This method can be applied to the levels of trade, thus estimating directly the non-linear form of the gravity model and avoiding dropping zero observations (both for trade and official finance flows). An influential paper by Santos Silva and Tenreyro (2006) highlights that, in the presence of heteroskedasticity (as is usual in trade data), the PPML is a robust approach. In addition, independent variables are not required to follow Poisson distribution law, that is why this technique is the most preferable for estimating the multiplicative gravity equation. Another advantage of the PPML method is that it gives consistent estimates for panel data in the presence of fixed effects of trading partners (Westerlund and Wilhelmsson 2009). Finally, coefficients of the Poisson model have clear interpretation, which is similar to the OLS estimations: the coefficients for all logged independent variables should be interpreted as elasticities and coefficients for variables in levels as semi-elasticities.

3.2 Data description

Our dataset covers the period 2000-2014 and includes 53 African countries, also referred to as recipients, and USA, main European donors (data on Germany, France, UK taken together)[10] and China as their main donors.

[10] The study focuses on the major European donors of Africa – Germany, UK and France, following OECD DAC statistics. The reason why we take the three major donors instead of EU as a whole is that European countries distribute most of their foreign aid individually and not through EuropeAid or other EU institutions. Since the present study aims to measure impact of *bilateral* aid on *bilateral* trade relations, summing the

The theoretically founded gravity model suggests that trade should preferably be treated separately each way: (import from *i* to *j* at time *t* being one observation, and import from *j* to *i* at time *t* - another one (Baldwin and Taglioni 2006). Our data on *bilateral* trade comes from the UN Conference on Trade and Development Dataset (see Figure 1 for a short summary). Due to data quality, we use reported total imports for both incoming and outgoing trade flows.[11] Disaggregating the data, as *primary commodities* we take its broadest definition including precious stones and non-monetary gold from UNCTAD SITC rev.3 (UNCTAD 2019): sectors 0 to 4 plus 68, 667 and 971). Complementary, as *manufactured goods* we take SITC classification sectors 5 to 8 less 667 and 68.[12]

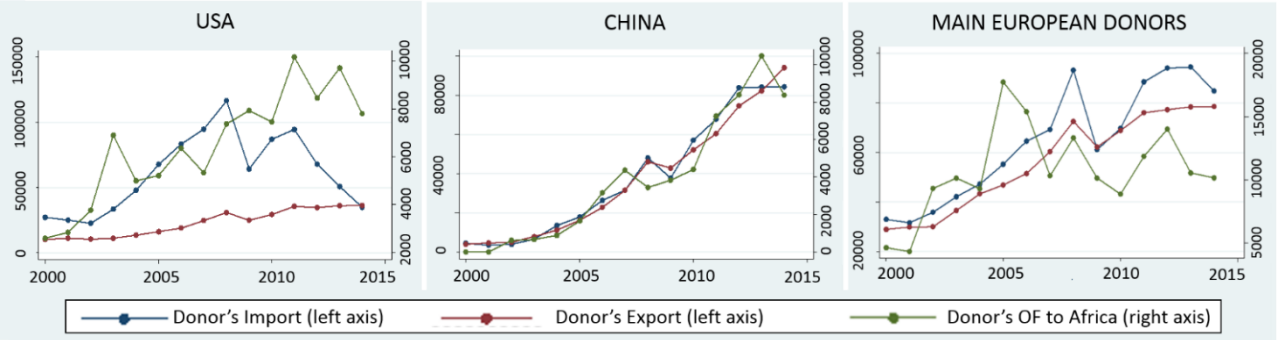

Figure 1. OF, import and export flows from USA, China and main European donors to Africa between 2000 and 2014, million US$.

The data on *official finance of traditional donors* comes from the OECD DAC online database of International Development Statistics. From this database we obtain the volumes of disbursed bilateral aid and other official flows by recipient and donor. Data on *China's official finance* comes from the AidData, where it was collected at the project level and based on an open-source methodology named Tracking Underreported Financial Flows (TUFF).

information on aid and trade would violate this concept. For this reason, we took the three major donors and trade partners to Africa from Europe and pool those observations in one model.

[11] A similar strategy is followed by Helpman et al. (2008) and Pettersson and Johansson (2013).

[12] Manufactured goods include chemicals and related products, manufactured goods, machinery and transport equipment and miscellaneous manufactured articles. Primary commodities include food and live animals, beverages and tobacco, crude materials, inedible, except fuels, mineral fuels, lubricants and related materials, animal and vegetable oils, fats and waxes, pearls, precious & semi-precious stones, non-ferrous metals, non-monetary gold (excluding gold ores and concentrates). While alternative groupings are possible, the main strength of the two groups selected is that, taken together, they account for all the classified trade flows. For robustness we test primary commodities classification excluding precious stones and non-monetary gold and report the differences later in text.

This methodology provides a systematic way of tracking aid and other forms of state financing from governments that do not publish comprehensive or detailed information about their overseas activities. However, this dataset has two important limitations. First, it does not allow to distinguish with certainty between the funding complying with the DAC's definition of Official Development Assistance (ODA and ODA-like) and Other Official Flows (OOF). In particular, a fraction of projects lacking sufficient details (interest rates, grace periods, or maturity dates) are originally classified as "vague". Following Dreher et al. (2018) we treat those projects as OOF (see Figure 2). The second limitation is that the dataset on China contains only data on commitments of finance, in contrast to the data of actual disbursements available for traditional donors. Nonetheless, based on the available data on the starting and ending period of the projects we estimate the average length of the projects (distinguishing between infrastructural and non-infrastructural projects)[13] and extrapolate the OF amounts in equal shares over the respective periods, thus ensuring comparability between the OF coming from traditional donors and China. As an additional control variable, we also include *sum of bilateral official finance from all other donors* we analyse here to a single recipient to check whether other donors disturb an existing bilateral trade relationship between particular countries (Nowak-Lehmann and Martínez-Zarzoso 2013).

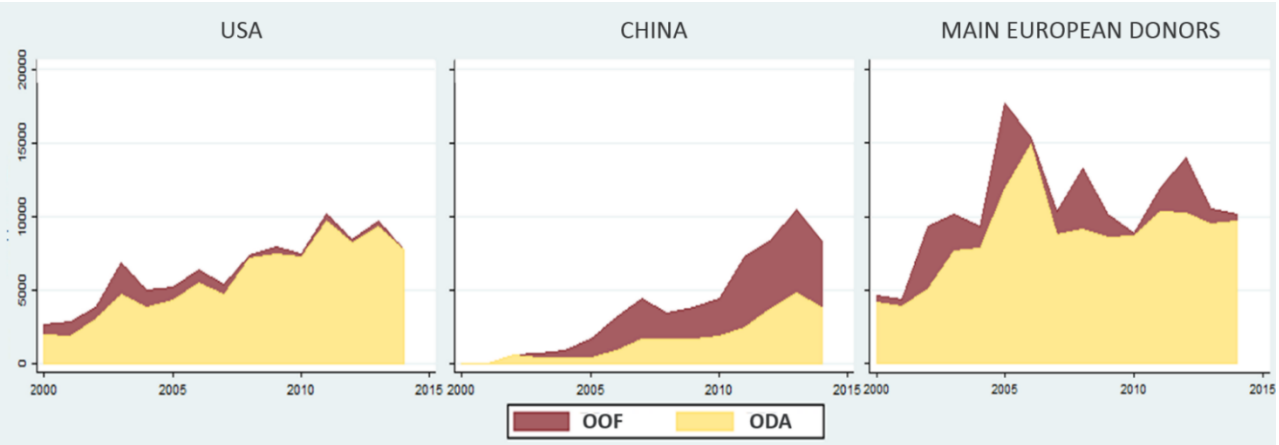

Figure 2. OF flows from traditional donors and China to Africa between 2000 and 2014, distinguishing between ODA and OOF flows, million US$.

[13] Infrastructure projects funded by China last on average 3 years, while all other projects last on average 2 years.

Data on *GDP* of donors and recipients has been taken from the World Development Indicators Online database. To take into account trade barriers, we use the *degree of trade freedom*, which data is provided by the Heritage Foundation. Index of Trade Freedom is a composite measure of the extent of tariff and non-tariff barriers that affect imports and exports of goods and services. Its score is based on two inputs: the trade-weighted average tariff rate and non-tariff barriers. Also tariff barriers are accounted in the form of dummies for the existence of *regional trade agreements (RTA)*[14] and *WTO membership* of donors and recipients; this data has been taken from WTO database.

Since search costs are probably lower for trade between countries whose business practices, competitiveness and delivery reliability are well known to one another, firms are more likely to search for suppliers or customers in countries where the business environment is familiar to them. For this reason, we include dummy for *Bilateral Investment Treaties and Treaties with Investment Provisions* from the database of Investment Policy HUB.

To account for additional income and production capacity of recipient countries, we add *Foreign Direct Investments (FDI)* from the UNCTAD database. Because of country-pair fixed effects in (2) we cannot include additional controls like distance, landlockedness of countries, common language and colonial history.

More details on dependent, explanatory and control variables can be found in Appendix A. There we report spatial distribution of OF flows from the three major donors to African countries (Figure A2) and the dynamics of bilateral import and export flows between the three major donors and African countries (including the breakdown between main SITC sectors, Figure A3). Also, a covariance matrix of all variables (Figure A1) and unit root test

[14] The likelihood of the two countries selecting into an RTA may be high if there already exist large bilateral trade flows, and creation of RTA deepens liberalization beyond tariff barriers into domestic regulations. However, following Baier and Bergstrand (2007), omitted variable (selection) bias can be solved by using correct specification of the model. Thus, there are unobserved time-invariant bilateral variables, influencing simultaneously the presence of an RTA and the volume of trade; these variables are likely correlated with RTAij and they are best controlled by using bilateral “fixed effects” in the panel data.

of trade and OF flows demonstrating that those variables are stationary (Table A3) are provided.

4. Estimation results

Regression results of the models on the impact of official finance cumulated over the preceding three years on imports and exports of donors in the current period are presented in Tables 1 and 3, respectively. Additionally, results for models differentiating between types of funding (ODA and OOF) are presented in Tables 2 and 4. Robustness checks using, instead of 3 year cumulated flows, finance provided in the previous year only are presented in Appendix B. Figure 3 shows the summarized results of all regressions, where the color and the sign illustrate significant role of official finance variables in regressions. The columns represent the variables that were used in the estimation — OF, ODA and OOF. We see that the results are stable, that is, the sign and significance of the coefficients in most regressions are preserved for different form of instrumenting official flows. More detailed estimation results for each donor are discussed below.[15]

Considering the influence of control variables of the model, it can be noted that the recipient's GDP occasionally has a significant coefficient on the volume of bilateral trade, but in most cases it is not significant. The same holds true for the donor's GDP, which was included only in models for Europe, since in the models for the USA and China this variable is captured by fixed effects. For traditional donors, recipient's membership in the WTO reduces the trade volumes, while in the case of China we find a positive relationship. This result may appear because membership in WTO gives developing countries immediate access to developed markets at the lower tariff rate, but they do not have to immediately

[15] We also estimated a pooled regression for all donors taken together, where we consistently observe positive impact of OF and OOF on the donors' exports, but for the donors imports we do not get robust results. The reason is that the donors are very different when it comes to the role of their official finance on their import from the recipient economy. For brevity reasons we do not include those results here but they can be obtained from authors on request.

remove reciprocal tariffs in their markets (Part IV of the GATT 1994). As a result, developing countries can protect their markets from overwhelming competitive pressure from developed countries, while China –as a developing member of the WTO– benefits more from trade with African countries joining WTO. Another complementary explanation is that African members of the WTO, due to higher openness of their economies, were negatively affected by the slowdown of international trade in Europe and the US in the aftermath of the global economic recession, while China has been hit by the recession less severely. RTAs are generally not found to be significant. A negative coefficient is found for RTA in case of export from USA, but it is caused by one single positive observation (RTA dummy equal 1) for Morocco.

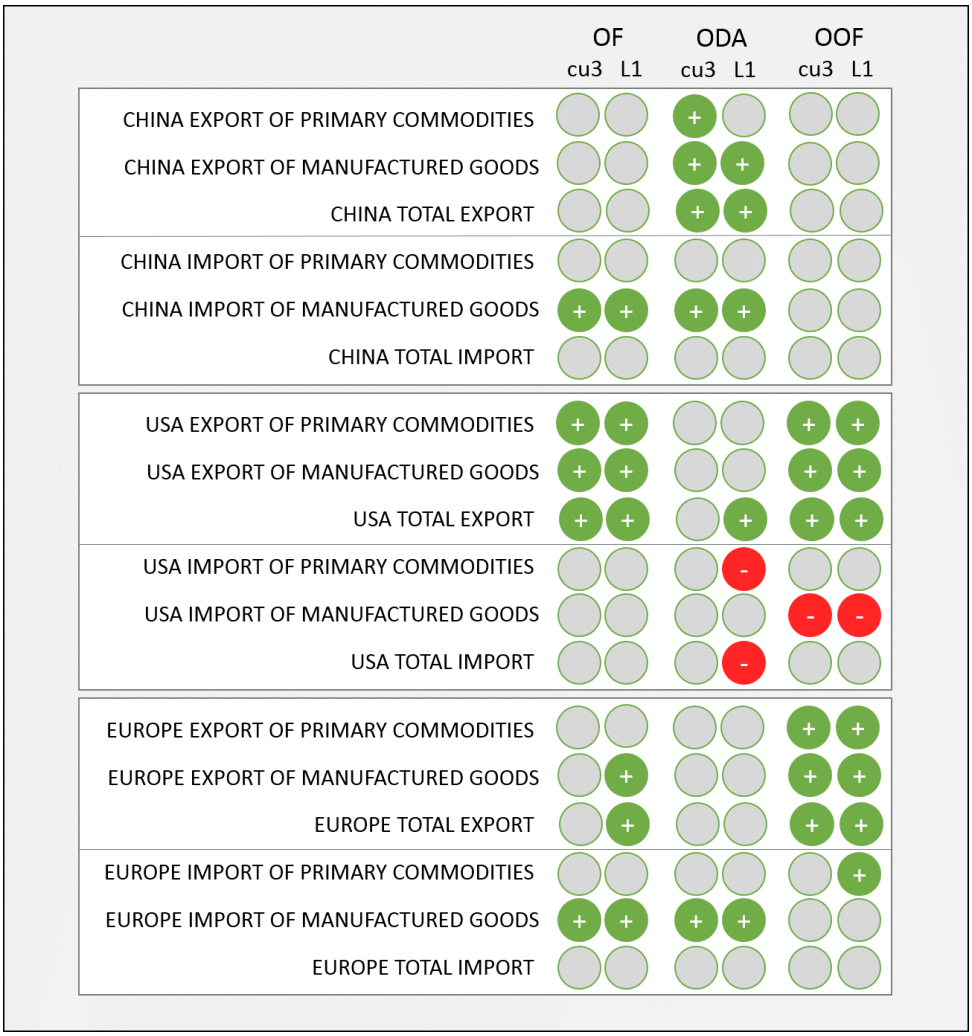

Figure 3. Summary of regression results

Note: cu3 stands for the amount of finance cumulated over three previous years, L1 - finance provided in the previous period.

4.1 Results for China

Import from African countries

According to the results of the regression analysis, we reject Hypothesis 2 proposing that China, as one of the largest importers of African primary commodities, is using official finance to secure access to raw materials in Africa as we find no statistically significant relation with the import of primary commodities. On the contrary, we see a significant positive relationship between official finance (and ODA particularly) and imports of manufactured goods from Africa (Table 1). This result is in line with the fact that there has been a considerable amount of Chinese FDI in manufacturing sector in Africa, notably in sectors like leather, textiles, rubber, metal and mineral products, building materials (Chen 2015, Bräutigam et al. 2018). The transfer of Chinese production to Africa is happening due to wealth of natural resources and cheap labor, and it resembles the flying geese model that explained earlier the relocation of low technology industries from Japan to other Asian countries (Akamatsu 1962). China was a late comer in that model, but is now on the technology frontier, thus in the role of leader goose (Lin 2011, Bräutigam 2018). For African countries this is an opportunity to enter international market and increase trade volumes, as China itself did 30 years ago. According to UNCTAD statistics, the most important manufacturing sectors of Chinese import from Africa in 2000-2014 are manufactured goods (SITC 6, +30% increase over 15 years) to 50% consisting of non-metallic mineral products (SITC 66, +33%) and iron and steel (SITC 67, +23%),[16] chemicals (SITC 5, +16%) and machinery and equipment (SITC 7, +15%) that by more than 50% consists of electrical machinery (SITC 77, +16%).

[16] Henceforth we will report growth rates of export and import of particular type of goods and services estimated not on yearly basis but by taking year 2000 as a starting period and year 2014 as a final period, i.e. over the entire period of 15 years under consideration. This is important to remember since yearly growth rates are usually much smaller. Also note that the trade flows are not deflated which means that the growth rates are biased upwards.

Table 1. Regression results for donor's import and cumulated OF

Variables	China			USA			main European donors		
	(1) Import of primary	(2) Import of manufactures	(3) Import total	(1) Import of primary	(2) Import of manufactures	(3) Import total	(1) Import of primary	(2) Import of manufactures	(3) Import total
lnGDP of recipient	0.353	0.134	0.399	-0.132	-0.040	-0.186	1.195***	0.309*	1.098***
	(0.324)	(0.288)	(0.294)	(0.130)	(0.227)	(0.152)	(0.169)	(0.183)	(0.156)
OF cumulated over 3 years	-0.007	0.201**	-0.008	0.018	0.091	0.066	0.057	0.071**	0.061
	(0.051)	(0.083)	(0.046)	(0.117)	(0.071)	(0.136)	(0.050)	(0.034)	(0.045)
OF cumulated over 3 years from other donors	-0.041*	-0.001	-0.037*	0.004	0.088**	0.007	-0.017	-0.054	-0.022
	(0.023)	(0.035)	(0.023)	(0.008)	(0.034)	(0.009)	(0.034)	(0.041)	(0.032)
WTO recipient	5.144***	2.768***	1.971***	0.753***	-0.994***	-0.630***	0.939**	-1.296***	-1.300***
	(1.012)	(0.140)	(0.127)	(0.064)	(0.121)	(0.054)	(0.372)	(0.262)	(0.332)
Trade freedom recipient	0.010*	-0.013***	0.008*	-0.000	-0.002	0.001	0.008**	-0.001	0.005
	(0.005)	(0.005)	(0.005)	(0.003)	(0.007)	(0.003)	(0.004)	(0.003)	(0.003)
Bilateral investment treaties	-0.699***	0.565***	-0.659***	0.748***	-0.716***	0.028	-0.004	0.092	0.028
	(0.222)	(0.195)	(0.215)	(0.175)	(0.255)	(0.223)	(0.083)	(0.080)	(0.080)
FDI recipient	0.006	-0.008	0.006	0.009	0.022***	0.011	0.040***	-0.004	0.033**
	(0.009)	(0.017)	(0.009)	(0.016)	(0.007)	(0.014)	(0.015)	(0.006)	(0.013)
RTA				0.085	0.279	0.082	0.002	-0.122	-0.083
				(0.112)	(0.172)	(0.092)	(0.158)	(0.114)	(0.143)
lnGDP of donor							0.774	2.710***	1.229**
							(0.572)	(0.678)	(0.527)
Trade freedom donor							0.022	-0.008	0.012
							(0.030)	(0.023)	(0.024)
N of observations	561	567	567	567	567	567	1695	1701	1701
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note. Clustered robust standard errors are in parenthesis. The asterisks ***, **, and * are 1%, 5%, and 10% of significance levels, respectively.
Variables *lnGDP of donor* and *Trade freedom donor* are invariant for each country-pair in regressions for China and USA, thus not included.
Variable RTA is time invariant for China, thus not included.

Table 2. Regression results for donor's import and cumulated ODA and OOF

	China			USA			main European donors		
	(1) Import of primary	(2) Import of manufactures	(3) Import total	(1) Import of primary	(2) Import of manufactures	(3) Import total	(1) Import of primary	(2) Import of manufactures	(3) Import total
lnGDP of recipient	0.400	-0.123	0.438	-0.092	0.081	-0.149	1.241***	0.214	1.121***
	(0.332)	(0.255)	(0.304)	(0.110)	(0.270)	(0.155)	(0.166)	(0.169)	(0.155)
ODA cumulated over 3 years	0.020	0.990***	0.044	-0.002	0.065	0.073	0.054	0.190*	0.089
	(0.239)	(0.348)	(0.235)	(0.057)	(0.096)	(0.086)	(0.064)	(0.103)	(0.070)
OOF cumulated over 3 years	-0.018	0.056	-0.021	0.287	-0.726***	0.251	0.077	-0.006	0.062
	(0.066)	(0.094)	(0.062)	(0.205)	(0.282)	(0.201)	(0.053)	(0.049)	(0.045)
ODA cumulated over 3 years from other donors	-0.029	-0.010	-0.028	0.001	0.248***	0.002	-0.041	-0.149**	-0.051
	(0.030)	(0.045)	(0.028)	(0.013)	(0.090)	(0.011)	(0.042)	(0.062)	(0.043)
OOF cumulated over 3 years from other donors	-0.059	-0.048	-0.052	0.020	-0.063*	0.027	0.045	0.035	0.023
	(0.037)	(0.044)	(0.036)	(0.041)	(0.038)	(0.042)	(0.071)	(0.046)	(0.068)
WTO recipient	5.150***	2.754***	1.978***	0.667***	-0.866***	-0.687***	0.931**	-1.309***	-1.311***
	(1.011)	(0.145)	(0.126)	(0.077)	(0.115)	(0.067)	(0.370)	(0.268)	(0.334)
Trade freedom recipient	0.010*	-0.013**	0.008*	0.001	-0.000	0.001	0.008**	-0.001	0.005
	(0.005)	(0.005)	(0.005)	(0.002)	(0.007)	(0.002)	(0.004)	(0.003)	(0.003)
Bilateral investment treaties	-0.700***	0.388	-0.666***	0.686***	-0.527*	-0.012	0.001	0.097	0.032
	(0.232)	(0.243)	(0.225)	(0.180)	(0.283)	(0.231)	(0.084)	(0.092)	(0.082)
FDI recipient	0.006	-0.011	0.006	0.013	0.020**	0.013	0.041***	-0.003	0.034***
	(0.009)	(0.017)	(0.009)	(0.016)	(0.009)	(0.015)	(0.015)	(0.006)	(0.012)
RTA				-0.015	0.239	0.018	0.006	-0.165	-0.092
				(0.114)	(0.164)	(0.090)	(0.163)	(0.119)	(0.150)
lnGDP of donor							0.762	2.616***	1.201**
							(0.575)	(0.619)	(0.514)
Trade freedom donor							0.025	0.001	0.015
							(0.031)	(0.024)	(0.024)
Number of obs.	561	567	567	567	567	567	1695	1701	1701
Country fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note. Clustered robust standard errors are in parenthesis. The asterisks ***, **, and * are 1%, 5%, and 10% of significance levels, respectively.
Variables *lnGDP of donor* and *Trade freedom donor* are invariant for each country-pair in regressions for China and USA, thus not included.
Variable RTA is time invariant for China, thus not included.

Table 3. Regression results for donor's export and cumulated OF

Variables	China			USA			main European donors		
	(1) Export of primary	(2) Export of manufactures	(3) Export total	(1) Export of primary	(2) Export of manufactures	(3) Export total	(1) Export of primary	(2) Export of manufactures	(3) Export total
lnGDP of recipient	0.828***	0.665***	0.676***	0.479	-0.481***	-0.196	-0.128	0.003	-0.022
	(0.105)	(0.133)	(0.129)	(0.374)	(0.149)	(0.170)	(0.314)	(0.146)	(0.164)
OF cumulated over 3 years	0.033	0.021	0.021	0.154***	0.061**	0.106***	0.019	0.039	0.034
	(0.041)	(0.025)	(0.024)	(0.052)	(0.029)	(0.027)	(0.057)	(0.040)	(0.040)
OF cumulated over 3 years from other donors	0.014***	0.017***	0.017***	-0.027	0.001	-0.005	-0.007	-0.040**	-0.031
	(0.005)	(0.006)	(0.006)	(0.040)	(0.027)	(0.022)	(0.040)	(0.019)	(0.019)
WTO recipient	1.224***	0.243**	0.313***	-1.336***	-0.552***	-0.883***	-0.396	-0.587***	-0.425
	(0.094)	(0.109)	(0.110)	(0.225)	(0.077)	(0.104)	(0.340)	(0.223)	(0.264)
Trade freedom recipient	-0.001	0.009*	0.008*	0.016**	0.003	0.009**	0.005*	0.001	0.003
	(0.004)	(0.005)	(0.005)	(0.007)	(0.003)	(0.004)	(0.003)	(0.002)	(0.002)
Bilateral investment treaties	0.115	-0.085	-0.073	0.394***	-0.235	0.041	-0.013	0.182***	0.130**
	(0.097)	(0.112)	(0.109)	(0.153)	(0.163)	(0.154)	(0.107)	(0.062)	(0.064)
FDI recipient	0.020*	0.005	0.006	0.019**	0.009	0.011*	-0.036*	0.007	-0.001
	(0.011)	(0.007)	(0.006)	(0.009)	(0.011)	(0.006)	(0.020)	(0.006)	(0.006)
RTA				-1.028***	-0.703***	-0.842***	-0.003	0.145*	0.116
				(0.310)	(0.085)	(0.127)	(0.106)	(0.083)	(0.080)
lnGDP of donor							-0.385	0.774**	0.397
							(0.838)	(0.371)	(0.412)
Trade freedom donor							0.021	0.044***	0.035**
							(0.031)	(0.016)	(0.016)
N of observations	567	567	567	567	567	567	1701	1701	1701
Country fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note. Clustered robust standard errors are in parenthesis. The asterisks ***, **, and * are 1%, 5%, and 10% of significance levels, respectively.
Variables *lnGDP of donor* and *Trade freedom donor* are invariant for each country-pair in regressions for China and USA, thus not included.
Variable RTA is time invariant for China, thus not included.

Table 4. Regression results for donor's export and cumulated ODA and OOF

	China			USA			main European donors		
	(1) Export of primary	(2) Export of manufactures	(3) Export total	(1) Export of primary	(2) Export of manufactures	(3) Export total	(1) Export of primary	(2) Export of manufactures	(3) Export total
lnGDP of recipient	0.807***	0.617***	0.630***	0.453	-0.510***	-0.219	-0.054	0.020	0.006
	(0.102)	(0.121)	(0.118)	(0.314)	(0.143)	(0.150)	(0.287)	(0.135)	(0.152)
ODA cumulated over 3 years	0.158*	0.210***	0.203***	-0.014	-0.010	0.012	-0.106	-0.056	-0.077
	(0.088)	(0.078)	(0.077)	(0.070)	(0.040)	(0.032)	(0.097)	(0.135)	(0.118)
OOF cumulated over 3 years	-0.007	-0.019	-0.017	0.963***	0.576***	0.669***	0.166***	0.092*	0.105**
	(0.054)	(0.028)	(0.027)	(0.302)	(0.156)	(0.082)	(0.063)	(0.050)	(0.047)
ODA cumulated over 3 years from other donors	0.013**	0.005	0.006	0.011	-0.039	-0.013	-0.044	-0.035	-0.037
	(0.006)	(0.005)	(0.005)	(0.035)	(0.035)	(0.022)	(0.051)	(0.038)	(0.036)
OOF cumulated over 3 years from other donors	0.009	0.020	0.020	-0.003	0.069***	0.042**	0.130**	0.003	0.045
	(0.011)	(0.017)	(0.016)	(0.040)	(0.025)	(0.019)	(0.064)	(0.050)	(0.041)
WTO recipient	1.225***	0.232**	0.303***	-1.374***	-0.602***	-0.928***	-0.393	-0.586***	-0.424
	(0.094)	(0.110)	(0.112)	(0.196)	(0.059)	(0.077)	(0.339)	(0.223)	(0.265)
Trade freedom recipient	-0.000	0.009*	0.008*	0.017**	0.004	0.010***	0.006**	0.001	0.003
	(0.004)	(0.005)	(0.005)	(0.007)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Bilateral investment treaties	0.095	-0.156	-0.139	0.441***	-0.249	0.042	-0.029	0.166**	0.110*
	(0.085)	(0.106)	(0.103)	(0.134)	(0.163)	(0.154)	(0.101)	(0.067)	(0.066)
FDI recipient	0.022*	0.006	0.007	0.013	-0.001	0.004	-0.034*	0.006	-0.002
	(0.011)	(0.006)	(0.005)	(0.009)	(0.009)	(0.007)	(0.018)	(0.007)	(0.007)
RTA				-1.033***	-0.718***	-0.857***	-0.006	0.148*	0.114
				(0.264)	(0.061)	(0.089)	(0.106)	(0.087)	(0.084)
lnGDP of donor							-0.378	0.789**	0.411
							(0.839)	(0.366)	(0.405)
Trade freedom donor							0.022	0.043***	0.035**
							(0.030)	(0.015)	(0.015)
Number of obs.	567	567	567	567	567	567	1701	1701	1701
Country fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note. Clustered robust standard errors are in parenthesis. The asterisks ***, **, and * are 1%, 5%, and 10% of significance levels, respectively.
Variables *lnGDP of donor* and *Trade freedom donor* are invariant for each country-pair in regressions for China and USA, thus not included.
Variable RTA is time invariant for China, thus not included.

Comparing coefficients for ODA and OOF, we observe a statistically significant effect only for ODA (Table 2). In particular, an increase by 100 million US$ in ODA provided to an African country leads to approximately 10% increase in import of manufacturing. The same pattern emerges if we take robustness checks for ODA lagged by one year (presented in Appendix B) into account. In this case, the coefficient for ODA indicates an even stronger increase in import of manufacturing – by 17%. This provides evidence to reject our Hypothesis 3 conjecturing that OOF should have a stronger impact on trade flows between the donor and the recipient.

Export to African countries.

China's ODA has a strong impact on China's exports to Africa (Hypothesis 1 for Chinese ODA is not rejected). From Table 4 we can see that OOF is insignificant on Chinese exports, while concessional ODA-like flows (which have greater grant element, but most often tied in case of China) have a significant positive effect on exports from China. This might be due to the fact that higher degree of concessionality allows the donor to attach more strings. In any case, Hypothesis 3 on the stronger effect of OOF than ODA on trade between the recipient and the donor, is rejected for China's export. Taking into account the additional analysis where we used first lag of OF, OOF and ODA instead of their cumulated sum over the three preceding years (Appendix B), we conclude that results are robust for the export of manufacturing with largest sectors being machinery and transport equipment (SITC 7 +29% increase), manufactured goods (SITC 6 +25%) and miscellaneous manufactured articles (SITC 8 +23%), while results for export of primary commodities by China are less robust, and significant only in estimation of cumulated values of ODA. Moreover, if we exclude precious stones and non-monetary gold from consideration, the relation between Chinese ODA and export of primary commodities becomes insignificant.

To summarize, China's financial aid to Africa is stimulating trade of manufactured goods with the African continent in both directions: China is selling more machinery and transport equipment, and buying steel, construction materials and chemicals. This result is a good illustration of win-win cooperation, as export of Chinese relatively low-cost machinery and equipment allows African countries to strengthen their industrial base and diversify their export. In doing this, China uses its ODA-like finance and not OOF. Not being a DAC member, China did not commit itself to untying its aid. Therefore, this result is not totally surprising.

4.2 Results for USA

Import from African countries

We find a significant and negative relationship between OOF coming from the US and the import of manufactured goods from Africa (Table 2). This result is robust to lag specification (Table B2 in Appendix B)[17] and may look surprising at first sight, but in the literature there are studies obtaining similar outcome (McGillivray and Oczkowski 1992; Lloyd et al. 2000). Given the fact that over 2000-2014 the United States were consistently reducing their OOF and at the same time were increasing imports from industrial sectors, the negative coefficient may be considered more as a statistical artefact and does not play much role for the trade relationship between the US and the African continent. Among one digit SITC manufacturing sectors, the fastest growing ones are chemicals (SITC 5, +11% in 15 years) and machinery and transport equipment (SITC 7, +11%). Slower was rising import of manufactured goods (SITC 6, +4%) and miscellaneous manufactured articles (SITC 8,

[17] We also find less robust evidence on a negative role of US ODA on the total imports and imports of primary commodities in particular. As we cannot confirm this finding for ODA cumulated over the three preceding years, we abstain from interpreting it further.

+4%). Also we shall stress that our results are in line with Hypothesis 2 for the USA that their OF do not stimulate import of primary commodities from Africa.

Export to African countries.

When it comes to testing the relationship between OF from the US and its export to Africa, we consistently find positive and significant relationship not only with overall export, but also its constituent parts: manufacturing and primary commodities (Table 3). This result is also confirmed for alternative OF specification taken as first lag (Appendix B). For this reason, for the US we cannot reject Hypothesis 1 on the positive effect of official finance on the export of manufactured goods to Africa. Comparing the regression coefficients obtained for OOF and ODA (Table 4), we confirm the relation for OOF but not ODA. Thus, in the case of the United States, we cannot reject Hypothesis 3 that less concessional finance has a stronger influence on trade flows. Moreover, we find that OF – in the form of OOF flows – from the US stimulate the donor's export of primary commodities as well. This relation, however, loses significance if we drop precious stones non-monetary gold from consideration. If we take a closer look on the dynamics of the US export to Africa during the period 2000-2014, we find that the dominant manufacturing exporting sector is machinery and transport equipment (SITC 7, +9%) followed by chemicals (SITC 5, +10%) and manufactured goods (SITC 6, +10%).

Overall, we find that the official finance from the US in Africa is mainly serving the US own interest in stimulating export of manufactured goods. OOF that include export credits are the main instrument to achieve this. While the US do not use their OF to stimulate import of primary commodities from Africa, we also could not find any positive link between their official finance and import of manufacturing from Africa. If anything, the association is negative for OOF.

4.3 Results for main European donors

Import from African countries

Similar to our earlier discussion for China, we find a positive link between official finance from European donors and their imports of manufactured goods from Africa. Further differentiating between ODA and OOF, we find this association to be particularly strong and robust for ODA, and not significant for OOF, thus providing evidence to reject Hypothesis 3. It should nonetheless be noted that increased export of manufacturing by African countries reflects structural change and diversification, so that, while the ODA-trade coupling looks odd for DAC countries, it refers to a type of trade with positive development implications. Comparing the regression coefficients one should mention though that the effect for European donors is smaller: for 100 million US$ of additional ODA one would observe 2-4% increase in imports (compared to 10-17% for China). Furthermore, as we find no significant association of funding from European countries with import of primary commodities, we cannot reject Hypothesis 2 implying that the European donors, as DAC members, do not use aid to gain access to natural resources from Africa. Among the main manufacturing sectors contributing to import from Africa to UK, Germany and France are machinery and equipment (SITC 7, +10%), with over one third being electrical machinery (SITC 77, +10%),[18] miscellaneous manufactured articles (SITC 8, +1%) to 70% consisting of apparel and clothing accessories (SITC 84, +0.2%), manufactured goods (SITC 6, -0.5%) and chemicals (SITC 5, +9%).

Export to African countries

Considering trade flows in the opposite direction, similar to the US we find a positive link between OOF from Europe and their export of manufactured goods,[19] while no

[18] Road vehicles (SITC 78) is also an important group, but limited to South Africa, Tunisia, and Morocco.
[19] Again, for Europe, just like for the US and China, significance in the relation between official funding and export of primary commodities is driven by precious stones non-monetary gold included in primary commodities.

significant effect is found for ODA. This result is robust to alternative lag specification (Appendix B) and it is in line with Hypothesis 1 – that donors promote their export of manufacturing to Africa using OF–, and Hypothesis 3 – that OOF as financial flows, which do not have to serve development objectives, play a major role in affecting trade flows. Given that for European donors ODA is of larger size than OOF (similar to the US and unlike China), this further illustrates the orientation of DAC donors to move away from tied aid and remove barriers to open competition for procurement. Comparing European donors with the US in the role their OOF play on export of goods it is worth stressing that for Europe the coefficients are much smaller: 100 million US$ increase in OOF leads to on average 1-2% increase versus 6-10% for the US. For manufacturing, the largest export sectors from the three largest European donors to Africa are machinery and transport equipment (SITC 7, +7%) dominated by road vehicles (SITC 78), and chemicals (SITC 5, +8%) dominated by medicinal and pharmaceutical products (SITC 54).

To sum up, we find that the official finance from the European countries resembles some features observed for the US and China. Similar to USA, OOF from Europe stimulates export to Africa, and alike China, ODA from Europe leads to higher import of manufacturing from Africa. In both cases, however, the impacts are smaller in size in case of Europe.

5. Conclusion

Aid effectiveness and "untying" of aid are among the major topics in the literature on international development cooperation. We contribute to this literature by estimating a gravity-type model for bilateral trade flows between African countries and their major donors augmented with flows of official finance. These models have been tested separately for each of the donors, direction of trade flows (export or import to Africa) and types of trade flows (manufactured goods, primary commodities or the two taken together). Furthermore, we differentiate between types of official funding (OF, ODA or OOF). This allows us to identify

similarities and differences in the impacts of aid on trade reflecting different donors' national interests and development objectives in Africa.

In accordance with the literature, we find a positive and significant relationship between donors' exports and official finance provided for all the donors under consideration. This result holds if we disaggregate the exports in primary commodities and manufactured goods. Interestingly, for trade flows in the opposite direction the relationship is positive and significant only for the import of manufactured goods to China and Europe. This finding is in sharp contrast with the popular claim that Chinese funding is tied to import of natural resources. Looking closer we see that while exporting more machinery and transport equipment to Africa, China is increasingly importing low added value manufacturing. This well illustrates its win-win strategy, which finds outlets for Chinese production, but also helps African countries to strengthen their industrial base and diversify their export. For Europe we find a similar relationship although much smaller in size of the regression coefficients.

Furthermore, following the recent trend on untying aid, we test which of the two constituent parts of official finance plays a bigger role. When disaggregating official funding into ODA and OOF flows, we find that unlike traditional donors like the US and European donors, China is (still) using more concessional flows and funding with development objectives as the main instrument to stimulate its export. This result should not look surprising since not being a DAC member, China did not commit itself to untying its aid, i.e. to clearly keep development and commercial objectives separated. European donors and the US being DAC members are indeed moving away from tied aid. We also find ODA as a main instrument for China and European donors to stimulate import of manufacturing from Africa. This, however, can be viewed as a positive result of development funding and is not about tied aid, because export of manufacturing from Africa reflects structural change and diversification, so that this type of trade has development implications.

Regardless the main tool adopted (ODA vs OOF), we can note that all donors promote their export to Africa, but also that, for all of them, the main sector is machinery and equipment (SITC 7), which looks very positive. While industrial consumption goods simply crowd out local production, equipment and capital goods contribute to increase the production capacity of the importing country, with documented effects on long-run growth (Lee 1995).

Further research could disaggregate equipment from other manufacturing to assess difference among donors and potential role of Chinese low cost/small scale equipment which is very popular among African SMEs. Since China orients most of its funding for the infrastructure projects, further research would benefit from disaggregate data on aid for trade and aid for infrastructure.

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Appendix A. Data description

Table A1. Variables description

	Name	Description	Data Source
Dependent variables	Total donor's export	Total bilateral recipient's import from particular donor.	UN Conference on Trade and Development Data
	Donor's export of primary commodities	Recipient's bilateral Import of Primary commodities, precious stones and non-monetary gold from particular donor (SITC 0 + 1 + 2 + 3 + 4 + 68 + 667+ 971).	
	Donor's export of manufactured goods	Recipient's bilateral Import of Manufactured goods from particular donor (SITC 5 to 8 less 667 and 68).	
	Total donor's import	Total bilateral donor's import from particular African country.	
	Donor's import of primary commodities	Donor's bilateral Import of Primary commodities, precious stones and non-monetary gold (SITC 0 + 1 + 2 + 3 + 4 + 68 + 667+ 971).	
	Donor's import of manufactured goods	Donor's bilateral Import of Manufactured goods (SITC 5 to 8 less 667 and 68).	
Official Funding	Official Funding (OF)	Bilateral OF from Germany, UK, France, USA is taken as gross disbursements; Bilateral OF from China is calculated from commitment data by taking moving averages over the last two/three years for infrastructure/other projects.	OECD data (for main European donors, USA) AidData (for China)
	Official Development Assistance (ODA)	Bilateral ODA from Germany, UK, France, USA is taken as gross disbursements; Bilateral ODA from China is calculated from commitment data by taking moving averages over the last two/three years for infrastructure/other projects	
	Other Official Flows (OOF)	Bilateral OOF is calculated by differencing bilateral OF and bilateral ODA flows for all donors.	
Controls	GDP of recipient	GDP of recipient.	World Development Indicators (World Bank)
	GDP of donor	GDP of donor.	
	Bilateral Investment Treaties and Treaties with Investment Provisions	1=Pair has Bilateral Investment Treaties and Treaties with Investment Provisions. For EU we take into account agreements with OCT (Overseas Countries and Territories), ACP (African, Caribbean and Pacific Group of States); for France, Germany and UK we consider only bilateral agreements.	Investment Policy HUB
	WTO recipient	1=Recipient is GATT/WTO member.	World Trade Organisation
	RTA	1=RTA (regional trade agreement) following the transcription of the list of regional trade agreements made available on the WTO website.	World Trade Organisation
	FDI	Total Foreign Direct investments of recipient that provided by the world.	UN Conference on Trade and Development Data
	Trade freedom of the donor	Trade freedom is a composite measure of the extent of tariff and non-tariff barriers that affect imports and exports of goods and services.	Heritage Index Website
	Trade freedom of the recipient		

Table A2. Descriptive statistics

Variable	Unit	Obs.	Average	Max	Min
Donor's export of primary commodities	millions US$, current	4770	155.06	0	8568.955
Donor's export of manufactured goods		4770	586.978	0	23387.71
Donor's import of primary commodities		4770	824.25	0	46735.03
Donor's import of manufactured goods		4770	174.378	0	12293.3
Official funding (OF)	billions US$, current	4770	0.136	-1.341	9.933
Official development assistance (ODA)		4770	0.107	-.001	8.697
Other official flows (OOF)		4770	0.029	-1.357	4.099
GDP of donor	millions US$, current	4770	6850000	1200000	1.91e+07
GDP of recipient		4770	26267.34	0	568000
Bilateral investment treaties	binary	4770	0.442	0	1
WTO recipient	binary	4770	0.764	0	1
RTA[20]	binary	4770	0.077	0	1
Trade freedom of recipient	index (0-100)	4194	61.347	0	90
Trade freedom of donor		4770	79.333	42.6	87.8
FDI recipient	billions US$, current	4674	0.697	-7.12	11.578
Note. We take all variables in current prices, because gravity is an expenditure function allocating nominal GDP into nominal imports and inappropriate deflation of trade flows (e.g., by the US aggregate price index) creates biases via spurious correlations (Baldwin and Taglioni, 2006).					

[20] Take into account that for USA there is only one RTA (United States – Morocco, 2006).

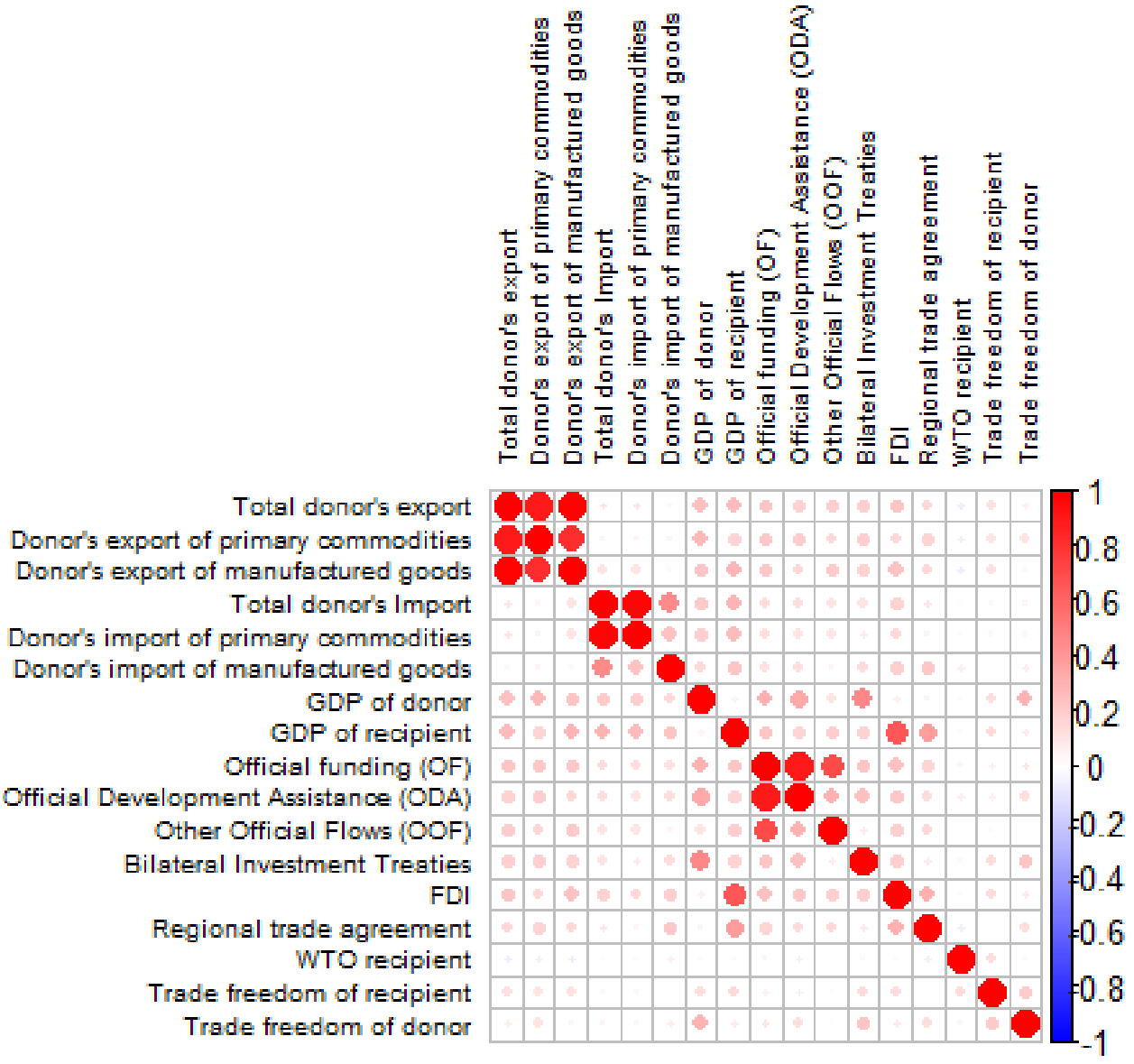

Figure A1. Correlation matrix of all variables plotted as a circle diagram with the color illustrating the sign and the size of circles illustrating absolute size of the correlations.

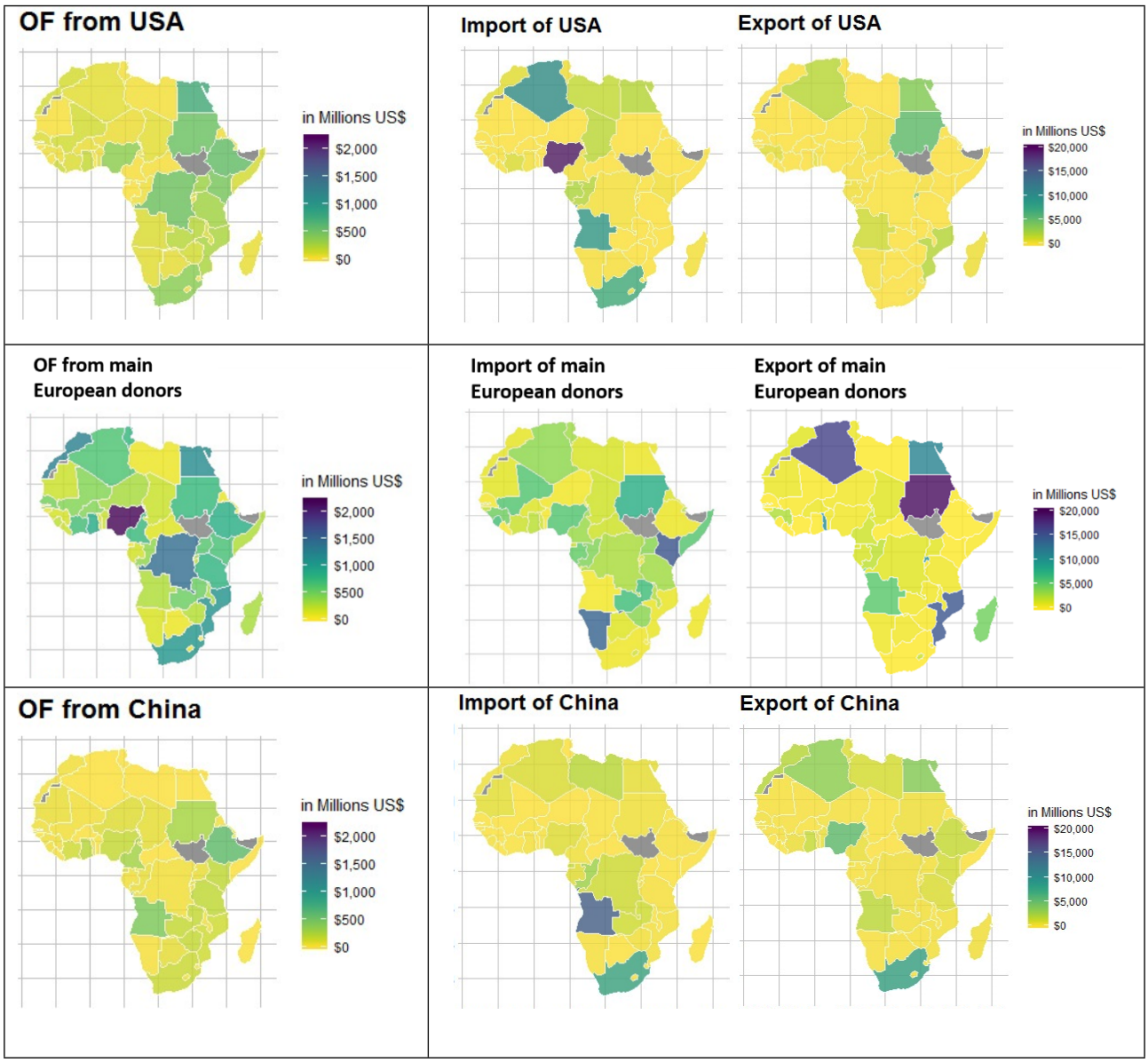

Figure A2. Spatial distribution of OF and trade flows (import and export) from the main donors to Africa in the period 2000-2014, in million US$ (results are averaged over fifteen years).

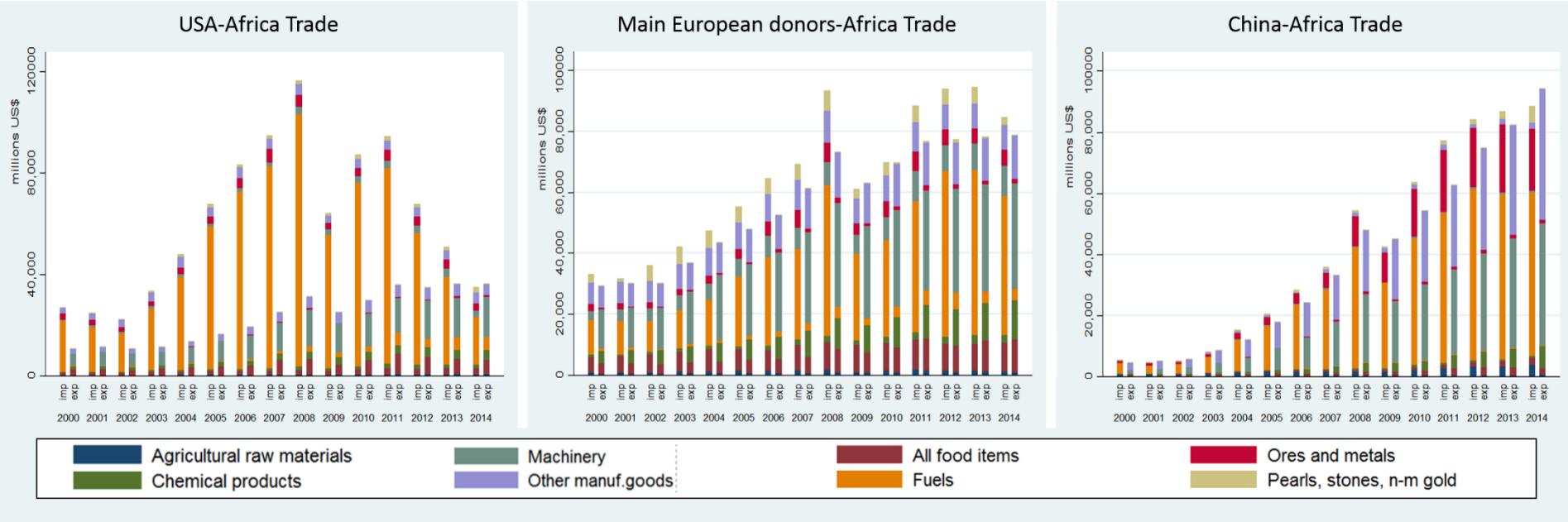

Figure A3. Distribution of export and import flows from USA, main European donors and China to Africa across sectors between 2000-2014, in million US$.

Note: imp stands for import of goods and commodities to the donor country, while *exp* – for export of goods and commodities from the donor country.

Table A3 – Results of the Harris-Tzavalis unit-root test (Ho: Panels contain unit root, Ha: Panels are stationary)

	Donor export	Donor export of primary	Donor manuf. export	Donor import	Donor import of primary	Donor manuf. import	OF	ODA	OOF
Statistic rho	0.353	0.271	0.462	0.408	0.386	0.473	0.213	0.330	-0.080
Z	-13.820	-19.309	-6.502	-10.156	-11.593	-5.779	-23.166	-15.360	-42.870
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of panels	318	318	318	318	318	318	318	318	318
Number of periods	15	15	15	15	15	15	15	15	15
Panel means	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Time trend	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.

Appendix B. Additional regression results

Table B1. Regression results for donor's import and lagged OF

Variables	China			USA			main European donors		
	(1) Import of primary	(2) Import of manufactures	(3) Import total	(1) Import of primary	(2) Import of manufactures	(3) Import total	(1) Import of primary	(2) Import of manufactures	(3) Import total
lnGDP of recipient	0.315	0.273	0.368	-0.084	0.103	-0.114	1.058***	0.216	0.990***
	(0.309)	(0.244)	(0.280)	(0.119)	(0.183)	(0.136)	(0.179)	(0.173)	(0.161)
L1.OF	0.044	0.359**	0.043	-0.055	0.147	0.029	0.083	0.098*	0.078
	(0.130)	(0.181)	(0.118)	(0.055)	(0.128)	(0.111)	(0.064)	(0.055)	(0.062)
L1. OF from other donors	-0.033	-0.001	-0.028	0.011	0.029	0.016	-0.076*	-0.112**	-0.078*
	(0.029)	(0.03)	(0.028)	(0.015)	(0.034)	(0.014)	(0.041)	(0.048)	(0.042)
WTO recipient	4.797***	2.589***	1.773***	0.675***	-1.034***	-0.684***	-1.866*	-1.353***	-1.639***
	(1.009)	(0.128)	(0.106)	(0.068)	(0.099)	(0.050)	(0.995)	(0.344)	(0.536)
Trade freedom recipient	0.010**	-0.011**	0.009*	-0.002	-0.002	-0.001	0.006	0.001	0.004
	(0.005)	(0.005)	(0.005)	(0.003)	(0.005)	(0.002)	(0.004)	(0.002)	(0.003)
Bilateral investment treaties	-0.628***	0.462***	-0.593***	0.629***	-0.730***	-0.016	0.097	0.112	0.117
	(0.232)	(0.129)	(0.218)	(0.208)	(0.216)	(0.229)	(0.104)	(0.088)	(0.102)
FDI recipient	0.006	0.003	0.006	0.012	0.025***	0.014	0.036**	0.001	0.030**
	(0.011)	(0.014)	(0.010)	(0.013)	(0.009)	(0.012)	(0.015)	(0.006)	(0.013)
RTA				-0.005	0.131	-0.050	0.089	0.023	0.018
				(0.100)	(0.119)	(0.075)	(0.171)	(0.151)	(0.152)
lnGDP of donor							0.625	2.694***	1.100**
							(0.564)	(0.691)	(0.528)
Trade freedom donor							0.023	-0.009	0.010
							(0.030)	(0.025)	(0.023)
N of observations	644	650	650	650	650	650	1944	1950	1950
Country fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note. Clustered robust standard errors are in parenthesis. The asterisks ***, **, and * are 1%, 5%, and 10% of significance levels, respectively.
Variables *lnGDP of donor* and *Trade freedom donor* are invariant for each country-pair in regressions for China and USA, thus not included.
Variable RTA is time invariant for China, thus not included.

Table B2. Regression results for donor's import and lagged ODA and OOF

Variables	China			USA			main European donors		
	(1) Import of primary	(2) Import of manufactures	(3) Import total	(1) Import of primary	(2) Import of manufactures	(3) Import total	(1) Import of primary	(2) Import of manufactures	(3) Import total
lnGDP of recipient	0.345	0.029	0.391	-0.034	0.079	-0.092	1.075***	0.199	1.005***
	(0.292)	(0.220)	(0.268)	(0.106)	(0.187)	(0.125)	(0.171)	(0.173)	(0.155)
L1.ODA	-0.072	1.716***	-0.020	-0.447***	0.256	-0.211**	0.144	0.419**	0.175
	(0.387)	(0.583)	(0.371)	(0.143)	(0.219)	(0.104)	(0.122)	(0.208)	(0.129)
L1.OOF	0.038	0.241	0.034	0.156	-0.615***	0.127	0.117*	-0.035	0.095
	(0.129)	(0.204)	(0.120)	(0.238)	(0.236)	(0.256)	(0.069)	(0.051)	(0.064)
L1.ODA from other donors	0.007	-0.071	0.004	0.050***	0.164	0.046***	-0.161**	-0.377**	-0.173**
	(0.039)	(0.080)	(0.037)	(0.017)	(0.115)	(0.015)	(0.075)	(0.151)	(0.082)
L1.OOF from other donors	-0.097	-0.005	-0.075	-0.046	-0.019	-0.032	0.006	-0.015	-0.005
	(0.061)	(0.043)	(0.053)	(0.033)	(0.038)	(0.027)	(0.065)	(0.040)	(0.064)
WTO recipient	4.810***	2.581***	1.784***	0.643***	-0.973***	-0.700***	-1.883*	-1.388***	-1.653***
	(1.009)	(0.133)	(0.106)	(0.082)	(0.104)	(0.065)	(0.997)	(0.344)	(0.538)
Trade freedom recipient	0.010**	-0.012**	0.009**	-0.003	-0.001	-0.002	0.006*	-0.000	0.004
	(0.005)	(0.005)	(0.004)	(0.003)	(0.004)	(0.002)	(0.004)	(0.002)	(0.003)
Bilateral investment treaties	-0.609***	0.374***	-0.578***	0.635***	-0.654***	-0.024	0.098	0.104	0.116
	(0.223)	(0.130)	(0.212)	(0.202)	(0.220)	(0.236)	(0.105)	(0.079)	(0.102)
FDI recipient	0.007	0.003	0.006	0.018	0.032***	0.018	0.034**	0.001	0.029**
	(0.011)	(0.017)	(0.010)	(0.013)	(0.010)	(0.013)	(0.015)	(0.006)	(0.013)
RTA				-0.014	0.126	-0.046	0.089	-0.046	0.007
				(0.109)	(0.118)	(0.083)	(0.177)	(0.133)	(0.157)
lnGDP of donor							0.573	2.687***	1.068**
							(0.563)	(0.653)	(0.521)
Trade freedom donor							0.024	0.004	0.013
							(0.030)	(0.025)	(0.024)
N of observations	644	650	650	650	650	650	1944	1950	1950
Country fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note. Clustered robust standard errors are in parenthesis. The asterisks ***, **, and * are 1%, 5%, and 10% of significance levels, respectively.
Variables *lnGDP of donor* and *Trade freedom donor* are invariant for each country-pair in regressions for China and USA, thus not included.
Variable RTA is time invariant for China, thus not included.

Table B3. Regression results for donor's export and lagged OF

Variables	China			USA			main European donors		
	(1) Export of primary	(2) Export of manufactures	(3) Export total	(1) Export of primary	(2) Export of manufactures	(3) Export total	(1) Export of primary	(2) Export of manufactures	(3) Export total
lnGDP of recipient	0.805***	0.586***	0.599***	0.490*	-0.344	-0.123	-0.067	0.118	0.090
	(0.102)	(0.153)	(0.148)	(0.258)	(0.211)	(0.190)	(0.261)	(0.108)	(0.122)
L1.OF	0.035	0.035	0.035	0.480***	0.271**	0.357***	0.037	0.057***	0.048***
	(0.100)	(0.051)	(0.050)	(0.140)	(0.111)	(0.082)	(0.044)	(0.020)	(0.019)
L1. OF from other donors	-0.007	0.010	0.009	-0.057	-0.086	-0.069	-0.068	-0.047*	-0.049**
	(0.005)	(0.011)	(0.011)	(0.076)	(0.059)	(0.047)	(0.042)	(0.024)	(0.023)
WTO recipient	1.118***	0.224**	0.289***	-1.380***	-0.648***	-0.940***	-0.264	-0.602***	-0.395*
	(0.085)	(0.105)	(0.106)	(0.157)	(0.084)	(0.090)	(0.363)	(0.151)	(0.224)
Trade freedom recipient	-0.000	0.008	0.007	0.016***	0.005***	0.010***	0.003	0.001	0.002
	(0.004)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Bilateral investment treaties	-0.020	-0.141	-0.131	0.398**	-0.258	0.042	-0.002	0.178***	0.131**
	(0.087)	(0.109)	(0.106)	(0.169)	(0.172)	(0.184)	(0.109)	(0.060)	(0.057)
FDI recipient	0.021***	0.002	0.003	0.015**	0.002	0.006	-0.027	0.005	-0.000
	(0.008)	(0.008)	(0.008)	(0.006)	(0.015)	(0.009)	(0.020)	(0.005)	(0.006)
RTA				-0.956***	-0.744***	-0.824***	0.052	0.177**	0.154**
				(0.179)	(0.110)	(0.116)	(0.110)	(0.074)	(0.073)
lnGDP of donor							-0.432	0.898**	0.491
							(0.882)	(0.382)	(0.425)
Trade freedom donor							0.011	0.047***	0.035**
							(0.028)	(0.014)	(0.014)
N of observations	650	650	650	650	650	650	1950	1950	1950
Country fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note. Clustered robust standard errors are in parenthesis. The asterisks ***, **, and * are 1%, 5%, and 10% of significance levels, respectively.
Variables *lnGDP of donor* and *Trade freedom donor* are invariant for each country-pair in regressions for China and USA, thus not included.
Variable RTA is time invariant for China, thus not included.

Table B4. Regression results for donor's export and lagged ODA and OOF

Variables	China			USA			main European donors		
	(1) Export of primary	(2) Export of manufactures	(3) Export total	(1) Export of primary	(2) Export of manufactures	(3) Export total	(1) Export of primary	(2) Export of manufactures	(3) Export total
lnGDP of recipient	0.787***	0.540***	0.556***	0.539**	-0.338	-0.115	-0.023	0.125	0.105
	(0.100)	(0.134)	(0.130)	(0.268)	(0.209)	(0.187)	(0.257)	(0.105)	(0.118)
L1.ODA	0.190	0.404***	0.388***	0.167	0.206	0.225**	0.044	0.089	0.075
	(0.150)	(0.129)	(0.122)	(0.189)	(0.150)	(0.090)	(0.144)	(0.121)	(0.118)
L1.OOF	-0.007	-0.041	-0.037	1.603**	0.500**	0.745***	0.084*	0.056*	0.056*
	(0.122)	(0.050)	(0.051)	(0.628)	(0.214)	(0.282)	(0.049)	(0.033)	(0.034)
L1.ODA from other donors	-0.006	-0.003	-0.003	0.088	-0.084	0.006	-0.240**	-0.104*	-0.134**
	(0.008)	(0.010)	(0.010)	(0.072)	(0.129)	(0.053)	(0.099)	(0.056)	(0.056)
L1.OOF from other donors	-0.008	0.027	0.025	-0.102	-0.082	-0.095**	0.016	-0.009	0.007
	(0.020)	(0.026)	(0.023)	(0.082)	(0.055)	(0.039)	(0.037)	(0.031)	(0.026)
WTO recipient	1.120***	0.227**	0.292***	-1.405***	-0.656***	-0.952***	-0.259	-0.602***	-0.395*
	(0.085)	(0.105)	(0.105)	(0.146)	(0.086)	(0.086)	(0.362)	(0.151)	(0.224)
Trade freedom recipient	-0.000	0.008	0.007	0.017***	0.005***	0.011***	0.003	0.001	0.002
	(0.004)	(0.005)	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Bilateral investment treaties	-0.015	-0.158*	-0.145	0.428***	-0.257	0.050	0.017	0.183***	0.138***
	(0.081)	(0.095)	(0.093)	(0.161)	(0.173)	(0.185)	(0.110)	(0.057)	(0.053)
FDI recipient	0.022***	0.002	0.004	0.009	0.001	0.004	-0.019	0.007	0.003
	(0.009)	(0.007)	(0.007)	(0.007)	(0.016)	(0.011)	(0.016)	(0.006)	(0.006)
RTA				-0.925***	-0.735***	-0.822***	0.012	0.157**	0.126*
				(0.180)	(0.105)	(0.110)	(0.105)	(0.080)	(0.076)
lnGDP of donor							-0.505	0.864**	0.444
							(0.883)	(0.376)	(0.418)
Trade freedom donor							0.009	0.046***	0.034**
							(0.027)	(0.014)	(0.014)
N of observations	650	650	650	650	650	650	1950	1950	1950
Country fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note. Clustered robust standard errors are in parenthesis. The asterisks ***, **, and * are 1%, 5%, and 10% of significance levels, respectively.
Variables *lnGDP of donor* and *Trade freedom donor* are invariant for each country-pair in regressions for China and USA, thus not included.
Variable RTA is time invariant for China, thus not included.