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Export Upgrading in Donor and Recipient Countries and Bilateral Development Aid Allocation

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Abstract

This paper contributes to the literature on aid allocation by investigating whether export product upgrading (export product diversification and export quality improvement) in both donors and aid recipient-countries matters for donors' aid allocation. The analysis is conducted in a gravity type framework model over a panel dataset comprising 23 donor-countries and 126 recipient-countries over the period 1970-2010. The study uses both within fixed effects and fixed effects quantile regression estimators to perform the analysis. The empirical results suggest evidence that export product diversification in donor-countries does not influence their bilateral aid supply, but an improvement in their overall export quality does generate higher bilateral aid to recipient-countries. In the meantime, while export product diversification in recipient countries does not influence the bilateral aid these countries receive from donors, bilateral aid supplied by donors declines when recipient-countries experience higher overall export quality improvement. Finally, the impact of export upgrading in recipient-countries on the bilateral aid received from donors is dependent upon recipient-countries' level of economic development, proxied by their real per capita income.

JEL classification: F35, F4

Keywords: Bilateral Aid, Export Product Diversification, Export Quality Improvement

1. Introduction

The role of trade in aid allocated by donors to recipient-countries has been the subject of many studies in the body of the aid literature[1] that explores the determinants of donors' aid supply, either for aggregate aid or for bilateral aid.

On the one hand, the literature on the determinants of aggregate ODA supply has demonstrated that several factors can affect the supply of foreign aid by donors to recipients, including macroeconomic factors, international and domestic political factors. Trade, in particular, is considered an important determinant of donors' ODA allocation. A detailed literature survey on these determinants can be found in Fuchs et al. (2014). The survey of these authors shows that the findings of studies exploring the impact of trade on foreign aid supplied by donors remain inconclusive. For example, Bertoli et al. (2008) show empirical evidence that foreign aid increases when donor countries enjoy a strong positive trade balance. Tingley (2010) has questioned whether trade-dependent donor countries – with trade dependency measured by the sum of exports and imports relative to gross domestic product (GDP) – tend to be more "generous" in terms of aid supply than countries that are less dependent on trade. However, he does not find a significant effect of this variable. Lundsgaarde et al. (2007) provide empirical evidence that increased imports in a donor country from developing countries are associated with diminishing aid budgets (the amount of aid allocated by donors to recipient-countries). However, this impact observed by the authors is

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[1] Another body of the aid literature has been devoted to the effectiveness of the development aid received by recipient countries with respect to the latter's economic development.

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"loosely" significant, that is, significant at only the 10% level. In relation to bilateral aid allocation, Alesina and Dollar (2000) observe that donors allocate more aid to reward developing countries for the good quality of their economic policies, in particular their trade liberalization policies.

On the other hand, an important strand of the literature has underscored the role of donors' exports on the aid they allocated. In particular, Claessens, Cassimon, and Van Campenhout (2009) highlight that earlier contributions to the aid allocation literature often reported a positive effect of donors' exports on aid.

Berthélemy (2006) ranks various donor countries according to the elasticity of aid with respect to bilateral exports of the donor to the recipient country and obtains that most of the larger donors are rated "moderately egoistic" by this criterion. He concludes that export-related self-interest drives the donors' aid allocation. Likewise, Hoeffler and Outram (2011) find that all top five donor countries (France, Germany, Japan, the United Kingdom, and the United States) provide more aid to trading partners. It is worth noting that in contrast to Berthélemy (2006), Hoeffler and Outram (2011) have considered the flow of exports and imports between a donor and a recipient country. Dudley and Montmarquette (1976), Neumayer (2003) and Younas (2008) have demonstrated that a higher total of exports from donor countries to the recipient countries results in greater aid allocation. Barthel et al. (2014) use sector-specific aid data and examine whether donor-countries compete for export markets for foreign aid allocation. They find that the five largest donors react to aid giving by other donors with whom they compete in terms of exporting goods and services to a specific recipient country at both stages of their allocation of aid for economic infrastructure and production sectors. However, they find no evidence that export competition drives aid allocation for more altruistic donors and for aid in social infrastructure.

Despite this important literature on the role of trade on the supply/allocation of development aid, to the best of our knowledge, the role of export product upgrading on aid allocation has not been investigated. In this study, export product upgrading entails either export product diversification or improvement in export product quality. Improvement in export product quality refers to improvement in the quality of existing products.

Yet, some studies such as Munemo (2011) have shown that aid flows received by recipient countries matter for the degree of the export product diversification, but none study explores the relationship in the other direction. This paper aims to fill this gap in the empirical literature by exploring the impact of export product upgrading in both donor-countries and recipient-countries on donors' aid allocation. This is all the more relevant that the international trade literature has highlighted the importance for countries, in particular developing countries to upgrade their export products, including by diversifying their export products away from the primary sector, towards the manufacturing sector.

This paper posits two main arguments: the first argument stipulates that donors would be willing to allocate higher aid to recipient-countries with a view to helping them spur their export performance – including, upgrade their export product - and better integrate into the multilateral trading system. Hence, recipient-countries with lower degree of export product diversification (or higher degree of export product concentration) would likely enjoy higher donors' bilateral aid. This willingness of donors is particularly in line with the World Trade Organization (WTO) Members commitments - through the Aid for Trade (AfT) Initiative - to provide higher AfT to

recipient countries in order to "help them build the supply-side capacity and trade-related infrastructure that they need to assist them to implement and benefit from WTO Agreements and more broadly to expand their trade" (WTO Secretariat document WT/MIN(05)/DEC).

Nonetheless, rather than focusing here only on AfT flows, we rely on total official development aid because the degree of export product upgrading in a recipient-country could affect both AfT as well non-AfT component of ODA. It is important to emphasize while the literature on the determinants of AfT effectiveness is scant, some studies such as Lee, et al. (2015) and Gnangnon (2016) have shown the importance of trade for AfT allocation by obtaining evidence of positive impact of trade openness in recipient-countries on AfT received by recipients.

Likewise, donors could also provide higher aid flows to recipient-countries that upgrade their export products in order to further encourage them to do so. As a result, while we mainly expect export upgrading in recipient-countries to be associated with lower donors' bilateral aid supply, it is still possible to obtain a positive impact of export upgrading in recipient-countries on the bilateral aid that they receive.

The second argument puts forth in this analysis is related to the influence of export upgrading in donor-countries on their bilateral aid allocation. In effect, we argue that as donors increase the diversification of their export products or as they improve the quality of their export products, they would likely experience lower unemployment rate, lower GDP volatility and higher economic growth that would in turn affect positively (and indirectly) their overall government revenue and consequently, their supply of development aid. Likewise, export product upgrading, by reducing the exposure of donor-countries to external shocks, could likely reduce the need for these countries to increase their expenditure to address the adverse consequences of external shocks and consequently improve the room in their budget to supply higher aid to recipient-countries.

The empirical analysis is carried out in a donor-recipient bilateral relationship framework, i.e., by relying on dyadic data analysis. It suggests evidence that overall export product diversification in donor-countries does not matter for donors' bilateral aid supply to developing countries, but improvement in the overall export product quality in donor-countries does exert a positive impact on their bilateral aid allocation. At the same time, we obtain evidence that recipient-countries' overall export product concentration (or diversification) does not matter for the amounts of development aid inflows they receive from donors. Meanwhile, recipient-countries that improve the overall quality of their existing export products experience lower bilateral aid from donors. Furthermore, the analysis suggests evidence that the impact of recipient-countries' export upgrading (export product concentration and export product quality) on donors' bilateral aid supply depends on recipient-countries' level of economic development.

The rest of the paper is organized as follows: Section 2 provides a discussion on the channels through which export product diversification in both recipient-countries and donor-countries could affect donors' aid allocation. Section 3 describes the model specification to be estimated, while Section 4 discusses the estimation strategy. Section 5 interprets the estimations' results and Section 6 concludes.

2. Discussion on the effect of export product upgrading in recipient-countries and donor-countries on donors' aid allocation

The literature has put forth several reasons to justify the need for diversification of export products. The structural models of economic development (see for e.g. Chenery, 1979; Syrquin, 1989) argue that countries should diversify their exports from primary products into manufactured products. This is in line with the Prebisch-Singer thesis (Prebisch, 1950; Singer, 1950) that vertical export diversification (which takes place by moving up the value chain to produce manufactured products) reduces declining terms of trade for commodity-dependent countries. Export diversification is an important engine for economic growth (see for e.g., Al-Marhubi, 2000; Lederman and Maloney, 2007; Agosin, 2007; Hesse, 2008). Export diversification also contributes to mitigating countries' vulnerability to economic shocks, including the volatility and instability in export earnings (see for e.g., Bleaney and Greenaway, 2001; Samen, 2010). Furthermore, trade openness reduces economic growth volatility in countries with relatively diversified export baskets (Haddad et al., 2013).

2.1. Effect of export upgrading in recipient-countries on donors' aid allocation

Donors would likely supply higher aid to recipient-countries when the latter experience a low degree of export product upgrading (measured either by export product diversification or by export quality improvement). The rationale for the rise in aid supply to these countries lies with the willingness of donors to help recipient-countries expand their exports and better integrate into the multilateral trading system. This is in line with World Trade Organization (WTO) Members' commitments - through the afore-mentioned Aid for Trade (AfT) Initiative to provide higher AfT to recipient countries, in particular Least developed countries (LDCs). Nevertheless, we do not rely here only on AfT, but on total official development assistance (ODA), which encompasses both AfT and non-AfT components, the latter including social sector related aid. This is because in their aid allocation decision, the degree of export upgrading in recipient-countries would likely matter not only for AfT flows supplied by donors, but also for non-AfT flows.

Despite the pertinence of these arguments, one could still argue that donors would likely be willing to extend lower bilateral aid to some recipient-countries because of their limited absorptive capacity[2] (Feeny and de Silva, 2012) with respect to this aid as well as because of the Dutch Disease phenomenon, which could generate an anti-export bias by adversely affecting export upgrading in recipient countries through reduction of the number of products in the export basket (see for e.g., Collier 2007; Rajan and Subramanian 2005) or through lower value addition to the existing export product quality (i.e., lower quality of existing export products). These arguments echo to some extent the findings of Munemo (2011) who obtains evidence that foreign aid not exceeding 20% of a country's GDP significantly promotes export diversification, while foreign aid in excess of 20% of GDP significantly impedes export diversification.

[2] The concept of "Absorptive capacity constraints" refers to the different capacity constraints which help explain the finding of diminishing returns to foreign aid. They could include: capital constraints; policy and institutional constraints; macroeconomic constraints; donor practices; and social and cultural constraints (see for e.g., Feeny and de Silva, 2012).

Munemo (2011) concludes that as low-income countries receive aid lower than 20% of their GDP, varying amounts of additional aid can be used to enhance export diversification without causing a Dutch disease effect. It is noteworthy that this "20% of GDP" figure of aid represents an aggregate aid (in per cent of GDP), i.e., the aid received by each country from all donors. Incidentally, it could be argued that donors may grant lower bilateral aid to recipient-countries that upgrade their export products merely because they would believe that such export product upgrading would provide these recipient-countries with financial means to help them address their development needs. Furthermore, donors could reduce their bilateral aid supply to recipient-countries that upgrade their export products on the premise that export upgrading in recipient-countries contributes to mitigating recipient-countries' exposure to external shocks and therefore reducing their need for financial means to address the adverse impact of these shocks on their respective economies. Donors could also decide to provide higher aid flows to recipient-countries that upgrade their export products in order to further encourage them to do so.

Overall, we expect export product upgrading in recipient-countries to be negatively associated with donors' bilateral aid supply. However, it is still possible that export upgrading in recipient-countries induces higher donors' bilateral aid supply.

2.2. Effect of export upgrading in donor-countries on donors' aid allocation

As noted above, export product upgrading in donor-countries would directly affect several macroeconomic factors, which in turn would influence these countries' government revenue and expenditure, and consequently their aid budget. Unfortunately, there is no study on the impact of export upgrading in developed countries on macroeconomic variables such as unemployment rate, government expenditures. A recent study (see Brun and Gnangnon, 2017) shows evidence that export upgrading matters positively for non-resource tax revenue. Nonetheless, studies such as Lederman and Maloney (2007), Agosin (2007), Hesse (2008), Haddad et al. (2013) provide evidence that export upgrading, in particular export diversification contributes to lower economic growth and lower economic growth volatility.

Against this background and despite the lack of empirical evidence on the impact of export upgrading on macroeconomic indicators such as unemployment and government expenditure, we do postulate that export product upgrading would be associated with higher export performance, lower unemployment rate, lower economic growth and lower economic growth volatility. Higher export performance and lower unemployment rate would in turn likely be associated with higher tax revenue and lower expenditure, including social spending. Similarly, higher economic growth and lower economic growth volatility could also significantly contribute to increasing government revenue. As a result, donors could be willing to extend higher aid budgets to recipient-countries. Furthermore, export upgrading in donor-countries could also reduce the exposure of these countries to future shocks and thereby, reduce the likelihood for the need of these countries to increase expenditure to address the negative consequences of future shocks. Consequently, donor-governments would avail themselves of a higher room of manoeuvre to supply higher aid to recipient-countries.

3. Empirical model

3.1. The model

We analyse the relationship between export upgrading in both donor and recipient countries on donors' bilateral aid allocation decision by relying on dyadic analysis, i.e., by postulating a model, where the unit of analysis is the 'country pair/year' and where we include recipient and donor countries' characteristics that could affect the influence of export upgrading variables on donors' aid allocation.

We consider the following model, similar in structure to that of Dabla-Norris, Minoiu and Zanna (2015):

$$
\begin{aligned}
&Log(1+ODA)_{ijt} = \alpha_{ij} + \beta_1 Log(1+ODA)_{ijt-1} + \beta_2 Log(ExpUpgr\,\mathrm{Re}c)_{jt-1} \\
&+ \beta_3 Log(GDPC\,\mathrm{Re}c)_{jt-1} + \beta_4 (Log(GDPC\,\mathrm{Re}c)_{jt-1})^2 + \beta_5 Log(Open\,\mathrm{Re}c)_{jt-1} \\
&+ \beta_6 Log(Pop\,\mathrm{Re}c)_{jt-1} + \beta_7 InstQual\,\mathrm{Re}c_{jt-1} + \beta_8 Log(ExpUpgrDon)_{jt} \\
&+ \beta_9 Log(GDPCDon)_{it} + \beta_{10} Log(\mathrm{Re}vDon)_{it} + \beta_{11} Log(ExpDon)_{it} \\
&+ \beta_{12} Log(DebtDon)_{it} + \beta_{13} Log(PopDon)_{jt} + \beta_{14} Log(OpenDon)_{jt} + \mu_t + \eta_{ijt}
\end{aligned}
\qquad (1)
$$

where i and j are the subscripts associated respectively with donor-country and recipient-country; t is the time-period.

The panel dataset is based on dyadic data covering23 donor-countries and 126 recipient-countries, over the period 1970-2010. The choice of the period as well as countries is based on data availability, in particular on data available on export upgrading variables. Definition and source of the variables are provided in Appendix 1, and descriptive statistics on these variables are provided in Appendix 2. Appendix 3 reports pairwise correlation between variables used in the analysis, while Appendix 4 presents the list of recipient-countries and donor-countries used in the analysis. "ODA" is the amount of bilateral gross total ODA commitment of a donor j vis-à-vis a recipient-country i. Data related to this variable has been converted in constant 2005 values, using the total DAC Deflator for Resource Flows. As in principle, ODA commitments could not take negative values, we replace negative values of the "ODA" variable in the panel dataset by missing data. As "ODA" contains "0" values, we transform this variable using Log(1+ODA) where "Log" denotes the natural logarithm. All other variables except "InstQualRec" are considered with the natural Logarithm in model (1).

"ExpUpgrRec" is the export upgrading index of the recipient-country. It could be either the overall export product concentration of the recipient-country (ECIRec) or the overall export product quality (QUALRec) of the recipient-country. It is important to note that a rise in the index of export product concentration variable indicates higher export product concentration, while a decline in this index represents higher export product diversification. A rise in the index of overall export product quality indicates an improvement in the overall export product quality.

"GDPCRec" is the real per capita GDP in the recipient-country.

"OpenRec" is the overall degree of trade openness in the recipient-country; trade openness is measured by the sum of exports and imports in a recipient-country, as a share of the latter's GDP.

"PopRec" is the size of the population in the recipient-country.

"InstQualRec" is the measure of the institutional quality in the recipient-country.

"ExpUpgrDon" stands for the export upgrading index of the donor-country. It could be either the overall export product concentration of the donor-country (ECIDon) or the overall export product quality (QUALDon) of the donor-country. Here also, a rise in the index of overall export product concentration indicates higher overall export product concentration, while a decline in this index represents overall export product diversification. In the meantime, a rise in the index of overall export product quality indicates an improvement in the overall export product quality.

"GDPCDon" is the real per capita GDP in the donor-country.

"RevDon" is the share of total revenue, in % GDP in a donor-country.

"ExpDon" is the share of total expenditure, in % GDP in a donor-country.

"DebtDon" is the share of total gross public debt, in % GDP in a donor-country.

"PopDon" is the size of total population of a donor-country.

"OpenDon" is the overall degree of trade openness in a donor-country; trade openness is measured by the sum of exports and imports in a donor-country, as a share of the latter's GDP.

β_1 to β_{14} are parameters to be estimated.

η_{ijt} is a well-behaved error term. α_{ij} represent country-pair fixed effects, and control for time-invariant country-pair features (such as past colonial ties, sharing a common language, other forms of cultural proximity, and geographical distance) that may influence the likelihood of a bilateral relationship. μ_t represent year dummies effects and control for global shocks as well as pre-existing trends (see Plümper and Neumayer, 2010).

Note that introduction of a one-year lag of the aid variable in the model to capture the state dependence in the bilateral aid supplied by donors is grounded on several reasons:

From a theoretical perspective, Wildavsky (1964)'s points out that the principal influence on the budget for any spending agency in the current year is the last year's budget and assumes that this is even more true for aid compare to other categories of public expenditures. Since much aid consists of money committed several years in advance for the support of particular projects, such aid cannot be rescinded without serious offense to foreign governments. Mosley (1985) reinforces this argument by stressing that it is particularly true for aid agencies since aid projects often run over several years, with financial flows being committed in year one. From an econometric standpoint, Bond (2002) highlights that even when the coefficient of the lagged dependent variable(s) could not be the focus of interest, allowing for dynamics in the underlying process may be crucial for recovering consistent estimates of other parameters.

3.2. Discussion on the expected effect of control variables

We discuss here the expected effect of the covariates, other than our variables of interest.

"GDPCRec": According for example to Berthelemy (2006), recipients that experience a higher level of development (proxied by per capita income) are expected to receive less aid. However, if bilateral aid is guided by self-interest, the per capita income could exert a positive effect on donors' bilateral aid supply.

"OPENRec": The degree of trade openness of recipient-countries matters for aid allocation, as donors allocate more aid to reward developing countries for the good quality of their economic policies, in particular their trade liberalization policies (see for e.g., Alesina and Dollar, 2000). Hence, we expect recipient-countries' overall degree of trade openness to be associated with higher bilateral aid supplied by donors.

"POPRec": the size of recipient-countries' population matters for aid allocation for many reasons (see for e.g., Younas, 2008): (i) the marginal impact of aid decreases as the population increases; (ii) high population countries lack the administrative expertise to absorb large amounts of aid; (iii) it is relatively easier for donors to wield political influence over a smaller country than a large country.

"InstQualRec": The literature does not come up with a clear-cut effect of institutional quality on bilateral aid allocation (see for e.g., In'airat, 2014). For example, Alesina and Weder (2002) obtain that among donors, corruption is a decisive factor for aid allocation only for Australian and Scadinavian donor countries; Svensson (2000) and Neumayer (2003a) found a weak role of corruption in the selection of recipient countries that will benefit from foreign aid. Trumball and Wall (1994) observed that an altruistic donor may not necessarily provide more aid to poorer nations because it may wish to punish the recipient government for political oppression. Bandyopadhyay and Wall (2007) provide evidence that an improvement in civil/political rights in recipient countries is associated with higher aid receipts.

"GDPCDon": the empirical literature remains inconclusive with respect to the effect of real output in donor-countries on their aid supply. For example, Boschini and Olofsgård (2007) and, Round and Odedokun (2003, 2004) obtain a positive effect of per capita income in donor-countries on their total aid supply; Dreher and Fuchs (2011), Bertoli et al. (2008) and Frot (2009) obtain mixed evidence and Lundsgaarde et al. (2007) and Mosley (1985) find insignificant effect of donors' per capita income on their aid supply.

"REVDon", "EXPDon" and "DEBTDon": A fiscal surplus in a donor country is associated with a reduction in aid supply (see for e.g., Mosley, 1985; Bertoli et al. 2008), whereas Faini (2006) find that the stock of debt and the budget deficit exert a severely negative effect on donors' aid effort. Beside these studies, Round and Odedokun (2004) and Boschini and Olofsgard (2007) find no significant effect of the fiscal position of a donor on its aid effort.

"POPDon": Round and Odedokun (2004), for example, postulate that an increase in the population may be associated with greater population heterogeneity, loss of social cohesion and, ceteris paribus, a decline in willingness to redistribute. There is support for this hypothesis to the extent that, within the DAC member countries, the small countries – such as the Nordic countries – are more homogeneous and cohesive, and have long maintained an altruistic and progressive attitude towards foreign aid.

"OPENDon": Dang et al. (2010) examine the effect of trade integration, captured through the variable "trade" (exports plus imports) as a share of GDP, on aid effort determinants and obtain no significant effect of the former on the latter. Along the same lines, Tingley (2010) suspects trade-dependent countries, where trade dependency is measured by the sum of exports and imports relative to GDP, to be more "generous" donors. However, he does not find any significant effect of trade dependency on donors' aid budgets.

It is worth noting that all explanatory variables capturing recipient-characteristics in model (1) are introduced with a one-year lag, given that the decision-making process

on aid allocation is likely subject to informational time lags (see for e.g., Feeny and McGillivray, 2008; Stubb et al., 2016). Moreover, as the explanatory variables in models (1) vary only at the donor – and recipient level respectively (but not at both simultaneously) and given that our dependent variable varies at the country-pair level, the endogeneity concerns related to causality running from the aid variable to the covariates are severely mitigated (see also Dabla-Norris et al., 2015 for this argument).

4. Estimation strategy

One could question whether in model (1), the variable representing recipient-countries' export upgrading is endogenous, primarily due to the possible bi-directional causality with respect to the dependent variable. This endogeneity concern should not be considered as so strong for several reasons. First, as noted above, our dependent variable varies at the country-pair level, while several regressors, including our variables of interest, - namely "ExpUpgrRec" and "ExpUrpgrDon"- vary either at the donor level or at the recipient level. This contributes to mitigating the endogeneity concerns associated with the causality running from aid flows to many explanatory variables (see also Dabla-Norris, Minoiu and Zanna, 2015), especially in the case of recipient countries, notably for the "ExpUpgrRec" variable. Second, the risk of endogeneity of "ExpUpgrRec" variable is further mitigated by the fact export upgrading in recipient countries is likely to exert an immediate effect on bilateral aid flows supplied by donors rather than the other way around. Indeed, as the values of the indicators of recipient-countries' export upgrading change little from year to year (given that upgrading export products, either through export diversification or through export quality improvement takes time, although with less longer time for export quality improvement as compared to export diversification), there would not be any unexpected change in export upgrading due to a rise or fall in donors' bilateral aid supply. For all these reasons, and given that it is very hard to find an instrument for our export upgrading (in recipient-countries) indicator, we definitely consider that the endogeneity issue relating to the "ExpUpgrRec" variable is less likely to be strong in model (1). It is worth noting that there is no risk of endogeneity of the "ExpUpgrDon" variable in model (1), as donors' bilateral aid allocated is clearly expected to be influenced by export upgrading in donor-countries and not the other way around.

Furthermore, as our aid variable is left censored at zero, model (1) is confronted with a corner solution (Wooldridge, 2002). To address this bounded nature of the aid variable, the empirical literature usually utilizes either a tobit regression approach, a two-part estimation technique[3] (see for e.g., Boussalio and Peiffer, 2011; Drury et al., 2005; Neumayer, 2003b, 2005; Stubbs et al., 2016) or the Heckman (1979) two-step method. However, in our dataset, there are only 138 zeros[4] out of 41,754 observations. Therefore, we decide to estimate directly the allocation model (1) by relying on the

[3] The two-part estimation technique entails the estimation of the model in two steps: first part of the estimation is the so-called "selection model", which explains the decision-making process of donors whereby they first decide which countries need to receive any aid, before deciding the amount of aid these countries would receive from a budget pool. The second part of the estimation is based on the use of an Ordinary Least Squares (OLS) technique on strictly positive observations of aid data. It aims to explain how much aid the selected countries will receive.

[4] The ODA variable contains 138 zeros out of 41754 observations; hence, these zeros account for 0.33% of all the observations in the ODA variable.

entire dataset and by using two estimators. The first estimator is the within fixed effects estimator along with the Driscoll and Kraay (1998) technique to correct standard errors. This estimator helps take into account the possible cross-sectional dependence along with the eventual heteroscedasticity and serial correlation in residuals (see Hoechle, 2007[5] who adapted this technique in Stata software for unbalanced panels). The second estimator is the fixed effects quantile regression approach developed by Canay (2011). This approach allows us to examine the impact of the export upgrading variable (relating to both recipient-countries and donor-countries) on donors' bilateral aid allocation across the distribution of the latter. Canay (2011)'s fixed effects quantile regression approach relies on the assumption that fixed effects in the panel data act as location shifters, i.e, they are constant across quantiles (affecting all quantiles in the same way). Against this background, the implementation of Canay (2011)'s fixed effects quantile regression technique involves two major steps: the first step consists of running a standard within fixed effects model from which we derive the predicted value of the dependent variable (i.e., the dependent variable depurated from the unobserved heterogeneity, i.e., fixed effects). The second step entails the estimation of a standard pooled quantile regression model in which the transformed dependent (outcome) variable is regressed on explanatory variables. In this paper, we implement this two-step procedure of the fixed effects quantile regression technique using quantiles (10, 20, 30, 40, 50, 60, 70, 80, 90), where 10 to 90 represents respectively the 10^{th} to 90^{th} quantiles. It is noteworthy that we perform the estimation in the second step by relying on the simultaneous quantile analysis approach and report heteroscedasticity-robust standard errors obtained from 100 bootstrapping repetitions.

It could be argued that the estimation of the allocation equation (1) in a dynamic specification may suffer from the Nickell bias (1981) due to the presence of the lag of the dependent variable as a right hand side variable. Instrumental variables techniques, including the GMM estimator (see Arellano and Bond, 1991; Blundell and Bond, 1998) have been proposed to address this problem. However, this approach requires small T and large N. While Nickell (1981) has shown that the bias approaches zero as T tends to infinity, it is still unclear what value of T could be considered as sufficient enough to reduce significantly the bias in the system dynamic model. Judson and Owen (1999) show that the bias remains substantial when T equals 20 and may range from up to 20% of the true value for T equals to 30, with, in the latter case, the estimates being of correct sign and the bias of exogenous variables being quite small.

Against this backdrop, and given that our T is equal to 41, we assume that the Nickel bias is small and estimate the dynamic specification of model (1) by means of the within fixed effects estimator described above.

It is worth noting that in addition to perform the estimation of the allocation model specifications by means of the within fixed effects estimator as well as the fixed effects quantile regression approach, we also examine whether the impact of export product upgrading in recipient-countries on donors' bilateral aid supply depends on recipient-countries' level of economic development. In so doing, we circumvent the use of "subjective sub-samples (of the entire sample) to examine such impact.

[5] The "xtscc" device has been developed in Stata by Hoechle (2007) to perform these estimations.

5. Interpretation of estimations' results

Table 1 reports the estimations' results of model (1) over the entire sample obtained by means of the within fixed effects where standard errors are corrected using the Driscoll and Kraay (1998) technique. Tables 2 and 3 present the outcome of the estimation of model (1) specification where the estimator is the fixed effects quantile regression approach. Specifically, Table 2 displays the outcome of the model (1) estimation, where the export upgrading variable on both the recipients and donors' side is measured by overall export product concentration. In Table 3 are reported the results associated with model (1) estimation where export upgrading variable on both the recipients and donors' side is measured by overall export product quality.

Table 4 reports the results of the estimation of model (1) specification where we examine whether the effect of export upgrading variables (namely overall export product concentration and overall export product quality) on bilateral aid flows depends on recipient-countries' level of economic development, which we proxy by their real per capita GDP.

It is important to recall here that the estimates associated with these estimations provide short term effects of these variables, with long term effects being the value of short term effect divided by one minus the coefficient associated with the one-year lag of the dependent variable. It is also worth noting that across all tables, the significance and the positive sign of the coefficient associated with the one-year lag of the dependent variable clearly confirms the state-dependence nature of bilateral aid flows: the higher the bilateral aid supplied in previous year, the higher the aid provided in the current year.

Before interpreting the results displayed in these tables, we find very important to stress that with respect to quantile regression analysis, countries located in higher quantiles are those that receive higher bilateral aid from donors. Hence, countries situated in the 90^{th} quantile are those that receive the greatest amount of bilateral development aid from donors, whereas countries situated in the 10^{th} quantile are those that receive the lowest amount of bilateral aid flows from donors.

Let us start the interpretation of the estimations' results with those reported in Table 1. The estimates presented in column [1] of Table 1 suggest that export product concentration in recipient-countries does not exert a significant impact on bilateral aid flows allocated by donors. Column [3] indicates that an improvement in export quality in recipient-countries is associated with lower bilateral aid supplied by donors. In particular, a 1 point increase in the recipient-countries' index of export quality leads to a decline of bilateral aid flows by 0.133 point.

Table 1: Effect of Export Upgrading in recipient and donor-countries on Donors' bilateral ODA Supply

Estimator: Within Fixed Effects with Driscoll-Kraay (1998) standard errors

VARIABLES	**Log(ODA)** **(1)**	**Log(ODA)** **(2)**
$Log(ODA)_{t-1}$	0.419***	0.409***
	(0.0101)	(0.00978)
$Log(ECIRec)_{t-1}$	0.0650	
	(0.0662)	
$Log(QUALRec)_{t-1}$		-0.133*
		(0.0760)
$Log(GDPCRec)_{t-1}$	1.406***	1.632***
	(0.265)	(0.266)
$[Log(GDPCRec)_{t-1}]^2$	-0.122***	-0.136***
	(0.0190)	(0.0190)
$Log(OpenRec)_{t-1}$	0.0711**	0.0811**
	(0.0361)	(0.0352)
Log(PopRe)	0.0270	-0.178
	(0.142)	(0.140)
$InstQualRec_{t-1}$	0.0133***	0.0127***
	(0.00225)	(0.00229)
Log(ECIDon)	-0.0118	
	(0.120)	
Log(QUALDon)		2.488***
		(0.777)
Log(GDPCDon)	2.110***	1.944***
	(0.168)	(0.173)
Log(RevDon)	-0.715***	-0.742***
	(0.141)	(0.139)
Log(ExpDon)	0.737***	0.744***
	(0.133)	(0.129)
Log(DebtDon)	0.0245	0.0374
	(0.0400)	(0.0407)
Log(OpenDon)	-0.707***	-0.672***
	(0.0932)	(0.0891)
Log(PopDon)	0.680**	0.575**
	(0.268)	(0.274)
Constant	-28.72***	-22.99***
	(5.361)	(5.481)
Observations	38,244	40,664
R-square Within	0.252	0.243
Number of Country-Pairs	1,757	2,063

*Notes: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Standard errors have been clustered at the country-pairs level. Robust Standard Errors are in parenthesis. We control for year dummies in the regressions, but results associated with these dummies are not reported to save space.*

On donors' side, results in columns [1] and [2] indicate that overall export product concentration does not exert a significant impact on their bilateral aid allocation. However, we observe that the higher the export product quality in donor-countries, the higher the bilateral aid they supply to developing countries. In other words, we note that

a 1 point increase in the index of overall export product quality in donor-countries is associated with a 2.5 point increase in the amount of bilateral aid they supply.

Control variables across the columns [1] and [2] of Table 1 exhibit broadly the same sign of estimates and similar magnitudes of the latter. On the recipient-countries' side, we note that bilateral aid is non-linearly associated with per capita income in recipient-countries; the higher the overall trade openness in recipient-countries, the higher the aid flows received by these countries; recipients' population size does not matter for donors' aid supply, but their institutional quality does influence positively donors' aid supply. For donor-countries, results indicate that the factors that drive positively and significantly bilateral aid allocation include higher per capita income, lower government revenue share, higher government expenditure share, higher size of population and lower degree of trade openness. It is important to underline that public debt does not influence significantly bilateral aid.

Let us now consider results reported in Table 2. While Table 1 provides that the effect of overall export product concentration in recipients on bilateral aid supplied by donors is statistically non-significant, Table 2 indicates a statistically significant effect (at least at the 5% level) for quantiles at the top half of the conditional distribution (in particular the 20^{th} to 50^{th} quantiles). Over other quantiles, the effect is either statistically non-significant at the 10% level of statistical significance, or it is significant at only the 10% level. In the meantime, we find that across all quantiles, there is no significant impact of overall export product concentration in donor-countries on their bilateral aid supply.

Table 2: Effect of "Overall Export Product Concentration" in recipient-countries and donor-countries on Donors' bilateral ODA supply

Estimator: Fixed Effects Quantile Regressions based using Canay (2011)'s approach

VARIABLES	Q10 (1)	Q20 (2)	Q30 (3)	Q40 (4)	Q50 (5)	Q60 (6)	Q70 (7)	Q80 (8)	Q90 (9)
$Log(ODA)_{t-1}$	0.491***	0.492***	0.483***	0.469***	0.454***	0.438***	0.415***	0.378***	0.298***
	(0.00478)	(0.00328)	(0.00313)	(0.00287)	(0.00274)	(0.00274)	(0.00334)	(0.00370)	(0.00596)
$Log(ECIRec)_{t-1}$	0.0325	0.0699**	0.0919***	0.0665***	0.0504**	0.0372*	0.0269	0.0541*	0.0325
	(0.0495)	(0.0344)	(0.0230)	(0.0223)	(0.0210)	(0.0210)	(0.0243)	(0.0306)	(0.0387)
$Log(GDPCRec)_{t-1}$	0.690***	1.095***	1.163***	1.259***	1.251***	1.367***	1.469***	1.623***	1.951***
	(0.106)	(0.0688)	(0.0607)	(0.0523)	(0.0469)	(0.0498)	(0.0488)	(0.0655)	(0.0840)
$[Log(GDPCRec)_{t-1}]^2$	-0.0682***	-0.0966***	-0.102***	-0.109***	-0.110***	-0.119***	-0.128***	-0.140***	-0.165***
	(0.00724)	(0.00466)	(0.00412)	(0.00348)	(0.00322)	(0.00342)	(0.00335)	(0.00454)	(0.00583)
$Log(OpenRec)_{t-1}$	1.04e-05	0.0292*	0.0411***	0.0395***	0.0488***	0.0583***	0.0747***	0.0966***	0.0930***
	(0.0285)	(0.0152)	(0.0149)	(0.0122)	(0.0121)	(0.0151)	(0.0140)	(0.0176)	(0.0243)
Log(PopRe)	0.0108	0.00169	0.000327	0.000377	0.00887**	0.0174***	0.0219***	0.0350***	0.0449***
	(0.0111)	(0.00670)	(0.00548)	(0.00429)	(0.00429)	(0.00501)	(0.00528)	(0.00674)	(0.00928)
$InstQualRec_{t-1}$	0.0152***	0.0126***	0.0123***	0.0121***	0.0119***	0.0113***	0.0117***	0.0126***	0.0131***
	(0.00208)	(0.00128)	(0.000954)	(0.000864)	(0.000855)	(0.000806)	(0.000925)	(0.00122)	(0.00164)
Log(ECIDon)	-0.00422	-0.0386	-0.0260	-0.0378	-0.00850	0.0212	0.0476	0.0527	0.0626
	(0.0765)	(0.0544)	(0.0399)	(0.0324)	(0.0270)	(0.0310)	(0.0337)	(0.0469)	(0.0637)
Log(GDPCDon)	1.868***	2.007***	2.039***	2.069***	2.094***	2.117***	2.124***	2.169***	2.381***
	(0.0482)	(0.0283)	(0.0220)	(0.0183)	(0.0174)	(0.0204)	(0.0224)	(0.0298)	(0.0359)
Log(RevDon)	-1.106***	-0.987***	-0.908***	-0.796***	-0.750***	-0.635***	-0.617***	-0.558***	-0.692***
	(0.179)	(0.103)	(0.0900)	(0.0681)	(0.0673)	(0.0797)	(0.0810)	(0.101)	(0.137)
Log(ExpDon)	0.942***	0.835***	0.777***	0.679***	0.651***	0.596***	0.627***	0.613***	1.042***
	(0.185)	(0.111)	(0.0934)	(0.0787)	(0.0760)	(0.0946)	(0.0953)	(0.114)	(0.141)
Log(DebtDon)	-0.0894***	-0.0500**	-0.0130	0.0140	0.0251*	0.0493***	0.0838***	0.0962***	0.0852***
	(0.0294)	(0.0195)	(0.0156)	(0.0139)	(0.0140)	(0.0147)	(0.0172)	(0.0222)	(0.0289)
Log(OpenDon)	-0.532***	-0.620***	-0.646***	-0.676***	-0.684***	-0.701***	-0.720***	-0.743***	-0.862***
	(0.0550)	(0.0362)	(0.0273)	(0.0239)	(0.0199)	(0.0212)	(0.0244)	(0.0312)	(0.0448)
Log(PopDon)	0.723***	0.665***	0.640***	0.632***	0.639***	0.647***	0.653***	0.674***	0.727***
	(0.0234)	(0.0165)	(0.0125)	(0.0108)	(0.00945)	(0.0103)	(0.0116)	(0.0159)	(0.0226)
Constant	-25.93***	-27.11***	-26.82***	-26.85***	-26.89***	-27.67***	-27.91***	-28.87***	-32.17***
	(0.960)	(0.649)	(0.463)	(0.383)	(0.347)	(0.465)	(0.475)	(0.633)	(0.769)
Observations	38,244	38,244	38,244	38,244	38,244	38,244	38,244	38,244	38,244
Pseudo R-square	0.4774	0.5220	0.5415	0.5510	0.5534	0.5510	0.5456	0.5352	0.5120

*Notes: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Standard errors have been clustered at the country-pairs level: for Simultaneous Quantile Regressions, robust standard errors are obtained from 100 bootstrapping repetitions. Robust Standard Errors are in parenthesis. We control for year dummies in the regressions, but results associated with these dummies are not reported to save space.*

Results over control variables related to both recipient-countries and donor-countries are broadly in line with those reported in Table 1 and interpreted above, with the exception here that public debt in donor-countries appear to be alternatively negative and significant, positive and significant, and statistically non-significant, depending on the quantiles.

Taking up now the outcome of model (1) estimation reported in Table 3. We note that across all quantiles, export quality improvement in donor-countries leads to lower bilateral aid flows from donors. However, the magnitude of these negative effects across quantiles tends to be lower for countries located in quantiles of the second half of the conditional distribution, i.e., countries that are more dependent on bilateral aid flows (countries in the 60^{th} to 90^{th} countries) than for countries situated in the top half of the conditional distribution (i.e, countries that belong to 10^{th} to 50^{th} quantiles).

Likewise, export product quality improvement in donor-countries induces higher bilateral aid supply to recipient-countries located in all quantiles, except for those in the 10^{th} quantile. Importantly, recipient-countries that are located in the 60^{th} to 90^{th} quantiles tend to receive higher amounts of bilateral aid from donors than those belonging to 20^{th} to 50^{th} quantiles further to a rise in the degree of export quality improvement in donor-countries. This is exemplified by the fact that coefficients associated with the variable "QUALDon" are recipient-countries higher for countries in 60^{th} to 90^{th} quantiles than for those in 20^{th} to 50^{th} quantiles.

With respect to other recipients and donors' characteristics (control variables in model (1)), we observe results that are broadly similar to those of previous tables.

Finally, let us interpret results presented in Table 4. We are particularly interested here in whether the impact of recipient-countries' export upgrading degree on donors' bilateral aid allocation depends on recipient-countries' level of economic development, proxied by their real per capita income. To respond to this question, we introduce in model (1) the variable representing the interaction between either of the export upgrading variable in recipient-countries (overall export product concentration or overall export product quality) and recipient-countries' real per capita income. This model specification is estimated by means of within fixed estimator with standard errors corrected using the Driscoll-Kraay (1998) technique.

Table 3: Effect of the "Overall Export Product Quality" in recipient-countries and donor-countries on Donors' bilateral ODA supply

Estimator: Fixed Effects Quantile Regressions based using Canay (2011)'s approach

VARIABLES	Q10 (1)	Q20 (2)	Q30 (3)	Q40 (4)	Q50 (5)	Q60 (6)	Q70 (7)	Q80 (8)	Q90 (9)
$Log(ODA)_{t-1}$	0.487***	0.483***	0.470***	0.456***	0.439***	0.425***	0.400***	0.365***	0.290***
	(0.00552)	(0.00352)	(0.00318)	(0.00266)	(0.00304)	(0.00323)	(0.00336)	(0.00400)	(0.00538)
$Log(QUALRec)_{t-1}$	-0.122**	-0.156***	-0.144***	-0.121***	-0.105***	-0.111***	-0.106***	-0.114***	-0.0960**
	(0.0527)	(0.0382)	(0.0277)	(0.0241)	(0.0201)	(0.0243)	(0.0254)	(0.0315)	(0.0462)
$Log(GDPCRec)_{t-1}$	0.976***	1.295***	1.350***	1.471***	1.506***	1.646***	1.746***	1.928***	2.195***
	(0.0951)	(0.0698)	(0.0575)	(0.0519)	(0.0491)	(0.0485)	(0.0618)	(0.0739)	(0.0946)
$[Log(GDPCRec)_{t-1}]^2$	-0.0869***	-0.109***	-0.114***	-0.123***	-0.127***	-0.137***	-0.146***	-0.160***	-0.180***
	(0.00652)	(0.00478)	(0.00386)	(0.00350)	(0.00326)	(0.00324)	(0.00421)	(0.00495)	(0.00647)
$Log(OpenRec)_{t-1}$	0.0323	0.0616***	0.0700***	0.0567***	0.0679***	0.0764***	0.0928***	0.0936***	0.0738***
	(0.0250)	(0.0165)	(0.0137)	(0.0109)	(0.00957)	(0.0109)	(0.0122)	(0.0178)	(0.0234)
Log(PopRe)	-0.191***	-0.199***	-0.201***	-0.203***	-0.192***	-0.185***	-0.177***	-0.173***	-0.162***
	(0.00833)	(0.00542)	(0.00470)	(0.00379)	(0.00419)	(0.00461)	(0.00518)	(0.00648)	(0.00843)
$InstQualRec_{t-1}$	0.0153***	0.0112***	0.0109***	0.0114***	0.0114***	0.0109***	0.0117***	0.0123***	0.0130***
	(0.00201)	(0.00150)	(0.00116)	(0.000893)	(0.000769)	(0.000829)	(0.00101)	(0.00127)	(0.00168)
Log(QUALDon)	-0.707	0.707**	1.577***	2.258***	2.856***	3.518***	4.010***	4.305***	3.948***
	(0.499)	(0.341)	(0.297)	(0.240)	(0.234)	(0.255)	(0.278)	(0.428)	(0.512)
Log(GDPCDon)	1.820***	1.895***	1.904***	1.906***	1.922***	1.918***	1.949***	1.976***	2.159***
	(0.0483)	(0.0345)	(0.0293)	(0.0240)	(0.0234)	(0.0237)	(0.0257)	(0.0329)	(0.0361)
Log(RevDon)	-1.068***	-0.974***	-0.860***	-0.816***	-0.773***	-0.720***	-0.761***	-0.682***	-0.834***
	(0.174)	(0.104)	(0.0784)	(0.0588)	(0.0685)	(0.0729)	(0.0720)	(0.0907)	(0.143)
Log(ExpDon)	0.880***	0.798***	0.723***	0.682***	0.674***	0.646***	0.743***	0.716***	1.117***
	(0.194)	(0.107)	(0.0925)	(0.0669)	(0.0748)	(0.0739)	(0.0818)	(0.0935)	(0.161)
Log(DebtDon)	-0.0444	-0.00868	0.0191	0.0287**	0.0298**	0.0425***	0.0567***	0.0823***	0.0921***
	(0.0345)	(0.0198)	(0.0156)	(0.0142)	(0.0145)	(0.0149)	(0.0163)	(0.0208)	(0.0300)
Log(PopDon)	0.655***	0.585***	0.555***	0.535***	0.533***	0.524***	0.515***	0.533***	0.578***
	(0.0219)	(0.0132)	(0.0114)	(0.00901)	(0.00935)	(0.00942)	(0.0108)	(0.0128)	(0.0163)
Log(OpenDon)	-0.455***	-0.540***	-0.583***	-0.628***	-0.662***	-0.701***	-0.755***	-0.773***	-0.875***
	(0.0487)	(0.0324)	(0.0258)	(0.0194)	(0.0203)	(0.0209)	(0.0238)	(0.0284)	(0.0353)
Constant	-22.68***	-22.64***	-21.84***	-21.34***	-21.25***	-21.28***	-21.38***	-22.07***	-24.65***
	(0.840)	(0.542)	(0.478)	(0.402)	(0.370)	(0.401)	(0.438)	(0.601)	(0.728)
Observations	40,664	40,664	40,664	40,664	40,664	40,664	40,664	40,664	40,664
Pseudo R-square	0.4592	0.5015	0.5191	0.5266	0.5279	0.5257	0.5205	0.5104	0.4865

*Notes: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Standard errors have been clustered at the country-pairs level: for Simultaneous Quantile Regressions, robust standard errors are obtained from 100 bootstrapping repetitions. Robust Standard Errors are in parenthesis. We control for year dummies in the regressions, but results associated with these dummies are not reported to save space.*

Table 4: Impact of Export Upgrading in recipient-countries on bilateral ODA supply for varying level of development (per Capita income)

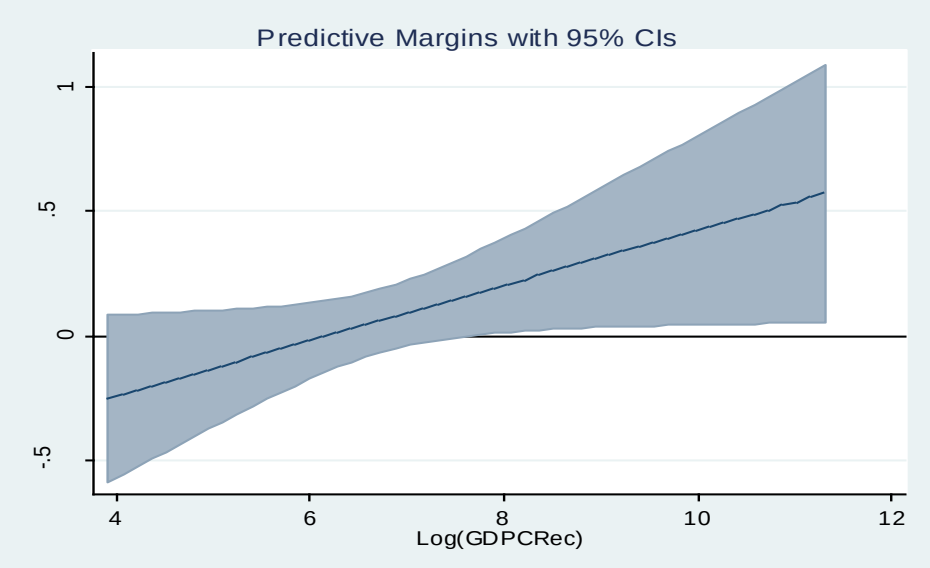
Estimator: Within Fixed Effects with Driscoll-Kraay (1998) standard errors

VARIABLES	Log(ODA) (1)	Log(ODA) (2)
$Log(ODA)_{t-1}$	0.419***	0.407***
	(0.0101)	(0.00979)
$Log(ECIRec)_{t-1}$	-0.690*	
	(0.386)	
$[Log(ECIRec)_{t-1}]*[Log(GDPCRec)_{t-1}]$	0.112**	
	(0.0564)	
$Log(QUALRec)_{t-1}$		2.031***
		(0.469)
$[Log(QUALRec)_{t-1}]*[Log(GDPCRec)_{t-1}]$		-0.338***
		(0.0720)
$Log(GDPCRec)_{t-1}$	1.226***	1.328***
	(0.272)	(0.264)
$[Log(GDPCRec)_{t-1}]^2$	-0.120***	-0.122***
	(0.0187)	(0.0185)
$Log(OpenRec)_{t-1}$	0.0811**	0.0825**
	(0.0354)	(0.0351)
Log(PopRe)	-0.0480	-0.245*
	(0.145)	(0.140)
$InstQualRec_{t-1}$	0.0134***	0.0120***
	(0.00225)	(0.00228)
Log(ECIDon)	-0.0112	
	(0.120)	
Log(QUALDon)		2.480***
		(0.773)
Log(GDPCDon)	2.113***	1.957***
	(0.168)	(0.173)
Log(RevDon)	-0.714***	-0.744***
	(0.141)	(0.138)
Log(ExpDon)	0.736***	0.740***
	(0.133)	(0.129)
Log(DebtDon)	0.0253	0.0375
	(0.0399)	(0.0405)
Log(PopDon)	0.675**	0.588**
	(0.268)	(0.273)
Log(OpenDon)	-0.710***	-0.679***
	(0.0930)	(0.0891)
Constant	-26.39***	-20.85***
	(5.482)	(5.491)
Observations	38,244	40,664
R-squared	0.252	0.244
Number of Country-Pairs	1,757	2,063
Within R^2	0.2520	0.2438
Between R^2	0.6865	0.6126
Overall R^2	0.5485	0.4893

*Notes: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Standard errors have been clustered at the country-pairs level. Robust Standard Errors are in parenthesis. We control for year dummies in the regressions, but results associated with these dummies are not reported to save space.*

Column [1] of Table 4 reports the results of the estimation of model (1) specification in which we introduce the interaction between recipient-countries' overall export product concentration and their real per capita income. The coefficient associated with the one-year lag of the variable "Log(ECIRec)" is negative and statistically significant at only the 10% level, whereas the coefficient (interaction term) related to the interaction variable $[Log(ECIRec)_{t-1}]*[Log(GDPCRec)_{t-1}]$ is positive and statistically significant at the 5% level of statistical significance. This tends to indicate that there is a threshold of "GDPCRec" beyond which the total impact of "ECIRec" on bilateral aid flows changes sign. To get a better picture of the impact of recipient-countries' overall export product concentration on the bilateral aid that they receive from donors, we examine graphically the marginal impact of recipient-countries' degree of overall export product concentration on donors' bilateral aid allocation for different levels of economic development in recipient-countries. Specifically, Figure 1 shows, at the 95 per cent confidence intervals, the evolution of the marginal effect of "ECIRec" on "ODA" for different recipient-countries' levels of economic development (proxied by real per capita income). It is important to note here that the statistically significant effects at the 95 per cent confidence intervals are those involving only the upper and lower bounds of the confidence interval that are either above (or below) the zero line.

Figure 1: Marginal Effect of "ECIRec" on "ODA", for varying recipient-countries' levels of economic development (real per capita income)



Source: Author

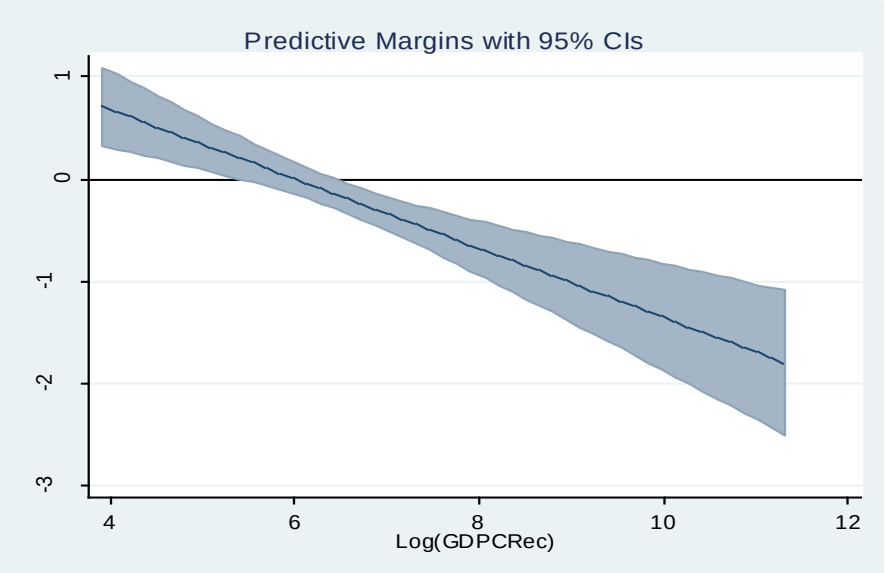
The Figure indicates that the marginal effect of "ECIRec" on "ODA" increases as recipient-countries experience higher per capita income, that is, as their level of economic development increases. However, this marginal positive effect is statistically significant only for countries that experience a real per capita income higher than or equal to $US 1749 [= exponential[6] (7.466767)]. Put differently, all countries with per capita income lower than $US 1749 do not experience a rise in the bilateral aid flows

[6] We use in this calculation the "exponential" symbol because the variable capturing the real per capita income in recipient-countries (GDPCRec) is expressed in Log in model (1).

that they receive when their degree of export product concentration changes. This category of countries seems to include some low-income countries that experience high export product concentration (notably on primary products) and therefore are in need for higher aid flows for their diversifying their exports. Nonetheless, this result may indicate that for countries situated in this category (with a real per capita income higher than or equal to $US 1749) their degree of export product concentration does not matter for the bilateral aid they receive from donors.

Similarly, column [2] shows a positive and statistically significant (at the 1% level) coefficient related to the variable "$Log(QUALRec)_{t-1}$" and a negative and statistically significant (at the 1% level) of the interaction term of the variable $[Log(QUALRec)_{t-1}]*[Log(GDPCRec)_{t-1}]$. These two results also suggest that there is a threshold of "GDPCRec" beyond which the total impact of "QUALRec" on donors' bilateral aid flows changes sign. A better insight of the impact of export quality in recipient-countries on donors' bilateral aid flows is provided by a graphical examination of the marginal effect of "QUALRec" on bilateral aid for different recipient-countries' levels of economic development. Figure 2 shows, at the 95 per cent confidence intervals, the evolution of this marginal impact. It indicates that the marginal effect of "QUALRec" on bilateral aid supplied by donors diminshes as countries experience higher per capita income. However, not all marginal impacts of export quality improvement on bilateral development aid are statistically significant. Indeed, the marginal effect is positive and statistically significant for countries with per capita income lower or equal to $US 255 [= exponential (5.541738)] (i.e., very low-income countries). However, for countries with real per capita income comprising between $US 255 and $US 620, this marginal effect is statistically nil. Finally, for countries with real per capita income higher than $US 620 [= exponential (6.430213)], the marginal effect of export quality improvement on development aid is negative and statistically significant, although the magnitude of this negative marginal effect increases (in absolute value) as the per capita income rises.

Figure 2: Marginal Effect of "QUALRec" on "ODA", for varying recipient-countries' levels of economic development (real per capita income)



Source: Author

It is worth noting in Table 4 that we obtain a non-significant impact of export product concentration of donor-countries on their bilateral aid supply (see column [1]) and a positive and significant impact of export quality improvement in donor-countries on their bilateral aid supply (see column [2]).

6. Conclusion

This paper investigates whether export upgrading in recipient-countries of development aid as well as in donor-countries matter for donors' bilateral aid allocation. The study is conducted on gravity-type model framework, which relies on dyadic data covering 23 donors and 126 recipient-countries, over the period 1970-2010. The analysis is performed by using the within fixed effects approach as well as the fixed effects quantile regression technique developed by Canay (2011).

The empirical results suggest evidence that export product diversification in donor-countries does not matter for their bilateral aid supply. At the same time, export product concentration (diversification) in recipient-countries appears to be an important factor in donors' bilateral aid allocation. Incidentally, the impact of recipient-countries' overall export product concentration on donors' bilateral aid allocation is dependent on recipient-countries' level of economic development. More specifically, only for countries that experience a real per capita income higher than or equal to $US 1749 experience higher bilateral aid further to a rise in their overall export product concentration. Similarly, improvement in export quality in recipient-countries is associated with lower donors' bilateral aid flows. Moreover, this impact appears to be dependent on recipient-countries' real per capita income. By the way, we find no significant impact of overall export product concentration in donor-countries on their bilateral aid allocation. However, export quality improvement in donor-countries induces a rise in their bilateral aid supply.

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Appendix 1: Variables - Definitions and sources

Variable	Definition	Source
ODA	ODA Commitments of a donor country i to a recipient j. The Gross overall ODA has been converted in constant 2005 values, using the total DAC Deflator for Resource Flows.	ODA Commitments data come from OECD-CRS (Credit Reporting System) Database; the total Donors Assistance Committee (DAC) Deflator for Resource Flows comes from the OECD Data
ExpUpgrRec	This variable represents the Export Upgrading Index of recipient-countries. The first measure of this variable is the overall export product concentration (ECIRec). It is calculated using the Theil Index and following the definitions and methods used in Cadot et al. (2011). A rise in this index signifies an increase in the degree of overall export product concentration and a decline in one of them indicates an increase in the degree of overall export diversification. The second measure of the export upgrading variable is the overall export product quality (QUALRec). A rise in this index indicates an improvement of the overall export product quality.	Details on the calculation of thexport product concentration indices could be found online: International Monetary Fund's Diversification Toolkit – See: https://www.imf.org/external/np/res/dfidimf/diversification.htm Details on the methodology used to calculate the export product quality index could be found in Henn, Papageorgiou and Spatafora (2013, 2015). Data are available online: International Monetary Fund's Diversification Toolkit – See: https://www.imf.org/external/np/res/dfidimf/diversification.htm
ExpUpgrDon	This variable represents the export concentration upgrading index of donor-countries. It could be either overall export product concentration Index (ECIDon) or the overall export product quality (QUALDon). The overall export product concentration index is calculated using the Theil Index and following the definitions and methods used in Cadot et al. (2011). A rise in the overall export product concentration index signifies an increase in the degree of overall export concentration, while a decline in this index indicates a rise in the overall export product diversification. Likewise, a rise in the index of overall export quality product suggests an improvement in the (overall) export product quality, while a decline in this index indicates lower improvement in the (overall) export product quality.	Details on the calculation of thexport product concentration indices could be found online: International Monetary Fund's Diversification Toolkit – See: https://www.imf.org/external/np/res/dfidimf/diversification.htm Details on the methodology used to calculate the export product quality index could be found in Henn, Papageorgiou and Spatafora (2013, 2015). Data are available online: International Monetary Fund's Diversification Toolkit – See: https://www.imf.org/external/np/res/dfidimf/diversification.htm
GDPCRec	Real GDP per capita (2005 constant prices) of recipient country j	World Development Indicators (WDI)
PopRe	Total population of recipient country j	World Development Indicators (WDI)
OpenRec	Openness degree of recipient country j, measured by the sum of exports and imports, as a share of GDP	World Development Indicators (WDI)

Variable	Definition	Source
InstQualRec	This is proxied by the Polity2" measure of democracy	Polity IV dataset: see Marshall and Jaggers (2002), Updated 2015
GDPCDon	Real GDP per capita (2005 constant prices) of donor country i	World Development Indicators (WDI)
RevDon	Total Government Revenue of donor-country i, in percentage of donor's GDP	Calculation of the Authors based on IMF's Historical Dataset of Fiscal Variables. See Mauro et al. (2013). See https://www.imf.org/external/pubs/cat/longres.aspx?sk=40222.0
ExpDon	Total Government Expenditure of donor-country i, in percentage of donor's GDP	Calculation of the Authors based on IMF's Historical Dataset of Fiscal Variables. Mauro et al. (2013). See https://www.imf.org/external/pubs/cat/longres.aspx?sk=40222.0
DebtDon	This is the Gross Public Debt-to-GDP-ratio in donor-country i	Source: IMF's Historical Dataset of Fiscal Variables. See Mauro et al. (2013). See https://www.imf.org/external/pubs/cat/longres.aspx?sk=40222.0
PopDon	Total population of donor-country i	World Development Indicators (WDI)
OpenDon	Openness degree of donor-country i, measured by the sum of exports and imports, as a share of donor's GDP	World Development Indicators (WDI)

Appendix 2: Descriptive statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
ODA	62313	304540.6	1591297	0	1.65e+08
OpenRec	103488	81.72	53.02	6.32	531.74
ECIRec	111216	3.90	1.09	1.53	6.41
QUALRec	107520	0.77	0.15	0.23	1.21
InstQualRec	98238	-0.85	6.90	-10.00	10.00
GDPCRec	107037	4597.25	8882.96	50.04	82192.93
PopRe	134694	2.64E+07	1.16E+08	5632	1.34E+09
RevDon	146370	39.13	9.48	10.98	60.55
ExpDon	146370	41.84	9.62	9.88	71.72
DebtDon	146370	53.67	30.39	2.97	220.00
ECIDon	146370	1.95	0.70	1.02	4.44
QUALDon	141270	0.99	0.03	0.91	1.07
GDPCDon	143480	28968.46	11040.07	7486.81	67804.55
OpenDon	144500	61.61	29.91	10.73	178.25
PopDon	146370	3.80e+07	5.77e+07	204438	3.09e+08

Appendix 3: Pairwise correlation between variables used in the analysis

	ODA	OpenRec	ECIRec	QUALRec	InstQualRec	GDPCRec
ODA	1.0000					
OpenRec	-0.0550*	1.0000				
ECIRec	-0.0454*	-0.0259*	1.0000			
QUALRec	-0.0169*	0.1245*	-0.3789*	1.0000		
InstQualRec	0.0017	0.0120*	-0.3233*	0.1923*	1.0000	
GDPCRec	-0.0364*	0.3740*	0.0186*	0.2325*	-0.0435*	1.0000
PopRe	0.1190*	-0.1767*	-0.2597*	0.0006	0.0272*	-0.0833*
RevDon	-0.0898*	0.0546*	-0.0267*	-0.0251*	0.1292*	0.0320*
ExpDon	-0.0719*	0.0491*	-0.0228*	-0.0180*	0.1076*	0.0258*
DebtDon	0.0351*	0.0482*	-0.0328*	-0.0259*	0.1509*	0.0321*
ECIDon	-0.0389*	0.0150*	-0.0083*	-0.0090*	0.0426*	0.0112*
QUALDon	0.0709*	0.0104*	-0.0077*	-0.0050	0.0334*	0.0088*
GDPCDon	-0.0161*	0.0820*	-0.0469*	-0.0447*	0.2181*	0.0585*
OpenDon	-0.1288*	0.0419*	-0.0198*	-0.0204*	0.0971*	0.0296*
PopDon	0.1912*	0.0065*	-0.0037	-0.0034	0.0173*	0.0046

*Notes: *p-value<0.1;*

Appendix 3 (Continued): Pairwise correlation between variables used in the analysis

	PopRe	**RevDon**	**ExpDon**	**DebtDon**	**ECIDon**	**QUALDon**	**GDPCDon**	**OpenDon**	**PopDon**
PopRe	1.0000								
RevDon	0.0185*	1.0000							
ExpDon	0.0166*	0.8910*	1.0000						
DebtDon	0.0208*	0.2283*	0.4074*	1.0000					
ECIDon	0.0056*	-0.0202*	-0.1597*	-0.1632*	1.0000				
QUALDon	0.0038	0.2147*	0.2306*	0.3154*	-0.3513*	1.0000			
GDPCDon	0.0299*	0.3769*	0.2034*	0.1907*	0.4183*	0.2423*	1.0000		
OpenDon	0.0138*	0.4376*	0.4021*	0.2003*	0.1288*	0.1818*	0.3966*	1.0000	
PopDon	0.0024	-0.2109*	-0.1572*	0.1747*	-0.3084*	0.2952*	-0.0274*	-0.5285*	1.0000

*Notes: *p-value<0.1;*

Appendix 4: List of countries used in the analysis

List of Recipient-countries			List of Donor-countries
Afghanistan	Gambia	Pakistan	Australia
Albania	Ghana	Panama	Austria
Algeria	Grenada	Papua New Guinea	Belgium
Angola	Guatemala	Paraguay	Canada
Antigua and	Guinea	Peru	Denmark
Argentina	Guinea-	Philippines	Finland
Bahamas	Guyana	Poland	France
Bahrain	Haiti	Qatar	Germany
Bangladesh	Honduras	Romania	Greece
Barbados	Hungary	Rwanda	Iceland
Belize	India	Samoa	Ireland
Benin	Indonesia	Saudi Arabia	Italy
Bermuda	Iran	Senegal	Japan
Bolivia	Iraq	Seychelles	Netherlands
Brazil	Israel	Sierra Leone	New Zealand
Bulgaria	Jamaica	Singapore	Norway
Burkina Faso	Jordan	Solomon Islands	Poland
Burundi	Kenya	Somalia	Portugal
Cambodia	Kiribati	South Africa	Spain
Cameroon	Korea, Rep	Sri Lanka	Sweden
Cape Verde	Kuwait	Saint Kitts and Nevis	Switzerland
Central African	Laos	Saint Lucia	United Kingdom
Chad	Lebanon	Saint Vincent and the	United States
Chile	Liberia	Sudan	
China	Libya	Suriname	
Colombia	Madagascar	Syria	
Comoros	Malawi	Tajikistan	
Congo, Dem. Rep.	Malaysia	Tanzania	
Congo, Rep.	Maldives	Thailand	
Costa Rica	Mali	Togo	
Cote d'Ivoire	Malta	Tonga	
Cuba	Mauritania	Trinidad and Tobago	
Cyprus	Mauritius	Tunisia	
Djibouti	Mexico	Turkey	
Dominica	Mongolia	Uganda	
Dominican Republic	Morocco	United Arab Emirates	
Ecuador	Mozambique	Uruguay	
Egypt	Nepal	Venezuela	
El Salvador	Nicaragua	Viet Nam	
Equatorial Guinea	Niger	Yemen	
Fiji	Nigeria	Zambia	
Gabon	Oman	Zimbabwe	