SCHOOL OF ECONOMICS AND MANAGEMENT

Aid and Trade

An Empirical Analysis of the Impact of European Development Aid on Donor's Exports

by

Kai Endres & Cathal Greally

May 2023

Master's Program in Economics

Department of Economics

Master Essay I (15 Credits)

Supervisor: Bengt Söderlund

Abstract

This study examines the relationship between development aid and trade, specifically focusing on the impact of aid on exports for 14 European donor countries committed to allocating 0.70% of their Gross National Income (GNI) to official development assistance (ODA). The 14 selected countries account for 41.5% of global ODA disbursements. Estimating a structural gravity model using Pseudo Poisson Maximum Likelihood estimators and panel data covering the period from 1995 to 2021, the findings reveal a significant and positive relationship between European development aid and donor's exports. One US$ more spent on development aid leads to an increase in exports of 0.19 US$ on average. Our findings show that the effect of aid on exports increases with more intense aid relationships Further, we apply several robustness checks to underpin our findings.

Key words: gravity model, development aid, exports, PPML, fixed effects

Acknowledgements

We would like to extend our deepest gratitude to our supervisor Bengt Söderlund for his invaluable guidance, encouragement and positivity as part of this process. We would also like to express an immense appreciation for our friends, who never failed to offer their support, opinions, and presence.

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1 Introduction

The benefits of development aid are manifold. Provision of aid has broadly aimed to lessen the burdens of poverty and bolster human development across the globe; this assistance is, in many ways, an explicit recognition by developed countries of the necessity in helping less-developed countries 'help themselves' via increasing technological, financial and economic aid to recipients (OECD, 2006). The OECD Development Assistance Committee (DAC), a key actor, has set itself the objective to promote "sustained, inclusive and sustainable economic growth" (OECD, n.d. A) via official development assistance (ODA), principally, so that no country will ultimately be dependent on aid.

This is a core component of aid and often the sole lens through which aid donation is viewed, but in what way does this perspective impact that mechanism in its own right? There is reason to believe that the flows of aid are impacted greatly by a number of domestic factors, endogenous to the aid-providing countries. The in-country perception of, and satisfaction with, a donor's political institutions (Chong and Gradstein, 2008), for example, can deeply impact that country's willingness to provide aid. Aid can seem one-sided, altruistic, and ultimately forgo-able - a zero-sum game from which the only winner is the recipient.

Aid-provision is not so simple, however, and its benefits are not so one-dimensional; beyond the clear, humanitarian outcomes of development assistance, aid donation has other, less one-sided benefits. Assistance of this kind requires a high degree of multilateral cooperation, and can often serve as a nexus through which countries can harbour and develop new and existing bilateral relationships.

Moreover, provision of aid may actually manifest tangible benefits to trade relations, as well as, principally, precipitate real increases in the size of exports from donor countries. It is this exact relationship that will be the focus of our own investigation; to what extent does aid impact upon trade? Specifically, as part of this paper, we shall attempt to investigate the relation between aid donation and exports as it relates to the case of the 14 European member states committed to the OECD's DAC

commitment of 0.70% of GNI. Making use of the structural gravity model, we estimate the impact of aid on trade using the Pseudo Poisson Maximum Likelihood (PPML) estimator and panel data for the 14 European donor countries and 172 recipient countries for the period 1995-2021.

Our study contributes to the existing literature which is dealing with the topic of development aid and trade. To the best of our knowledge, there has been no study investigating the relationship between aid given by the European countries committed 0.70% ODA of GNI goal and their exports to the recipient countries with a methodology that is based on the structural gravity model of trade.

The paper is organized as follows; section 2 contains a detailed definition of ODA and gives further information about the members of the DAC. Section 3 introduces the existing literature and outlines our rationale in choosing to examine this topic. Section 4 presents the theoretical relationship between aid and trade. Section 5 discusses the theoretical underpinnings introducing the gravity model of trade and our proposed specifications as well as the data sources and data used in our study. Section 6 documents our main results while section 7 shows several robustness checks to validate our findings. Lastly, section 8 concludes our presented study.

2 Background Information on ODA and the DAC

It is important early on to make clear in exactly what terms we are discussing the topic of aid[1]. ODA can both be in the form of grants or loans, and in order for payments to qualify as 'Official Development Assistance', it must meet the following requirements; It must be administered with its primary focus as both the promotion of economic development and the welfare of the developing countries to which the aid is directed. Military support (e.g arms deliveries) or transactions with primarily commercial goals (e.g. export credits) do not qualify as ODA (OECD, 2021).

[1] Which, for clarity, will refer to bilateral aid exclusively and will be used interchangeably with ODA throughout this paper.

When ODA is provided as a grant, the financial resources given do not need to be paid back by the receiving country. When ODA is given as a loan which has to be paid back by the recipient, the grant element and equivalent are calculated to make grants and loans comparable and reflect the donor's efforts. As money today is worth more than the same amount of money in the future, a discount rate may be applied to assess the value of tomorrow's money in terms of today's money. Grant element calculations use discount rates in order to reduce the expected future reflows from transactions to the value at present. Importantly, if the future expected value of aid is lower than the amount extended today, then the difference represents a 'gift' (OECD, 2021). "This gift portion is called a grant equivalent if expressed as a monetary value, and a grant element if expressed as a percentage of the amount now extended" (OECD, 2021, p. 4). Grants will have a grant element of 100% given they are provided fully as 'gifts', whereas conversely loans offered at market rates have a grant element of 0%. In short, a positive percentage implies a measure of generosity on the part of the donor (OECD, 2021). For data until 2017, only aid with a minimum grant element of 25% was considered under the guise of ODA however, post-2017 sees a slight change in this definition[2].

The 'Development Assistance Committee' (DAC) is the best-known international forum within the realm of aid; its target, set out by the OECD, involves a commitment from participants to contribute official development assistance at 0.70% of gross national income (GNI) (OECD, 2021). As part of this study, we shall attempt to examine, specifically, the 14 EU member states that joined the EU before 2002 and have pledged (and in some cases, succeeded) themselves in meeting this commitment. These 14 participant countries account for 96.50% of all aid donations from the European Union, and as such, 41.50% of all global donations. Member states of the EU

[2] "45 percent in the case of bilateral loans to the official sector of LDCs and other LICs (calculated at a rate of discount of 9 per cent); 15 per cent in the case of bilateral loans to the official sector of LMICs (calculated at a rate of discount of 7 per cent); 10 per cent in the case of bilateral loans to the official sector of UMICs (calculated at a rate of discount of 6 per cent); 10 per cent in the case of loans to multilateral institutions (calculated at a rate of discount of 5 per cent for global institutions and multilateral development banks, and 6 per cent for other organisations, including sub-regional organisations)" (OECD, 2021, p.6)

that joined after 2002 committed themselves to increase their ODA disbursements to 0.33% of their GNI (Council of the European Union, 2022). The idea of setting an aid target was first proposed for international consideration by the World Council of Churches in 1958, and after some fine-tuning, it was formally adopted by the United Nations General Assembly in 1970. In 1972, the DAC of the OECD, too, committed to this target, and since then it has stood as the central pillar within international development cooperation (OECD, 2006). Political advancement has been however, characteristically, slow - only a handful of countries at this point have consistently met the target, and as such, progress overall has been both protracted and inconsistent.

Within our own examination, we observe an expected level of variance amongst our sample set of European countries. Sweden became the first, reaching the target in 1974[3], followed shortly by the Netherlands in the following year. Denmark met it in 1978, and all three countries remained on target for many years afterwards, though the Netherlands has since slipped below. Finland achieved it once, in 1991, and Luxembourg reached it in 2000 and continues to do so (OECD, 2006). Germany hit the target in 2016 as well as 2020 and 2021. The other countries have not reached the 0.70% goal in the last decades (Council of the European Union, 2022). It is also worth noting for the sake of clarity that though initially measured in terms of Gross National Product, the term was discontinued in 1993 in favour of Gross National Income (OECD, 2016).

It is important to note that DAC guidelines on ODA are dynamic and, as such, are subject to change. In the time period we are considering there have been a number of amendments made to the framework; the introduction of clarified rules on in-donor refugee costs and changes to statistical measurement standards[4], for example, or the implementation of the previously mentioned grant equivalent[5], have all sought to modernise and streamline ODA contribution processes (OECD, 2021). These changes

[3] although on revised GNP figures
[4] In 2016-2018 and 2021 respectively
[5] 2019-2020

are not overly concerning (with respect to our own paper), however, and have served primarily in improving the quality, transparency and accuracy of recorded aid data.

3 Literature Review

Previous investigations into the aid-trade relationship have indeed found a tangible positive correlation between aid donations and donor exports, indicating that the level of development assistance provided by a given country does, in fact, affect that donor's general trade flows - inferring that aid not only directly benefits recipients, but also indirectly benefits donors. Studies have either focused on one specific donor country, and its aid recipients, or a set of multiple donor countries.

In their study about German development aid and exports Martínez-Zarzoso, Nowak-Lehmann, Klasen and Larch (2009) employ a static and dynamic gravity model and estimate that German exports amount to 140% (1.40 US$ for every 1 US$ of aid) of the aid given for its 138 recipients in the period 1962 to 2005. When focusing on the 75 main development partners of the German Federal Ministry for Economic Cooperation and Development (BMZ) the elasticity is remarkably higher and amounts to 2.33 US$ for every 1 US$ of aid. One key aspect of this paper addresses therefore the significance of so-called "real aid relationships"[6]. This attributes importance, not just to the simple act of giving, but also the meaningful engagement of donors and recipients in terms of general cooperation and coordination - both in the realm of development projects, and on the world stage. Interestingly, they also find evidence that the trade-positive effect of German aid is displaced by the aid provided by other EU member states. In 2016, Martínez-Zarzoso, Nowak-Lehman, Klasen and Johannsen investigated the effect of development aid on sectoral exports for Germany in the period 1978 to 2011. They found that every 1 US$ spent on aid yielded a 0.83 US$ increase in

[6] that is, aid relationships wherein there exists a deeper, more extensive bilateral partnership underpinning the donation of aid itself. In this instance, 'real aid relationships' refers to the cooperative efforts between the BMZ and its 75 'main development partners' to which it has committed consistent provision of aid. Associated with this is a general level of strategic collaboration greater than relationships in which aid is simply given with no deeper bilateral connection nor long-term vision or commitment.

German exports. Transport and electrical equipment as well as the machinery industry profited the most in terms of exports and employment. The authors employ the gravity model of trade with sector time fixed effects as well as recipient fixed effects and a leads and lags approach to tackle potential endogeneity issues. Additionally, Martínez-Zarzoso, Nowak-Lehman and Klasen (2017) investigated the relationship between aid and exports for the Netherlands using a dynamic gravity model estimated with recipient fixed effects as well as yearly time fixed effects and employing the GMM estimator. Their results show that for the period 1964-1999 the return of 1 US$ of aid lays between 0.26 US$ and 0.40 US$. For the period 2000 to 2011 the authors do not find a significant effect which can be explained by the fact that the Netherlands drastically changed their bilateral aid policies in 1999 and starting in 2000 only 33 countries received substantial amounts of Dutch development aid.

Within the literature of studies who focused on several donor countries, Lund's own, Nilsson (1997), was the first author to examine the impact of aid on European donor's exports. He examined this link for EU donors and their 108 recipients from 1975-1992. Estimating by way of a static specification of the gravity model of trade, he found that a 1 US$ increase in aid leads to a 2.60 US$ increase in exports, with an elasticity of exports (with respect to aid) of 0.23. Wagner, in his 2003 study, broadly categorised countries across a spectrum of selfless-to-selfish giving based on Alesina and Dollar (2000), wherein countries with more altruistic donation patterns were found to have received a relatively lesser return on investment and vice versa. Overall, he concludes that the return on aid in terms of trade is estimated to sit around 0.35 US$ for every dollar spent directly linked on aid projects and an additional 0.98 US$ through the export of goods not directly linked to aid projects. This amounts to a total of 1.33 US$ in exports for every 1 US$ spent on development aid (Wagner, 2003). In his study, Wagner (2003) uses a gravity model and OLS estimators with country pair fixed effects as well as maximum likelihood estimates without fixed effects due to computational constraints.

Pettersson and Johansson (2013) found that, moreover, aid increased bilateral trade flows for both donors and recipients; their analysis demonstrated, not just a positive link between general aid and donors' exports, but also a significant correlation between aid given specifically in the form of technical assistance and exports in both directions. In their study, the authors make use of the gravity model and 184 countries for the period 1990-2005. To estimate their specification without fixed effects they make use of the OLS estimator. Martínez-Zarzoso, Nowak-Lehmann, Parra and Klasen (2014) employ panel data methods to estimate to estimate the effects of aid on donor's exports in the long and short run. In the short-run, exports increase by 0.50 US$ for every 1 US$ spent on aid and 1.8 US$ in the long run. In contrast, Nowak-Lehmann, Martínez-Zarzoso, Herzer, Klasen and Zardozo (2013) look at the reverse relationship and investigate the impact of aid on the exports from the recipient to the donor country. Estimating the gravity model with non-stationary panel estimators for 123 countries they show that the effect is insignificant.

Furthermore, it is worth noting the potential for empirical biases, namely the issue of reverse causality, when undergoing analyses. In this instance, we can imagine that increases in exports (perceived as a result of increases in aid) could actually be a function of the opposite - increases in aid to a given country due to, for example, already burgeoning trade relations. This will be a core concern regarding our own investigation, and shall be discussed in greater depth further on.

All papers discussed up until this point have employed the gravity model of trade as the primary framework around which their respective investigations were based. However, for now, let us briefly present some papers which explicitly deviate from this as the sole or primary modus operandi. Employing Granger causality tests (as a test to investigate the direction of causality), Lloyd et al. (2000) examined data on aid and trade flows for four European donors and 26 African recipients between 1969 and 1995. They discovered trade Granger-caused aid in 14% of country pairs, Granger-caused aid in 13%, and finally, bi-directional causality in 8% of the pairs. Similarly, Osei et al. (2004) extended the analysis so as to include a larger sample of country pairs, finding, in turn, that donors providing a greater share of aid tended to trade more with

recipients. Interestingly, Martínez-Zarzoso et al. (2016) conducted Granger tests within the gravity model framework for the German case; finding, as part of this, evidence for a bi-directional causality between donor exports and bilateral aid, inferring the necessity for both variables to be considered endogenously. Specifically, the authors suggest employing appropriate techniques, such as the Generalised Method of Moments (GMM) and the Dynamic Ordinary Least Squares (DOLS) approach (Wooldridge, 2009) to address these endogeneity issues.

Implicit within the idea of 'goodwill' is the implication that causation works both ways i.e. that aid and trade is, in itself, a self-reinforcing relationship - as long as bilateral relations remain cooperative and whereby the "donor keeps giving and the recipient keeps buying" (Wagner, 2003). The Granger tests discussed earlier also aim to offer some insight into the direction of causality. Lloyd et al. (2000), as mentioned, found mixed results via Granger causality tests, for example. However, there is reason to hold doubts as to the efficacy of these tests in determining causality. First of all, the timing of events does not necessarily establish causation; for example, donors may make assistance commitments prior to actually disbursing aid, so a recipient country may import from a donor with the expectation that aid is in-coming. Furthermore, the general intuition underlying the aid-trade relationship is ultimately dependent on a contractual arrangement (be that explicit or implicit) between the donor and recipient. Causation in the context of a contract is itself distinct as the additional trade would not occur without the aid, and the additional aid would not occur without the trade - each event is ultimately dependent on the other, and as such, both the recipient and donor enter into a quasi-reciprocal agreement almost necessarily (Wagner, 2003). Wagner himself tests for this by finding a partial correlation between aid and trade after controlling for variables such economy size and distance. The primary concern here is the presence of these unmeasured, omitted variables which affect both aid and trade levels separately but simultaneously. This concern has informed to a reasonable degree the methodology used as part of this paper, and shall be discussed in greater detail later on.

The topic of tied aid is also a prominent topic of discussion. Tying aid involves offering aid on the condition that it be used exclusively to procure goods and/or services from the provider of the aid (OECD, n.d. B). Previous literature (Arvin and Baum, 1997 ; Arvin and Choudhry, 1997) suggests that untied aid has an approximately equal impact on promoting donor exports as aid that is tied. The underpinning for this is often presented in terms of 'goodwill', as well as the noted prevalence of parallel trade agreements and/or concessions. Consequently, the general consensus amongst authors is that the formal tying of aid elicits no additional benefits in terms of donor exports (Jepma, 1991 ; Arvin and Baum, 1997 ; Choudhry, 1997). Having said this, Martínez-Zarzoso et al. (2014) found a positive correlation (0.75) between the tying status and effectiveness of aid on exports, with an even stronger correlation (+30%) when the aid is explicitly tied. After 2000, however, aid tying is associated with a decrease in the effect of aid.

Many of the above mentioned studies, however, suffer from severe methodological shortcomings. Most of the studies fail to include importer and exporter time fixed effects to control for the so-called multilateral trade resistance (MTR) introduced by Anderson and van Wincoop (2003) as well country pair fixed effects to control for all time-invariant bilateral trade frictions. Further, most studies use linear estimators to estimate the gravity model in a log-linear version (s. Table A.3). The often used OLS estimator is not able to deal with heteroskedasticity and zero trade flows whereas the non-linear Pseudo Poisson Maximum Likelihood (PPML) estimator offers a solution to these problems (Santos Silva & Tenreyro, 2006).

Most relevant to our own paper in terms of methodology is Zhang and Martínez-Zarzoso (2022). Employing the PPML estimator with importer-time, exporter-time and importer-exporter fixed effects, they investigate the export-effect of aid donations from 12 new donors to 130 recipients over a 14-year period. The donors here are countries that, despite being recipients of ODA in recent memory, have been able to (due to sustained and rapid economic growth) 'cross over to the donor (Zhang & Martínez-Zarzoso, 2022). In this, they find a clear positive relation, however, an effect not quite

on par with more traditional donors. Wherein the efficacy of 'new' donors aid was examined here, we conversely put into focus a set of complementary sample countries with a more established record of aid donations over a longer period of investigation.

Overall, we aim to offer an updated and extensive analysis of the aid-trade relationship for traditional European donor countries as the aforementioned 'broad' analyses were largely performed prior to significant advances within relevant methodological techniques, namely Anderson and Van Wincoop (2003), and therefore suffer from severe methodological shortcomings. In providing a multi-country sample set, particularly within the European context, we believe our study both builds upon existing literature, employing updated and theory-consistent methodology, as well as expanding the general discussion on the topic of EU member contributions to ODA. Additionally, as previously stated, the 14 countries included in our sample account for 95% of all aid donations from the European Union, and as such, 41.5% of all global donations.
Put simply, this paper will investigate the relationship between aid donations and exports for the 14 EU member states committed to the 0.7% (of GNI) goal set out by the DAC. In this, we aim to both broaden the scope and update the methodological approach of previous literature; attempting to offer a general insight into the causal effect of ODA contributions.

4 Theoretical Link between Aid and Trade

Whereas increases in donor exports can be seen as a positive welfare effect in donor countries, and development aid can be, similarly, seen as a positive welfare effect in recipient countries, it is important to note that our paper will focus exclusively on the former rather than the latter. The broader discussion about the welfare effects of bilateral payments has its origins in the early debate over war reparations in Weimar Germany. The start of the discussion, principally between the British economist John Maynanrd Keynes and the Swedish economist Bertil Ohlin, was based on a new committee under the American industrialist and diplomat Owen Young in 1929; chiefly,

the assigned function of this committee was to rearrange the reparation payments. While Keynes argued that transfers both lead to a reduction in the income of the donor country and cause a deterioration of the terms-of-trade, Ohlin argued that there was no clear evidence whether the terms-of-trade would change in favour of the donor or against it. In 1936, the Soviet-American economist Wassily Leontief pointed out the possibility of the so-called transfer paradox, arguing that a transfer is potentially donor-enriching and recipient-immiserizing (Brakman and Van Marrewijk, 2007). In 1946, the American economist Paul Samuelson argued that the transfer paradox presented by Leontief is only possible on unstable markets. The Samuelson theorem states that "in a perfectly competitive, Walrasian, stable, two-country world with two traded goods, the donor's welfare falls and the recipient's welfare rises" (Brakman and Van Marrewijk, 2007, p.122). However, "Samuelsson's theorem does not hold if productive resources are transferred instead of purchasing power, if distortions are present in the system, if aid is tied, or if there are more than two countries" (Brakman and Van Marrewijk, 2007, p.122). The literature in the following years showed that the transfer paradox is possible in more general settings (Brakman and Van Marrewijk, 2007).

In our setting, the recipient of development aid registers an increase in its income which is expected to increase overall spending and, with it, imports from other countries, in particular the donor countries (Martínez-Zarzoso et al., 2016). However, to which extent aid fosters spending and therefore trade is ultimately dependent on how effectively it is itself employed. Recipients of aid have a responsibility to allocate spending in a manner which is conducive to the goals which underpin its provision; excessive bureaucracy or corruption, capital flight risk from kleptocratic elites, and the general mismanagement of funds will all ultimately impact the level to which aid is able to trigger a positive in-country income effect. As such, aid should, first and foremost, increase the effective spending of a recipient in order to promote exports through this income channel. This is first principles within the context of the aid-trade relationship. Despite this, it also worth noting (somewhat cynically) that although irresponsible allocation of aid may not lead to positive welfare outcomes within a

country, it may still lead to positive trends in donor-exports, should the donor, for example, provide decadent, autocratic leaders with luxury goods rather than capital exports (Lambsdorff, 2002; Kaufmann, 2009: Easterly and Williamson, 2010).
Furthermore, it needs to be kept in mind that reported ODA disbursements will not necessarily end up in the recipient country. A certain share of the aid is typically spent within the donor country for administrative work and bureaucracy of the responsible institutions but also money spent on refugees and asylum seekers, students from abroad, research and services count into the ODA numbers the members report (OECD, 2021). This money spent will not find its way in the recipient country and can therefore not increase effective spending.

Besides the effect of aid on exports through the income channel, there might be more channels of how aid can positively affect trade relationships. It is reasonable to believe that aid opens up pathways, not just for in-country development, but for greater economic integration within the broader international sphere. Relationships fostered as part of development efforts seem to be mirrored within the context of trade as the economic necessity for aid lessens and as opportunities for trade amplify. Aid, as such, is said to promote a sense of 'goodwill' towards donor countries from recipients; coupled with the fact that aid missions often come hand-in-hand with trade missions, the initial aid relationship may precipitate later trade agreements and/or generally expanded trade relationships between donors and recipients. Moreover, we can also consider the role of habit formation in this relationship; donor funded exports for aid related projects may eventually lead to a situation wherein the recipient keeps importing from the donor even after the project is finished. Further, a certain share of aid might be tied to imports from the donor country (Martínez-Zarzoso et al., 2009; 2016).

Djajic, Lahiri and Raimondos-Moller (2004) use a two country, two period setting to study the intertemporal welfare effect of temporary foreign aid. They show that a transfer in period one increases the welfare of the recipient whereas the donor loses. However, given habit formation or goodwill effects, preferences of the recipient might

shift towards the donor in period two who then starts importing goods from the donor country. In the following, the positive terms of trade effect for the donor induced by the imports from the recipient country increases the welfare of the donor in period two. Period two gains dominate the period one loss for the donor if the terms–of-trade effect is sufficiently large and the real rate of interest is sufficiently low. Conversely, if the real rate of interest to discount the loss in period two is high, the recipient gains as the present value of the loss in period two is smaller than the gain in period one. In addition, the authors show that equalising the interest rate between the two countries has no effect on the welfare of the world economy as a whole.

5 Methodology

5.1 Gravity Model of Trade

The gravity model of trade is one of the most frequently used empirical models to explain trade patterns within the field of international trade. Its theoretical roots are found in Isaac Newton's law of gravity which states that the forces of attraction between two objects are directly affected by the masses of the two objects and inversely affected by the distance between the two objects. In 1962, the Dutch economist Jan Tinbergen used the gravity model of trade for the first time to study the trade flows between countries. The basic gravity regression proposes that the volume of trade between two countries is proportional to their economic weight and inversely-proportional to the distance between them. Essentially, countries that are close in proximity and size are more likely to trade with each other than disparate countries separated by greater distances.

In its basic, naive form the model resembles Newton's law of gravity and can be written as follows:

$$X_{ij} = G\frac{GDP_i GDP_j}{DIST_{ij}} \quad (1)$$

Typically, the gravity model has been transformed in a log-linear specification to use linear estimation methods like OLS:

$$lnX_{ij} = \beta_0 + \beta_1 ln\, GDP_i + \beta_2 lnGDP_j + \beta_3 ln\, DIST_{ij} + \varepsilon_{ij} \quad (2)$$

Where X_{ij} are the exports from country i to country j, GDP_i and GDP_j denote the GDP of country i respectively country j and $DIST_{ij}$ is the distance between country i and j. G is the inverse of the world production and ε_{ij} is the error term. (Yotov, Piermartini, Monteiro & Larch, 2017).

As the gravity model lacked a solid theoretical foundation when it was first introduced, it faced heavy criticism from trade economists despite the fact of its strong ability to explain international trade patterns and was only sparsely used before the late 1990s and early 2000s. Over the span of time, the gravity model evolved from its basic, naive version as economists proposed new theoretical foundations and new ways of estimating it (Yotov et al., 2017). In 1979, Anderson was the first economist to give the gravity model of trade a theoretical backing by using constant elasticity of consumption preferences (CES) and differentiation of goods by the country of origin. Ten years later in 1989, Bergstrand derived the gravity model theoretically using a model of monopolistic competition. Eaton and Kortum (2002) used a Ricardian framework with intermediate goods to derive the gravity within the model. In the following years, the gravity model has been further developed and improved amongst others by Feenstra, Markusen and Rose (2001), Anderson and van Wincoop (2003), Feenstra (2016) and Haveman and Hummels (2004). Anderson and van Wincoop (2003) demonstrated that the naive gravity model suffered from omitted variable bias due to the issue that multilateral resistance terms (MTR) were not accounted for in the econometric analysis. To incorporate the multilateral resistance terms in the model, the authors proposed to use iterative custom nonlinear least squares programming. As this approach faces researchers with significant computational difficulties, many researchers made use of so-called "remoteness indexes" which approximate the multilateral resistance terms proposed by the authors by means of GDPs and bilateral distances

(Wei, 1996; Baier and Bergstrand, 2009). Feenstra (2016) and Olivero and Yotov (2012) advocate for using exporter and importer fixed effects to avoid computational complexity but still being able to account for the multilateral resistance terms. The gravity model can easily be extended from its basic form to control for factors which deter or facilitate trade between countries.

5.2 Model Specification and Estimation Techniques

To estimate a theory consistent gravity model, we build our analysis upon the structural gravity model proposed by Anderson and van Wincoop (2003).
The structural gravity model takes on the following form:

$$X_{ij,t} = \frac{Y_{i,t}Y_{j,t}}{Y_{w,t}}\left[\frac{\tau_{ij,t}}{P_{i,t}P_{j,t}}\right]^{1-\sigma} \tag{3}$$

$X_{ij,t}$ describe the exports from donor country i to recipient country j in period t. $Y_{i,t}$ is the donor's respectively the recipient's nominal income in period t, $Y_{w,t}$ is the world income in period t and $\tau_{ij,t}$ covers bilateral trade frictions. $P_{i,t}$ and $P_{j,t}$ cover the multilateral resistance and σ indicates the elasticity of substitution between products. We treat aid flows as a determining factor of the bilateral trade frictions captured by $\tau_{ij,t}$. Aid flows are expected to reduce bilateral trade costs by building up formal and informal relationships, habit formation or goodwill between the country pairs which enhances trade flows. Importer-time as well as exporter-time fixed effects are included to control for the unobservable multilateral resistance terms (MTR) $P_{i,t}$ and $P_{j,t}$. The multilateral trade resistance terms take barriers country i and j face when trading with all their trading partners into account. This opens up for the possibility of substitutability within a country's trading partners. $P_{i,t}$ is the multilateral resistance of exporter i, also referred to as outward multilateral resistance, and captures the ease of exporter i to enter the market. That is the cost of exporting to the rest of the world relative to all other countries. $P_{j,t}$, the multilateral resistance of importer j, also referred to as inward multilateral resistance, and captures the ease of importer j to enter the

market. That is the cost to deliver goods to country j relative to all other countries (Yotov et al., 2017).

These fixed effects also allow to account for any observable and unobservable importer and exporter characteristics (Yotov et al., 2017). Furthermore, we include importer-exporter country pair fixed effects to incorporate the effects of all time-invariant bilateral trade frictions on trade flows (Egger and Nigai, 2015) and account for the endogeneity of the aid variable (Baier and Bergstrand, 2007). Including country pair fixed effects will absorb every time-invariant bilateral trade determinants (e.g. distance, language or culture) and their effect can therefore not be estimated. Importer and exporter time fixed effects absorb all exporter and importer specific characteristics from the structural gravity model which leads to the omission of variables like GDP, institutions or population size.

Our proposed model takes on the following form:

$$X_{ij,t} = exp\left[\beta_{AID} ln\, AID_{ij,t} + \xi_{it} + \vartheta_{jt} + \delta_{ij}\right] \times \varepsilon_{ij,t} \quad (4)$$

X_{ij} describes the exports from donor country i to recipient country j in period t in current US$ and is in levels. $AID_{ij,t}$ describes the amount of ODA paid from a European donor country i to a receiving development country j in period t in current US$ and is logged. $\xi_{it}$and ϑ_{jt} are exporter respectively importer time fixed effects that account for the unobservable multilateral resistance terms. δ_{ij} are importer exporter country pair fixed effects. $\varepsilon_{ij,t}$ is the error term.

The standard approach in gravity modelling has long been to log linearize the model and use OLS to estimate it. This approach, however, has significant flaws that can limit the validity of the obtained estimators (Santos Silva and Tenreyro, 2006). In the presence of heteroskedasticity, which often poses a problem in trade data, the error term and the independent variables (regressors) will be correlated. This violates one of the main assumptions of OLS that, conditional on the independent variables, the expected value of the error term is zero, which leads to inconsistent estimates.

Furthermore, when log linearizing the gravity model, bilateral trade flows with the value of zero get dropped as the log of zero is mathematically not defined. Depending on the area of research and data, zero trade flows can be prevalent and dropping these observations can lead to the loss of important information (Yotov et al., 2017).

To overcome the problems faced when using linear OLS regression, Santos Silva and Tenreyro (2006) argue to use Pseudo Poisson Maximum Likelihood (PPML) estimators. Using PPML estimators allows us to get consistent estimators under relatively weak assumptions. We do not need to make any assumptions about the distribution of the error term and PPML is fully robust to heteroscedastic data which trade data is often plagued by. Furthermore, the PPMLHDFE command in STATA allows us to run regressions using PPML with high dimensional fixed effects while relatively little computational power is being needed (Correia, Guimarães & Zylkin, 2020).

Using PPML, the coefficient of aid will show us the elasticity of exports with respect to aid. Our number of interest, the impact of an increase in aid by 1.00 US$ on the dollar export value can be determined using the following formula:

$$\beta_{AID} = \frac{\partial Export}{\partial AID} \times \frac{AID}{Export} \tag{5}$$

$$\Leftrightarrow \quad \frac{\partial Export}{\partial AID} = \beta_{AID} \times \frac{Export}{Aid} \tag{6}$$

5.3 Data

Official Development Assistance (ODA) data was retrieved directly via the OECD database on aid contributions from the Development Assistance Committee (DAC) member states for the time period 1995-2021 (OECD, 2023). All values are sourced in current prices (in US$) as every database uses different base years to deflate monetary values in constant prices. In our analysis we focus on total net ODA disbursements as we are interested in the resources released to recipient countries in every observed year. Disbursements capture all actual expenditures related to aid from the donor countries.

Yearly bilateral trade flows are sourced from the UN Comtrade Database (UN, 2023). We focus on reported values for good exports by the 14 countries, taken at current prices (in US$). Data about regional trade agreements (RTA) comes from Mario Larch´s Regional Trade Agreements Database which covers all regional trade agreements reported to the World Trade Organization for the period 1950 to 2022 (Egger and Larch, 2008).

5.4 Data Description

Our dataset consists of the 14 European donor countries and all their ODA partners in the period from 1995 to 2021.[7] Negative aid flows can be explained by loans that were given out earlier by the donor countries and need to be paid back by the recipients. Table 1 shows summary statistics for our variables of interest with aid broken down by donor countries.

Figure A.1 shows that Germany is the biggest exporter of the 14 European donor countries considered and is followed by the other big European countries France and Italy. Exports to the recipient countries have been steadily increasing in the 27 year period.

As can be seen in figure A.2, Germany is the biggest donor of ODA in absolute terms followed by France. Table 2 depicts the number of aid recipients by the average years they were given aid to by the 14 donor countries. An average of e.g. 10 years means that the 14 European donor countries have given that country aid in on average 10 years during the observed 27 year time period. Recipient countries decline with increasing average years of aid relationship which indicates that a certain set of countries receives aid for long periods from most of the donor countries whereas other countries only receive aid from a selected set of countries and over a short period. Table A.1 shows this metric broken down for all ODA receiving countries and their donor

[7] Data for Luxembourg and Belgium starts in 1999 as the UN Comtrade Database reports exports for Luxembourg and Belgium combined before 1999.

Table 1: Descriptive Statistics Aid and Export Variable

Variable	Obs	Mean	Std. Dev.	Min	Max
Export total	50,253	3.25e+08	1.95e+09	1.181	1.24e+11
Aid total	50,253	9359036	4.54e+07	-3.16e+08	2.12e+09
AUT	3,791	2895761	2.23e+07	-3.00e+07	8.10e+08
BEL	3,225	5101712	2.40e+07	-1.99e+07	7.90e+08
DNK	3,194	7141390	1.69e+07	-6.41e+07	1.29e+08
FIN	3,554	2412183	6189534	-8230000	1.53e+08
FRA	4,296	2.95e+07	8.83e+07	-1.36e+08	2.03e+09
DEU	4,390	3.48e+07	1.01e+08	-1.06e+08	2.10e+09
GRC	3,668	465357.1	3118095	0	8.34e+07
IRL	3,494	2428935	7572933	0	8.09e+07
ITA	3,940	5118287	3.36e+07	-8.01e+07	9.54e+08
LUX	2,609	1452672	3994055	0	4.39e+07
NLD	3,948	9191821	2.29e+07	-3.16e+08	4.22e+08
PRT	3,129	1852263	1.62e+07	-2.38e+07	7.15e+08
ESP	3,402	6737719	4.11e+07	-8.42e+07	2.12e+09
SWE	3,613	9050792	1.91e+07	-1.77e+07	2.78e+08

Table 2: Average Aid Relationships in Years

Avg Years	Aid recipients	Avg Years	Aid recipients	Avg Years	Aid recipients
1	150	10	110	19	70
2	145	11	108	20	58
3	137	12	103	21	43
4	135	13	100	22	19
5	131	14	97	23	14
6	126	15	96	24	3
7	121	16	91	25	0
8	119	17	84	26	0
9	115	18	82	27	0

6 Results

Table 3: OLS & PPML Regression Results

VARIABLES	(1) OLS	(2) PPML
ln(Aid)	0.0305***	0.00858*
	(0.00607)	(0.00444)
Constant	16.48***	21.68***
	(0.0857)	(0.0738)
Observations	32,463	32,463
R-squared	0.945	

Notes: This table reports the impact of aid on exports using equation (4). The dependent variable is exports of the European donor countries. Dependent variable is in log form in column (1) and level in column (2). The independent variable is the log of aid. Standard errors in parentheses are country pair clustered standard errors. The regression includes importer and exporter time fixed effects as well as importer-exporter fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table 3 shows the regression results for the full country sample. From the 50,253 observations in the dataset 17,790 observations are dropped when taking the log of the aid variable due to negative or zero aid flows. The coefficients show a significant and positive effect of development aid on exports. Column 1 shows the results estimated with OLS, column 2 was obtained using PPML. The OLS estimator estimates a considerably higher coefficient than the PPML estimator: Using OLS, a 10.00% increase in aid leads to a 0.31% increase in exports. PPML estimates that a 10.00% increase in aid leads to an 0.09% increase in exports. This translates to a 1 US$ increase in aid leads to 0.69 US$ in exports, respectively 1 US$ in aid leads to 0.19$ in exports. However, as argued above, the OLS estimator faces serious problems in our analysis that can be accounted for by using the PPML estimator. In the following analysis, we will therefore use PPML as our main estimation method. As we use panel data with a time dimension, we have recurring observations of country pairs. While using country

pair fixed effects, we can control for all bilateral time invariant effects between the exporter and importer, however, there is still the possibility of serially correlated error terms over time within country pairs (Yotov et al., 2017). Robust standard errors assume that errors are independent and identically distributed across observations over time. As this assumption is likely to be violated, we propose to use single-dimensional clustering by country pairs for the standard errors in the further analysis of this study.

Table 4: Regression Results by Continents

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Africa	America	Asia	Europe	Oceania
ln(Aid)	0.00570	0.0120*	0.00969	0.00406	-0.192***
	(0.00604)	(0.00640)	(0.00803)	(0.00739)	(0.0605)
Constant	20.80***	21.06***	22.36***	21.79***	19.89***
	(0.0999)	(0.101)	(0.136)	(0.122)	(0.795)
Observations	13,967	6,501	9,115	2,351	404

Notes: This table reports the impact of aid on exports using equation (4) with aid recipients being sorted by continents. The dependent variable is exports of the European donor countries and is in level form. The independent variable is the log of aid. Standard errors in parentheses are country pair clustered standard errors. The regression includes importer and exporter time fixed effects as well as importer-exporter fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table 4 shows results by continents. African countries receive the most development aid payments, followed by Asia and America (s. Figure A.3). When clustered by continents, we do not observe a statistically significant effect of aid on exports for Africa, Asia and Europe. Oceania shows a negative and statistically significant impact on the 1.00% level of aid on exports. However, these results should be treated carefully due to the relatively small sample size of only 404 observations for the Oceanian continent. The coefficient for the American continent is positive and significant on the 10.00% level.

Table 5: Regression Results by Years of Average Aid Relationship

	(1)	(2)	(3)	(4)	(5)
VARIABLES	0-5	5-10	10-15	15-20	>20
ln(Aid)	-0.0311	-0.0108	0.00551	0.00339	0.0160***
	(0.0211)	(0.0181)	(0.0124)	(0.00566)	(0.00594)
Constant	21.72***	19.06***	20.85***	21.30***	21.80***
	(0.297)	(0.254)	(0.186)	(0.0923)	(0.101)
Observations	403	2,105	2,355	9,622	18,044

Notes: This table reports the impact of aid on exports using equation (4) with aid recipients being sorted by the years of average aid relationships. The dependent variable is exports of the European donor countries and is in level form. The independent variable is the log of aid. Standard errors in parentheses are country pair clustered standard errors. The regression includes importer and exporter time fixed effects as well as importer-exporter fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table 5 shows results by the average years all 14 European donor countries gave aid to each recipient country (s. Table A.1). The higher the average years of giving aid, the more intense the aid relationship between donor and recipient country. The results indicate that the significant effect of aid on exports are mainly driven by the intense aid relationships which lasted for more than 20 years on average in the observed 27 year time span. An increase in aid by 1.00 US$ for the countries with more than 20 years is associated with an average increase in exports of 0.33 US$ compared to 0.19 US$ for the total sample. Noted should be here that observations in the first three bins are relatively low due to the high prevalence of zeros which in combination with the fixed effects can be problematic.

7 Robustness Checks

7.1 Controlling for Zero Aid Flows

As we log the dependent variable aid, all observations with zero aid flows are dropped as the log of zero is not defined. A solution to this problem can be to replace zeros with ones what assumes that adding ones does not affect the results. However, using ones is not an immaterial change to the data and therefore leads to distorted results. To tackle this problem, we follow Wagner (2003) and introduce two variables for aid provision. We introduce a no-aid dummy variable and a variable that takes on the maximum between one or the aid paid to that country.

Our model takes on the following specification:

$$X_{ij,t} = \exp\left[\beta_{NOAID} \ln \mathrm{N}OAID_{ij,t} + \beta_{MAXAID} \ln\left(\max\{1, AID_{ij,t}\}\right) + \xi_{it} + \vartheta_{jt} + \delta_{ij}\right] \times \varepsilon_{ij,t} \tag{7}$$

$$\beta_{NOAID} \ln NOAID_{ij,t} + \beta_{MAXAID} \ln\{\max(1, AID_{ij,t})\} = \begin{cases} \beta_{MAXAID} \ln\{\max(1, AID_{ij,t})\} \; when \; AID > 0 \\ \beta_{NOAID} lnNOAID_{ij,t} \; when \; AID = 0 \end{cases} \tag{8}$$

In this specification, β_{MAXAID} measures the elasticity when aid is positive and β_{NOAID} "serves as an adjustment to the constant for cases where aid is zero" (Wagner, 2003, p. 162).

Table 6 shows the results for the above presented model which indicates that the average aid effect has a significant effect on exports only when positive aid flows are considered as both variables are not significant neither in the full sample nor in the sample restricted to aid relationships lasting for more than twenty years.

However, this approach can also not cover negative trade flows. Over the observed time period, 3.41% of all observations are negative whereas 31.14% of all aid observations are zeros leading to 34.55% of all observations being omitted when not controlling for zero aid flows.

Table 6: Regression Results Controlling for Zero Aid Flows

VARIABLES	(1) Total	(2) >20 years
Max $(1, AID_{i,j,t})$	0.00105	0.000891
	(0.000943)	(0.00149)
No Aid Dummy	0.0218	0.0215
	(0.0209)	(0.0405)
Constant	21.79***	22.03***
	(0.0134)	(0.0224)
Observations	50,083	21,351

Notes: This table reports the impact of aid on exports using equation (7) controlling for zero aid flows. The dependent variable is exports of the European donor countries and is in level form. The independent variable is the no aid dummy and the maximum of one and the aid received. Column (1) reports results for the full sample, column (2) reports results for recipients with more than 20 years of aid relationship on average. Standard errors in parentheses are country pair clustered standard errors. The regression includes importer and exporter time fixed effects as well as importer-exporter fixed effects. *** p<0.01, ** p<0.05, * p<0.1

7.2 RTA-Aid Interaction

In the following, we aim to investigate whether a regional trade agreement (RTA) weakens the effect of aid on exports. RTA is a dummy variable that takes on one if there exists an FTA for the country pair in the respective year and zero if there is no RTA in place. The RTA variable is interacted with the Aid variable and shows the impact of an RTA on the aid export relationship (Martínez-Zarzoso, 2019).

The model takes on the following form:

$$X_{ij,t} = exp\left[\beta_{AID}\, ln\, AID_{i\,j,t} + \beta_{AIDxRTA}\, ln\left(AID_{ij,t} \times RTA_{ij,t}\right) + \xi_{it} + \vartheta_{jt} + \delta_{ij}\right] \times \varepsilon_{ij,t} \quad (9)$$

A negative sign of the interaction variable indicates that the effect of aid on exports is weakened by a regional trade agreement between donor and recipient country and strengthened when observing a positive coefficient (Martínez-Zarzoso, 2019).

Table 7: Regression Results Controlling for AID x RTA Interaction

	(1)	(2)
VARIABLES	Full Sample	>20 years
ln(Aid)	0.0136**	0.0248***
	(0.00545)	(0.00691)
ln(Aid) x RTA	-0.0117*	-0.0233***
	(0.00618)	(0.00842)
Constant	21.66***	21.75***
	(0.0741)	(0.101)
Observations	32,463	18,044

Notes: This table reports the impact of aid on exports using equation (9) controlling for the impact of RTAs. The dependent variable is exports of the European donor countries and is in level form. The independent variable is the log of aid. Column (1) reports results for the full sample, column (2) reports results for recipients with more than 20 years of aid relationship on average. Standard errors in parentheses are country pair clustered standard errors. The regression includes importer and exporter time fixed effects as well as importer-exporter fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Column one in table 7 presents results for the specification proposed in (9) and shows that the interaction variable is negative and significant on the 10.00% level.[8] When restricting the sample to countries which receive aid in more than 20 years on average in column two, the interaction is negative as well and significant on the 1.00% level. As expected, the aid variable is positive and significant on the 5.00% respectively the 1.00% level. These results show that when there is an RTA in place, the effect of aid on trade is reduced.

[8] The RTA variable gets omitted due to multicollinearity with the importer-time fixed effects as all donors are in the European Union which negotiates trade agreements for its members.

7.3 Lead Variables

Table 8: Regression Results with Lead Variables

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Total	>20	Total	>20	Total	>20
$\ln(Aid_t)$	0.00849*	0.0160***	0.00865*	0.0167***	0.00855*	0.0167***
	(0.00443)	(0.00599)	(0.00445)	(0.00606)	(0.00445)	(0.00596)
$\ln(Aid_{t+2})$	0.000231	0.00119				
	(0.000898)	(0.00120)				
$\ln(Aid_{t+4})$			-0.000480	1.25e-06		
			(0.000939)	(0.00132)		
$\ln(Aid_{t+6})$					-0.000487	0.000158
					(0.00114)	(0.00153)
Constant	21.68***	21.79***	21.68***	21.80***	21.68***	21.80***
	(0.0743)	(0.100)	(0.0736)	(0.0996)	(0.0758)	(0.102)
Observations	32,463	17,764	32,463	17,764	32,463	17,764

Notes: This table reports the impact of aid on exports using equation (10). The dependent variable is exports of the European donor countries and is in level form. The independent variable is the log of aid. Column (1), (3) & (5) report results for the full sample, column (2), (4) & (6) report results for recipients with more than 20 years of aid relationship on average. Standard errors in parentheses are country pair clustered standard errors. The regression includes importer and exporter time fixed effects as well as importer-exporter fixed effects. *** p<0.01, ** p<0.05, * p<0.1

We introduce future aid flows in our model to test if our specification with country pair fixed effects has properly accounted for potential "reverse causality" between exports and development aid. We add a two, four and six year lead aid variable in our model (Yotov et al., 2017).

The model takes on the following form:

$$X_{ij,t} = exp\left[\beta_{AID}\, ln\, AID_{i\,j,t} + \beta_{AID\tau}\, lnAID\tau_{i\,j,t+\tau} + \xi_{it} + \vartheta_{jt} + \delta_{ij}\right] \times \varepsilon_{ij,t},\ \ \tau \in \{2,4,6\} \qquad (10)$$

If strict exogeneity holds true, the introduced year lead variable should be statistically not different from zero and we can conclude that reverse causality does not pose a threat to our results (Yotov et al., 2017). Exports now cannot be explained by future aid flows which indicates that exports do not cause aid disbursements.

The results presented in table 8 show that the introduced two, four and six year aid lead variables are not statistically significant neither in the full sample nor in the sample restricted to twenty years. The aid variable is positive and significant. This shows that current exports do not affect future aid flows and we can conclude that aid is not given due to strong trade relationships.

7.4 Lagged Variables

Table 9: Regression Results with Lagged Variables

	(1)	(2)
VARIABLES	Total	>20 years
$\ln(Aid_t)$	0.00779*	0.0163***
	(0.00423)	(0.00556)
$\ln(Aid_{t-1})$	0.00170**	0.000866
	(0.000804)	(0.00138)
$\ln(Aid_{t-3})$	-0.000996	-0.000445
	(0.000977)	(0.00160)
$\ln(Aid_{t-5})$	-0.00101	-0.00146
	(0.000808)	(0.00140)
$\ln(Aid_{t-7})$	0.00114	0.00154
	(0.000855)	(0.00133)
Constant	21.68***	21.80***
	(0.0800)	(0.118)
Observations	32,463	17,764

Notes: This table reports the impact of aid on exports. The dependent variable is exports of the European donor countries and is in level form. The independent variable is the log of aid. Column (1) reports results for the full sample, column (2) reports results for recipients with more than 20 years of aid relationship on average. Standard errors in parentheses are country pair clustered standard errors. The regression includes importer and exporter time fixed effects as well as importer-exporter fixed effects. *** p<0.01, ** p<0.05, * p<0.1

As it could be the case that the effect of aid on exports materializes after a few years, we add one, three, five and seven year lags of our main regressor aid in our regression (Yotov et al., 2017). The results in table 9 show that exports given in previous periods only have a significant impact looking at the total sample with a one year lag. Besides this, aid given in the previous year does not have an impact on exports in the current period.

7.5 Controlling for Outliers

The scatter plot in figure 1 shows the exports from the donor to the recipient countries aggregated by the donor countries for each year. The clear outlier dots represent China which is still receiving significant aid flows from the European donors despite its gain in economic strength over the last decades. In the observed 27 year time period, China received on average around 500 million US$ in total from the 14 European donor countries per year. In the same period, however, the European countries in total exported yearly on average 100 billion US$ to China.

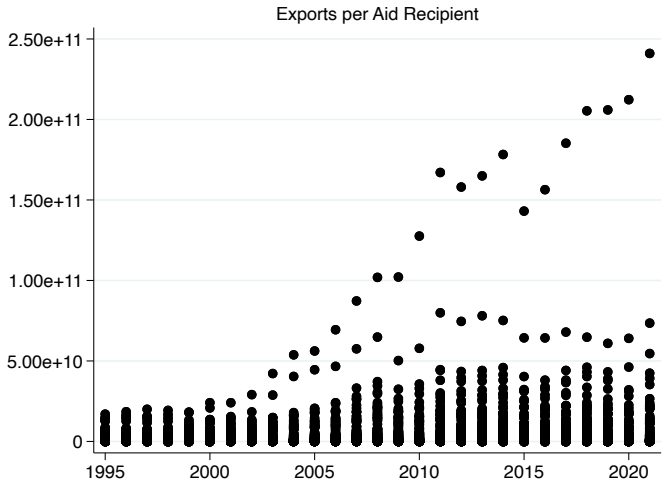

Figure 1: Exports by year and countries

In table 10 we run the baseline regression on the full sample without China. The results show a distinct increase in the significance level of the effect of aid on trade from the 10% level to the 1% level when excluding China from the analysis. When excluding China, an increase in aid by 10.00% leads to an increase in exports by 0.113%. This translates to 1 US$ spent on aid leads to an increase in exports by 0.20 US$ compared to 0.19 US$ for the total sample.

Table 10: Regression results

	(1)	(2)
VARIABLES	Total Sample	w/o China
ln(AID)	0.00858*	0.0113***
	(0.00444)	(0.00436)
Constant	21.68***	20.99***
	(0.0738)	(0.0704)
Observations	32,463	32,170

Notes: This table reports the impact of aid on exports using equation (4). The dependent variable is exports of the European donor countries and is in level form. The independent variable is the log of aid. Column (1) reports results for the full sample, column (2) reports results for the full sample excluding China. Standard errors in parentheses are country pair clustered standard errors. The regression includes importer and exporter time fixed effects as well as importer-exporter fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

8 Conclusion

Development assistance, through the provision of financial resources, technical assistance and capacity-building from the Global North to the Global South, plays a crucial role in international poverty reduction. In supporting programs that focus on education, healthcare and sanitation, aid bolsters developing countries' ability to ameliorate the problems entrenched within poverty. Moreover, development assistance may serve as a conduit for multilateral cooperation and coordination; in contributing to economic growth by way of infrastructural development (such as the building of

roads, bridges or ports), aid can stimulate in-country commerce, international trade and investment - leading to sustainable development, as well as greater integration within the global economic sphere. While these benefits demonstrate the potential impact of development aid, it is essential to ensure that aid is effectively targeted, aligned with recipient country priorities, and accompanied by sound governance frameworks in order to maximise these positive effects. The DAC aims to provide such a framework, and through its guidance, both aid-provision and poverty-reduction have moved in tandem. ODA is, as such, undoubtedly important, however long-term commitment to its provision is certainly easier said than done - aid is often viewed in terms of charitable donation, and as such, dispensable. The dynamics of aid are not so clear-cut however, and empirical research undergone over the last number of years has shone new light on how we may consider aid (UN, 2018). Principally, the provision of development assistance may, not just bolster the economic development of recipients, but additionally benefit the donors by way of increases in exports to these aid-receiving countries. We believe this should be a necessary consideration on the part of public policy makers when viewing the broader topic of aid, with this paper contributing further to the growing idea that aid may, and often does, bring about 'win-win' situations for both donors and recipients of aid.

As part of our own research we have targeted the 14 largest European donors (which account for 41.5% of global ODA provision) and their 172 recipient countries as a means to expand upon and update the pool of existing literature. In doing so, we employ the structural gravity model of trade and estimate it using the Pseudo Poisson Maximum Likelihood (PPML) estimator with panel data for the years 1995–2021. Our results show that European development aid has a significant and positive impact on exports of the donor countries. Every US$ spent on ODA leads to an increase in exports of 0.19 US$ on average. We do not find evidence for the effect of aid on trade on the continent level. However, when restricting our sample by the years of aid relationship we find that the significance is driven by long-term relationships. One US$ spent on aid leads to an increase in exports by 0.33 US$ on average for countries with long lasting aid relationships (greater than 20 years). This highlights the fact that aid donors

should focus on long-term relationships and should not expect short term gains when dispensing development assistance. We apply several robustness checks to account for potential biases and shortcomings in our analysis. By including lead variables, we show that aid is not driven by existing trade relationships as current exports cannot be explained by future aid flows. Controlling for zero aid flows shows that results are significant when only positive trade flows are considered. Further, we provide evidence that existing regional trade agreements reduce the effect of aid on trade. We identify China as an outlier in the data and run the baseline regression excluding China which increases the significance of the estimator considerably with only a minor shift in the elasticity.

Our results, however, are limited in their scope as we only look at aggregate values of exports and aid. We do not differentiate between different types of aid and export sectors. Further analysis here would allow one to see which types of aid might appear to be more effective than others in promoting trade relationships. Breaking down exports by sectors can give interesting insights which sectors are especially benefitting from European development aid. We do not deflate US$ trade and aid values for a certain base year which can lead to slight distortion in the results as we are dealing with a 27-year time period. However, this approach is in line with the current literature and allows for easy comparison of our results with previous studies. We use country pair clustered standard errors to deal with the potential problem of correlated error terms. Alternatively, rather than clustering by pair, one can also cluster standard errors by importer and exporter individually. There is, however, no clear evidence in the literature that this approach would lead to more accurate results. We use fixed effects to account for trade frictions and importer as well as exporter characteristics. However, there is still the possibility of omitted variable bias (OVB).

Our results show a significant but notably smaller effect of aid on donor's exports compared to earlier studies. As our results in Table 3 indicate, OLS might lead to higher estimates which could explain the difference of our study compared to earlier ones. We extend the current literature by providing further evidence for the

effectiveness of aid on exports for a sample of European donor countries while using theory-consistent and up-to-date appropriate econometric methods.

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Appendix

Table A.1: Donors and recipients aid relationship in years

ISO3	Continent	AUT	BEL	DNK	FIN	FRA	DEU	GRC	IRL	ITA	LUX	NLD	PRT	ESP	SWE	Avg. years
DZA	Africa	27	22	5	27	27	23	21	5	20	10	24	26	13	26	19.71
AGO	Africa	27	16	22	24	26	27	12	26	24	7	14	15	18	26	20.29
BWA	Africa	7	10	11	16	22	22	2	14	6	1	9	14	6	21	11.50
BDI	Africa	27	23	15	5	27	27	15	27	27	21	27	4	24	26	21.07
CMR	Africa	27	23	17	17	27	27	20	27	25	22	16	9	12	23	20.86
CPV	Africa	27	18	6	17	27	25	6	0	27	22	19	26	20	19	18.50
CAF	Africa	23	22	14	14	27	27	11	22	27	15	22	10	22	26	20.14
TCD	Africa	11	20	10	14	27	27	14	25	27	19	18	4	22	25	18.79
COM	Africa	0	10	0	7	27	19	3	2	6	3	5	2	5	3	6.57
COG	Africa	25	22	8	26	27	26	23	8	23	14	16	7	19	21	18.93
COD	Africa	27	23	15	1	27	27	26	26	27	22	27	18	24	26	22.57
BEN	Africa	26	23	20	24	27	27	8	24	27	21	27	4	24	25	21.93
GNQ	Africa	15	2	0	6	27	21	9	0	11	0	4	13	24	2	9.57
ETH	Africa	27	23	26	27	27	27	26	27	25	22	27	18	22	26	25.00
ERI	Africa	18	13	17	27	27	27	12	25	27	3	16	4	20	26	18.71
DJI	Africa	3	7	5	23	27	27	9	5	27	1	6	0	8	13	11.50
GAB	Africa	13	6	0	1	24	17	3	5	27	1	9	4	22	3	9.64
GMB	Africa	15	23	15	26	26	27	12	25	23	6	18	4	18	26	18.86
GHA	Africa	27	23	26	20	27	27	16	27	22	19	27	4	15	26	21.86
GIN	Africa	24	23	9	8	27	27	4	27	24	22	12	12	23	26	19.14
CIV	Africa	27	23	8	25	27	27	20	16	27	20	20	20	21	26	21.93

KEN	Africa	27	23	26	26	27	27	26	27	17	20	27	8	17	26	23.14
LSO	Africa	11	4	11	16	2	22	1	19	7	2	7	0	3	20	8.93
LBR	Africa	16	15	20	22	27	19	9	27	14	11	19	5	21	26	17.93
LBY	Africa	22	11	12	27	22	22	16	9	22	6	15	1	19	13	15.50
MDG	Africa	27	23	12	27	27	27	9	15	27	21	15	3	19	22	19.57
MWI	Africa	24	23	20	15	24	27	16	27	24	21	19	1	20	26	20.50
MLI	Africa	27	23	25	17	27	27	8	22	26	22	27	11	24	26	22.29
MRT	Africa	16	23	4	11	26	26	10	23	27	3	16	5	24	24	17.00
MUS	Africa	24	7	0	27	23	11	10	2	9	13	10	2	5	12	11.07
MAR	Africa	27	23	14	22	27	25	21	15	15	17	25	25	23	25	21.71
MOZ	Africa	27	23	26	27	27	27	5	27	27	17	27	26	24	26	24.00
NAM	Africa	20	21	9	22	13	22	5	13	22	15	15	20	13	21	16.50
NER	Africa	26	23	26	24	27	27	11	21	27	22	22	3	21	24	21.71
NGA	Africa	27	23	21	27	27	27	19	27	26	12	27	15	24	26	23.43
GNB	Africa	13	19	15	21	27	27	7	8	27	8	13	26	24	20	18.21
RWA	Africa	27	23	18	27	27	27	14	27	27	22	27	14	24	26	23.57
SHN	Africa	0	0	0	0	2	4	1	0	0	0	1	0	0	0	0.57
STP	Africa	14	1	0	16	27	19	8	1	17	4	7	26	21	9	12.14
SEN	Africa	27	23	15	26	27	27	10	27	27	22	27	24	23	26	23.64
SYC	Africa	6	5	0	0	21	17	9	1	6	0	8	3	8	4	6.29
SLE	Africa	27	18	21	16	27	27	14	27	26	16	22	14	22	26	21.64
SOM	Africa	27	15	24	10	27	27	8	27	27	10	27	9	14	26	19.86
ZAF	Africa	22	22	22	22	18	21	19	22	22	22	22	21	19	21	21.07
ZWE	Africa	26	23	24	27	25	27	23	27	26	9	27	23	24	26	24.07
SSD	Africa	9	8	9	7	9	9	0	8	9	1	9	3	9	8	7.00
SDN	Africa	27	21	26	27	27	27	23	27	27	21	27	8	24	26	24.14

SWZ	Africa	8	3	3	9	22	2	1	18	18	5	8	8	4	16	8.93
TGO	Africa	27	23	15	27	27	27	9	9	24	20	14	4	24	26	19.71
TUN	Africa	26	17	12	16	27	22	25	5	19	21	16	22	17	25	19.29
UGA	Africa	27	23	26	27	26	27	23	27	27	19	27	3	18	26	23.29
EGY	Africa	27	8	20	12	27	24	27	27	21	17	25	19	17	26	21.21
TZA	Africa	27	23	26	27	27	27	13	27	27	21	26	9	24	26	23.57
BFA	Africa	27	23	26	1	27	27	7	26	27	22	22	0	24	26	20.36
ZMB	Africa	25	23	24	25	24	27	11	27	27	10	21	0	21	26	20.79
MYT	Africa	0	0	0	0	11	1	0	0	0	0	0	0	0	0	0.86
ATG	America	6	0	0	0	18	13	10	1	4	0	4	1	5	1	4.50
ARG	America	27	21	6	27	26	27	18	24	11	21	24	21	11	22	20.43
BHS	America	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.07
BRB	America	5	0	0	18	15	15	2	0	1	0	9	0	7	0	5.14
BOL	America	27	23	25	26	27	27	6	27	26	20	22	1	24	26	21.93
BRA	America	27	23	16	16	26	27	19	27	27	22	27	27	24	26	23.86
BLZ	America	12	0	1	15	6	27	2	14	5	1	10	0	10	5	7.71
CHL	America	23	19	12	27	23	23	15	16	11	18	18	18	15	22	18.57
COL	America	27	23	24	24	24	27	15	27	17	21	27	18	23	26	23.07
CRI	America	27	17	7	17	27	25	8	2	13	10	25	4	17	26	16.07
CUB	America	27	23	12	2	27	27	19	5	27	19	23	17	24	22	19.57
DMA	America	3	2	2	24	12	23	3	1	5	0	6	1	6	3	6.50
DOM	America	22	23	16	1	25	24	5	9	17	2	22	1	22	23	15.14
ECU	America	27	23	16	19	25	27	2	18	20	21	18	4	20	26	19.00
SLV	America	27	23	14	27	27	26	13	25	27	22	23	10	24	26	22.43
GRD	America	6	0	0	25	16	24	3	8	2	1	7	0	2	2	6.86
GTM	America	27	23	20	23	27	27	3	27	17	20	25	7	24	26	21.14

GUY	America	1	6	4	13	24	27	3	8	6	7	11	0	6	9	8.93
HTI	America	19	23	9	4	27	27	10	27	24	22	22	16	21	26	19.79
HND	America	27	23	22	27	27	26	8	27	27	19	23	7	24	26	22.36
JAM	America	19	18	0	0	7	2	3	7	3	2	7	1	24	22	8.21
MEX	America	27	23	11	27	23	26	20	26	25	8	19	20	8	25	20.57
MSR	America	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0.21
ABW	America	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0.36
NIC	America	27	23	22	10	27	27	5	26	27	22	25	8	24	26	21.36
PAN	America	25	13	10	27	25	25	8	2	18	2	20	3	17	16	15.07
PRY	America	27	17	6	27	26	27	0	17	26	18	15	1	23	26	18.29
PER	America	27	23	21	7	26	26	18	27	23	22	14	16	23	26	21.36
KNA	America	3	0	0	2	12	6	3	0	1	0	4	0	2	1	2.43
AIA	America	0	0	0	0	0	5	0	0	0	0	1	0	0	0	0.43
LCA	America	5	0	0	2	13	25	2	12	2	0	7	1	6	3	5.57
VCT	America	10	0	0	2	14	18	4	1	2	0	5	2	3	1	4.43
SUR	America	5	23	0	13	25	27	2	0	3	0	27	0	4	1	9.29
TTO	America	1	2	0	26	16	11	3	2	1	0	8	0	7	0	5.50
URY	America	16	14	0	19	23	18	14	2	12	9	14	16	17	21	13.93
VEN	America	27	20	4	27	27	27	19	12	27	9	20	19	20	23	20.07
AFG	Asia	27	20	26	22	27	27	18	27	27	22	27	18	21	26	23.93
AZE	Asia	27	5	5	27	24	25	20	9	22	11	21	0	16	26	17.00
BHR	Asia	0	1	0	0	10	10	0	0	0	0	2	0	0	0	1.64
BGD	Asia	27	14	26	19	17	27	16	27	27	21	27	1	21	26	21.14
ARM	Asia	27	18	23	25	27	27	26	12	25	7	27	2	21	26	20.93
BTN	Asia	26	1	19	24	26	27	0	3	13	0	18	0	2	21	12.86
BRN	Asia	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.14

MMR	Asia	25	16	25	27	27	27	0	25	21	18	27	2	7	26	19.50
KHM	Asia	25	23	24	26	27	27	6	27	27	20	21	4	15	26	21.29
LKA	Asia	27	23	16	26	21	19	13	23	24	18	26	10	8	26	20.00
CHN	Asia	27	8	18	23	24	27	24	26	4	23	27	23	13	26	20.93
GEO	Asia	27	19	21	25	27	26	26	23	27	13	27	23	21	26	23.64
HKG	Asia	2	0	0	27	2	2	0	0	2	0	2	0	1	2	2.86
IDN	Asia	27	10	26	27	20	21	14	23	11	19	12	16	12	26	18.86
IRN	Asia	27	15	18	27	27	27	25	15	27	3	25	9	23	24	20.86
IRQ	Asia	27	18	19	2	26	27	24	26	27	21	27	9	22	26	21.50
ISR	Asia	2	0	0	26	2	0	1	1	2	0	2	0	2	2	2.86
KAZ	Asia	27	9	14	27	27	25	20	11	17	14	27	3	13	26	18.57
JOR	Asia	27	12	24	27	25	27	26	22	27	9	27	0	21	26	21.43
KOR	Asia	5	1	1	0	5	5	2	0	4	0	4	1	4	4	2.57
KWT	Asia	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0.21
KGZ	Asia	27	9	19	12	27	27	12	12	14	3	22	1	19	24	16.29
LAO	Asia	22	21	18	12	27	27	2	25	19	22	16	1	6	19	16.93
LBN	Asia	27	22	17	1	25	27	26	23	27	23	27	8	24	26	21.64
MYS	Asia	27	8	20	26	15	27	0	1	15	0	15	14	13	24	14.64
MDV	Asia	14	6	14	25	18	26	9	10	7	2	7	2	1	8	10.64
MNG	Asia	27	13	18	27	27	27	7	14	24	20	23	0	7	25	18.50
OMN	Asia	1	1	2	24	16	16	1	0	13	0	5	0	1	0	5.71
NPL	Asia	27	18	25	25	12	27	14	27	27	22	24	3	24	25	21.43
PAK	Asia	27	20	17	27	26	24	21	26	23	13	26	6	23	26	21.79
PHL	Asia	27	23	21	27	13	26	14	27	17	20	26	3	23	26	20.93
TLS	Asia	11	5	8	13	20	21	0	9	11	0	10	22	9	15	11.00
QAT	Asia	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0.14

SAU	Asia	13	0	0	0	13	13	4	0	1	0	5	0	0	0	3.50
IND	Asia	20	19	20	22	14	24	20	27	17	22	24	21	22	26	21.29
SGP	Asia	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0.21
VNM	Asia	27	23	25	19	27	27	13	27	22	23	25	13	14	25	22.14
SYR	Asia	27	18	16	27	27	23	26	15	24	9	27	9	24	25	21.21
TJK	Asia	26	5	14	16	27	27	7	13	15	16	22	1	12	25	16.14
THA	Asia	27	16	18	19	16	17	13	27	25	22	25	19	24	26	21.00
ARE	Asia	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0.21
TKM	Asia	21	2	1	19	26	27	6	3	11	1	9	0	5	4	9.64
UZB	Asia	27	8	4	15	27	27	21	8	21	12	14	0	13	25	15.86
YEM	Asia	27	15	24	20	27	27	20	20	26	11	27	4	17	26	20.79
PRK	Asia	23	10	7	0	20	25	12	10	23	9	23	1	7	24	13.86
ALB	Europe	27	18	26	16	27	27	26	22	27	18	23	3	16	26	21.57
BIH	Europe	27	12	20	14	27	27	26	21	27	18	27	15	14	26	21.50
BLR	Europe	17	13	14	26	17	17	12	11	17	6	10	3	15	16	13.86
HRV	Europe	16	12	10	13	16	13	14	4	3	7	16	9	11	16	11.43
CYP	Europe	2	0	0	0	2	0	1	0	2	0	0	0	1	0	0.57
GIB	Europe	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0.36
MLT	Europe	7	0	0	0	8	0	2	0	7	0	1	0	7	0	2.29
MDA	Europe	25	17	20	5	24	25	23	15	24	21	24	9	21	24	19.79
MNE	Europe	16	6	6	14	9	12	13	4	13	14	7	2	4	15	9.64
SRB	Europe	16	15	12	6	15	16	15	9	9	15	13	15	6	15	12.64
SVN	Europe	8	2	2	0	8	3	6	2	0	1	5	3	4	5	3.50
TUR	Europe	27	10	21	17	24	17	27	12	6	13	20	17	15	24	17.86
UKR	Europe	17	17	17	20	17	17	17	15	17	15	14	9	15	16	15.93
MKD	Europe	27	13	18	20	27	24	26	14	17	12	24	19	12	26	19.93

SLB	Oceania	1	0	6	2	13	21	1	5	6	0	8	1	1	7	5.14
COK	Oceania	0	0	0	0	4	14	0	0	1	0	0	0	0	0	1.36
FJI	Oceania	9	1	4	17	26	27	2	8	4	1	6	0	1	6	8.00
PYF	Oceania	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0.36
KIR	Oceania	0	0	0	0	6	16	0	1	4	0	5	0	0	3	2.50
NCL	Oceania	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0.36
VUT	Oceania	4	0	2	1	27	8	2	1	4	1	3	0	6	6	4.64
MNP	Oceania	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.07
MHL	Oceania	0	1	0	0	2	11	3	0	2	0	0	0	1	1	1.50
PLW	Oceania	1	2	1	0	1	16	0	0	4	0	0	0	1	1	1.93
PNG	Oceania	26	8	3	5	25	25	3	18	11	0	13	0	5	16	11.29
TKL	Oceania	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0.36
TON	Oceania	0	0	2	0	15	11	0	1	4	0	3	0	2	1	2.79
WLF	Oceania	0	1	0	0	25	1	0	0	0	0	0	0	0	0	1.93
WSM	Oceania	0	0	0	0	16	18	2	9	1	0	5	0	4	5	4.29
NRU	Oceania	0	0	0	0	2	0	0	0	5	0	0	0	0	0	0.50
NIU	Oceania	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0.36
TUV	Oceania	0	0	0	5	7	8	0	0	4	0	2	0	3	0	2.07

Table A.2: Countries and ISO codes

AFG	Afghanistan
ALA	Aland Islands
ALB	Albania
DZA	Algeria
ASM	American Samoa
AND	Andorra
AGO	Angola
LBR	Liberia
LBY	Libya
LIE	Liechtenstein
LTU	Lithuania
LUX	Luxembourg
MAC	Macao
MKD	North Macedonia

AIA	Anguilla
ATA	Antarctica
ATG	Antigua and Barbuda
ARG	Argentina
ARM	Armenia
ABW	Aruba
AUS	Australia
AUT	Austria
AZE	Azerbaijan
BHS	Bahamas
BHR	Bahrain
BGD	Bangladesh
BRB	Barbados
BLR	Belarus
BEL	Belgium
BLZ	Belize
BEN	Benin
BMU	Bermuda
BTN	Bhutan
BOL	Bolivia
BES	Bonaire, Sint Eustatius and Saba
BIH	Bosnia and Herzegovina
BWA	Botswana
BVT	Bouvet Island
BRA	Brazil
IOT	British Indian Ocean Territory
BRN	Brunei Darussalam
BGR	Bulgaria
BFA	Burkina Faso
MDG	Madagascar
MWI	Malawi
MYS	Malaysia
MDV	Maldives
MLI	Mali
MLT	Malta
MHL	Marshall Islands
MTQ	Martinique
MRT	Mauritania
MUS	Mauritius
MYT	Mayotte
MEX	Mexico
FSM	Micronesia, Federated States of
MDA	Moldova
MCO	Monaco
MNG	Mongolia
MNE	Montenegro
MSR	Montserrat
MAR	Morocco
MOZ	Mozambique
MMR	Myanmar
NAM	Namibia
NRU	Nauru
NPL	Nepal
NLD	Netherlands
NCL	New Caledonia
NZL	New Zealand
NIC	Nicaragua
NER	Niger

BDI	Burundi
KHM	Cambodia
CMR	Cameroon
CAN	Canada
CPV	Cape Verde
CYM	Cayman Islands
CAF	Central African Republic
TCD	Chad
CHL	Chile
CHN	China (People's Republic of)
CXR	Christmas Island
CCK	Cocos (Keeling) Islands
COL	Colombia
COM	Comoros
COG	Congo
COD	Democratic Republic of the Congo
COK	Cook Islands
CRI	Costa Rica
CIV	Côte d'Ivoire
HRV	Croatia
CUB	Cuba
CUW	Curaçao
CYP	Cyprus
CZE	Czechia
DNK	Denmark
DJI	Djibouti
DMA	Dominica
DOM	Dominican Republic
ECU	Ecuador
NGA	Nigeria
NIU	Niue
NFK	Norfolk Island
MNP	Northern Mariana Islands
NOR	Norway
OMN	Oman
PAK	Pakistan
PLW	Palau
PSE	Palestinian Territory, Occupied
PAN	Panama
PNG	Papua New Guinea
PRY	Paraguay
PER	Peru
PHL	Philippines
PCN	Pitcairn
POL	Poland
PRT	Portugal
PRI	Puerto Rico
QAT	Qatar
SRB	Serbia
REU	Reunion
ROU	Romania
RUS	Russia Federation
RWA	Rwanda
BLM	Saint Barthélemy
SHN	Saint Helena
KNA	Saint Kitts and Nevis
LCA	Saint Lucia
MAF	Saint Martin

EGY	Egypt
SLV	El Salvador
GNQ	Equatorial Guinea
ERI	Eritrea
EST	Estonia
ETH	Ethiopia
FLK	Falkland Islands (Malvinas)
FRO	Faroe Islands
FJI	Fiji
FIN	Finland
FRA	France
GUF	French Guiana
PYF	French Polynesia
ATF	French Southern Territories
GAB	Gabon
GMB	Gambia
GEO	Georgia
DEU	Germany
GHA	Ghana
GIB	Gibraltar
GRC	Greece
GRL	Greenland
GRD	Grenada
GLP	Guadeloupe
GUM	Guam
GTM	Guatemala
GGY	Guernsey
GIN	Guinea
SPM	Saint Pierre and Miquelon
VCT	Saint Vincent and the Grenadines
WSM	Samoa
SMR	San Marino
STP	Sao Tome and Principe
SAU	Saudi Arabia
SEN	Senegal
SYC	Seychelles
SLE	Sierra Leone
SGP	Singapore
SXM	Sint Maarten
SVK	Slovakia
SVN	Slovenia
SLB	Solomon Islands
SOM	Somalia
ZAF	South Africa
SGS	South Georgia & The South Sandwich Islands
SSD	South Sudan
ESP	Spain
LKA	Sri Lanka
SDN	Sudan
SUR	Suriname
SJM	Svalbard and Jan Mayen
SWZ	Swaziland
SWE	Sweden
CHE	Switzerland
SYR	Syrian Arab Republic
TWN	Chinese Taipei

GNB	Guinea-Bissau
GUY	Guyana
HTI	Haiti
HMD	Heard and Mc Donald Islands
VAT	Holy See (Vatican City State)
HND	Honduras
HKG	Hong Kong (China)
HUN	Hungary
ISL	Iceland
IND	India
IDN	Indonesia
IRN	Iran
IRQ	Iraq
IRL	Ireland
IMN	Isle of Man
ISR	Israel
ITA	Italy
JAM	Jamaica
JPN	Japan
JEY	Jersey
JOR	Jordan
KAZ	Kazakhstan
KEN	Kenya
KIR	Kiribati
PRK	Democratic People's Republic of Korea
KOR	Korea
XKX	Kosovo
KWT	Kuwait
KGZ	Kyrgyzstan
TJK	Tajikistan
TZA	Tanzania
THA	Thailand
TLS	Timor-Leste
TGO	Togo
TKL	Tokelau
TON	Tonga
TTO	Trinidad and Tobago
TUN	Tunisia
TUR	Türkiye
XTX	Turkish Rep N Cyprus (temporary code)
TKM	Turkmenistan
TCA	Turks and Caicos Islands
TUV	Tuvalu
UGA	Uganda
UKR	Ukraine
ARE	United Arab Emirates
GBR	United Kingdom
USA	United States
UMI	United States Minor Outlying Islands
URY	Uruguay
UZB	Uzbekistan
VUT	Vanuatu
VEN	Venezuela
VNM	Viet Nam
VGB	Virgin Islands, British
VIR	Virgin Islands, U.S.
WLF	Wallis and Futuna
ESH	Western Sahara

LAO	Lao People's Democratic Republic	YEM	Yemen
LVA	Latvia	ZMB	Zambia
LBN	Lebanon	ZWE	Zimbabwe
LSO	Lesotho	SWZ	Eswatini
		CPV	Cabo Verde

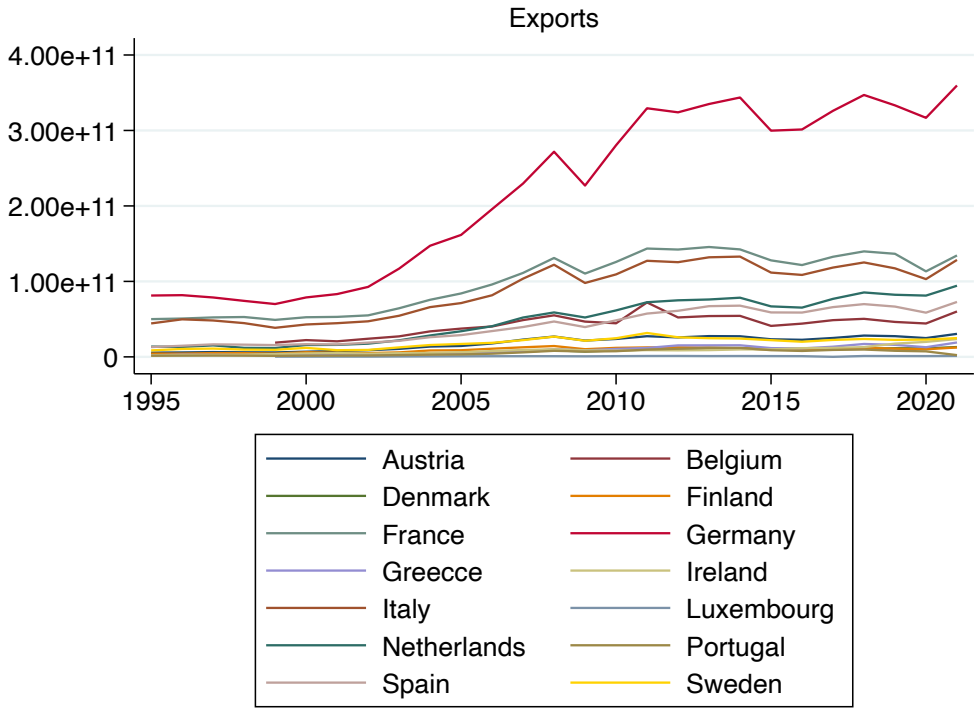

Figure A.1: Exports by Donors to Aid Recipients in (US$)

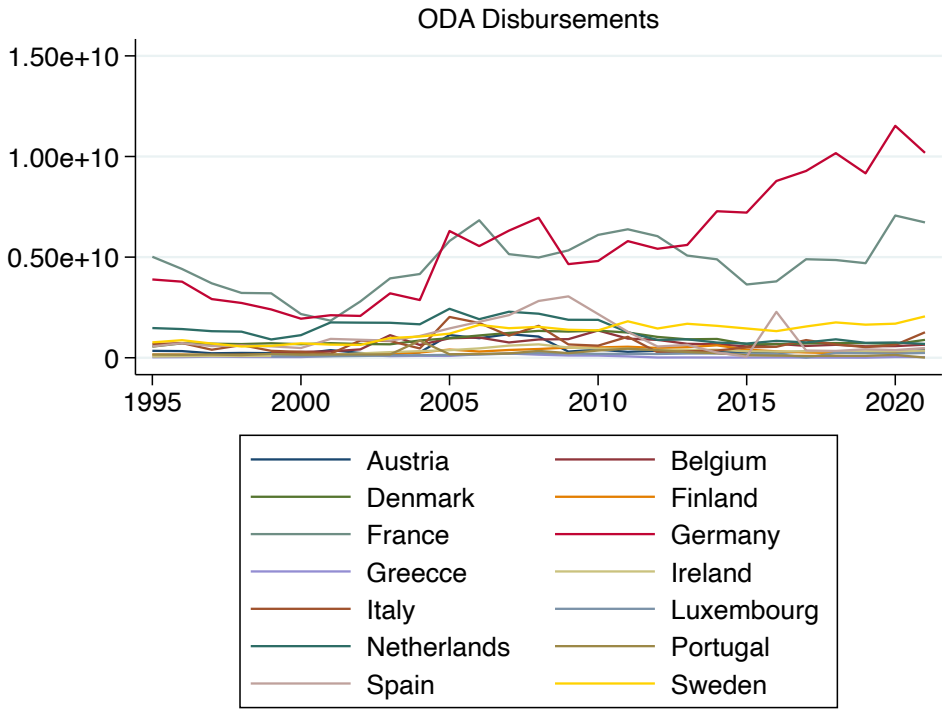

Figure A.2: ODA Disbursements of Donor Countries (in US$)

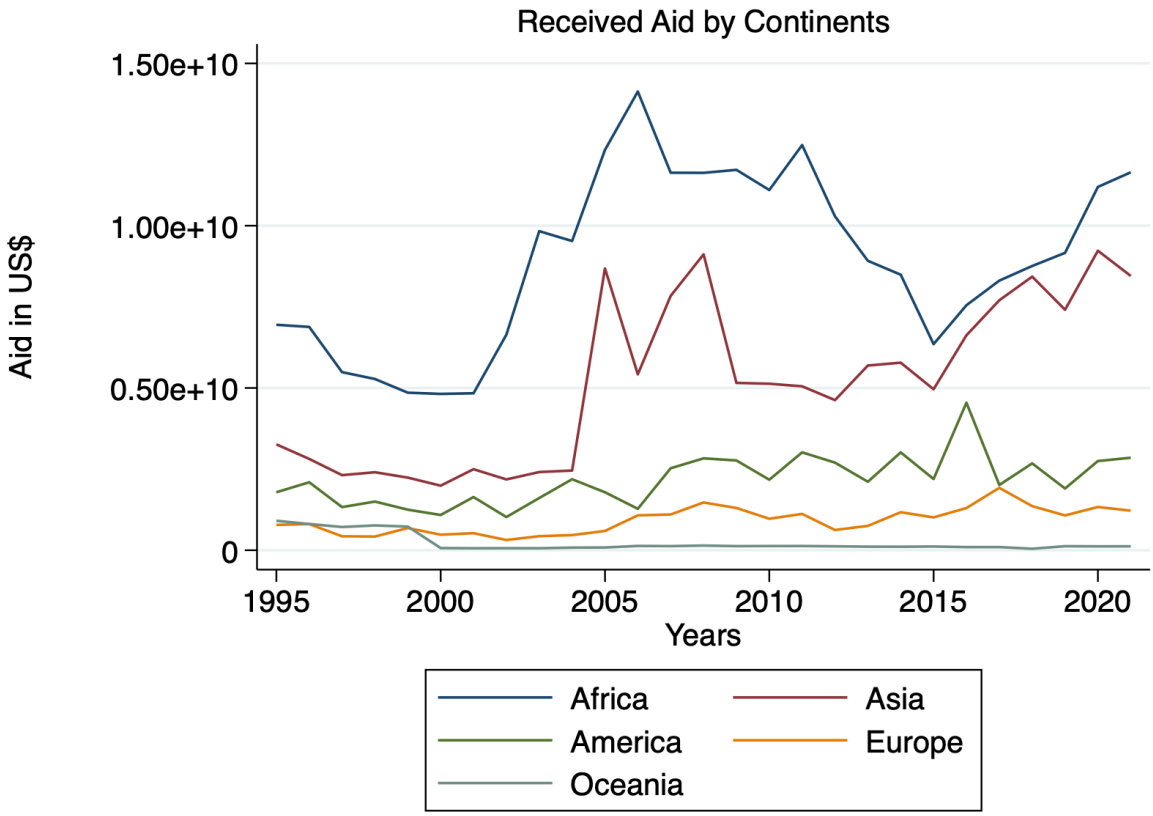

Figure A.3: Aid Received by Continents (in US$)

Table A.3: Literature Overview (adapted from Nishitateno & Umetani, 2023)

Authors	Panel data	Estimation Methods	Aid Variables	Elasticity
Nilsson (1997)	15 donors, 108 recipients, 1975-1992	OLS	Gross ODA disbursement	0.23
Wagner (2003)	20 donors, 109 recipients, 1970-1990	OLS	Gross ODA disbursement	0.062
Zarin-Nejadan et al. (2008)	Switzerland, 99 recipients, 1966-2003	OLS	Net ODA disbursement	0.045

Nowak-Lehmann D. et al. (2009)	Germany, 77 recipients, 1962-2005	Dynamic OLS	Gross ODA disbursement	0.13
Helbe et al. (2012)	172 exporters, 167 importers, 19902005	OLS	Gross AfT disbursement	0.004
Silva and Nelson (2012)	180 exporters, 180 importers, 1962-2000	OLS	Net ODA disbursement	0.018
Nowak Lehmann et al. (2013)	21 donors, 123 recipients, 1988-2007	DFGLS	Gross ODA disbursement	0.05
Pettersson and Johanson (2013)	184 exporters, 184 importers, 1990-2005	OLS	Gross AfT commitment	0.091

Martínez-Zarzoso, Nowak-Lehmann and Klasen (2014)	Netherlands, 130 recipients, 1973-2009	OLS, GMM	Net ODA disbursement	0.034
Martínez-Zarzoso, Nowak-Lehmann, Parra and Klasen (2014)	21 donors, 132 recipients, 1988-2007	OLS	Net ODA disbursement	0.039
Hansen and Rand (2014)	Denmark, 144 recipients, 1981-2010	OLS, GMM	Net ODA disbursement	0.075
Hühne et al. (2014)	152 recipients, 1990-2010	OLS, GMM	Gross AfT disbursement	0.033
Hoekman and Shingal (2020)	28 donors, 162 recipients, 2002-2010	PPML	Gross AfT disbursement	-0.012 (goods), -0.038 (services)