Nowak-Lehmann D., Felicitas; Martínez-Zarzoso, Inmaculada; Cardozo, Adriana; Herzer, Dierk; Klasen, Stephan

Conference Paper

Does Aid translate into Bilateral Trade? Findings for Recipient Countries

Proceedings of the German Development Economics Conference, Berlin 2011, No. 61

Provided in cooperation with:
Verein für Socialpolitik

DOES AID TRANSLATE INTO BILATERAL TRADE?

FINDINGS FOR RECIPIENT COUNTRIES

Felicitas Nowak-Lehmann D. , Inmaculada Martínez-Zarzoso, Adriana Cardozo, Dierk Herzer & Stephan Klasen

Abstract

This paper uses the gravity model of trade to investigate the link between foreign aid and exports in recipient countries. Most of the theoretical work emphasizes the negative impact of aid on recipient countries' exports primarily due to exchange rate appreciation, disregarding possible positive effects of aid in overcoming supply bottlenecks and promoting bilateral trade relations. Our empirical findings -all based on endogeneity-proof techniques (such as Dynamic OLS or more refined techniques) - depend very strongly on whether bilateral trade relations and autocorrelation of the disturbances are controlled for. When not controlling for these phenomena, the impact of aid is quite substantial (especially in Asia, Latin America & Caribbean) but when sound estimation techniques are applied the net impact of aid on recipient countries' exports becomes insignificant in the full 130-country sample and the sub-samples: Sub-Saharan Africa & MENA, Asia and Latin America & the Caribbean. However, this rather disappointing finding is in line with the small macroeconomic impact of aid found in earlier studies.

Key Words: International trade; foreign aid; recipient exports; bilateral trade relations

JEL Classification: F10; F35

1. Introduction

Both the Doha Development Round and the UN declaration on the Millennium Development Goals (MDGs) emphasize the importance of trade development in developing countries (DCs), especially in the least developed countries (LDCs). In specific, Millennium Development Goal 8 (MDG8: "Develop a global partnership for development") is concerned with a far better participation of developing countries in international trade through improved access to developed countries' markets and an active improvement of production and export capabilities in developing countries by means of official development assistance (ODA), especially Aid for Trade (AfT) measures.[1] In this context, foreign aid is also seen as a means to alleviate the lack of net capital inflows to least developed countries (LCDs) and to overcome severe supply-side constraints (physical and social infrastructure, insufficient capabilities in agriculture, manufacturing and services).

Since trade liberalization talks in the Doha Development Round ask for mutual concessions, on the side of developing countries concessions to liberalize their imports depend on an expected benefit, such as an increase of their exports. If this latter effect existed, this would imply a more positive assessment of bilateral aid.

It is therefore of utmost importance to study the impact of aid[2] on developing countries' exports to see whether aid is indeed an appropriate means to promote the production of export goods and thus enhance an export-led development which in turn could decrease aid-dependency of developing countries.[3] Also donors are more and more interested

[1] Aid for trade is part of ODA (about 20 percent) and includes 1) technical trade assistance, 2) trade-related infrastructure and 3) capacity-building to improve production and export capacities. The idea of giving AfT dates back to the Uruguay Round (1986-1994) and has become an interesting feature of world trade rounds, especially since the Sixth Ministerial Conference in Hong Kong in 2005. The original motivation was to grant AfT in return for the trade concessions made in trade liberalization agreements.

[2] In particular bilateral aid.

[3] As we will show in the theoretical part of the study (Section 2), capital inflows in the form of development aid may have positive and negative effects on recipient countries' exports and it is up to empirical investigations to determine which of the effects prevails.

in aid effectiveness having agreed on an increase of their aid-to-GDP ratio to 0.7 percent by 2015, which would imply for donors like Germany a doubling of the current ratio.

In this paper, we will rely on a bilateral trade model as we focus on bilateral trade relations between donors and recipient countries and, in particular, on aid's impact on recipient countries' exports. We will utilize an augmented gravity model with the usual control variables (Bergstrand, 1985, 1989 and 1990; Anderson and van Wincoop, 2003; Nelson and Juhasz Silva, 2008; Johansson and Pettersson, 2009), adding the bilateral exchange rate to control for changes in competitiveness between trading partners and utilizing endogeneity-proof estimation techniques. Since our analysis is based on a bilateral trade model, our focus is on the impact of bilateral aid (from one or several sources to a specific recipient). The reasons why we think bilateral aid should be strongly related to bilateral trade are twofold: bilateral aid not only enhances bilateral trade through reputation, mutual trust and support, goodwill and familiarity between trading partners of the North and the South (Arvin and Baum, 1997; Arvin and Choudry, 1997; Johansson and Pettersson, 2009), but also through more visible things such as the creation of customer relations, distribution channels and a better adaptation to the formal and informal market environment (Johansson and Pettersson, 2009).[4]

We add to the existing literature by *firstly* applying panel time series estimation techniques that have special advantages when the right hand side variables are endogenous which turns out to be the case in our sample. By means of a Granger causality test we find that, in the long run, aid (our main variable of concern) and recipient countries' exports are

[4] Johansson and Pettersson (2009) argue that an intensified aid relation works to reduce the effective cost of geographic distance thus reducing the 'distance'-coefficient, whereas we argue that an intensified aid relation makes aid more efficient thus increasing the 'bilateral aid'-coefficient.

inter-linked[5] (bi-directional relation between aid and exports) implying that either more aid is given to countries with a poor export performance because donors want to promote development in recipient countries or that more aid is given to successful exporters because donors wish to reward recipient countries' export efforts of the past. In particular, we apply modern long-run panel estimation techniques (Dynamic Feasible Generalized Least Squares (DFGLS)) that allow us not only to take the time series properties of the series into account and to exogenize the right hand side variables but also to control for autocorrelation[6] so that consistent and efficient results can be generated. Especially the control for endogeneity that was either IV –based or based on lags (GMM) in the past was not without weaknesses in the presence of poor instruments or in the presence of autocorrelation of the disturbances. Besides, control for autocorrelation is of utmost importance since autocorrelation reflects an omitted variable problem very often.

Secondly, we consider crowding out effects between different types of aid and in particular, by studying whether aid only promotes trade with the donor at the expense of other countries, or whether it promotes overall trade. We consider three different types of aid: first, bilateral aid of a single donor-recipient pair with a supposedly very high positive impact on bilateral trade relations, second, bilateral aid of the rest of the donors to a single recipient with a possibly trade-diverting (negative) impact on an existing bilateral trade relation, and third, multilateral aid to a single recipient with supposedly no impact on existing bilateral trade relations. In contrast to studies by Clemens et al. (2004), Reddy and Minoiu (2006), Johansson and Pettersson (2009) and Minoiu and Reddy (2010), who look at economically different types of aid (development aid versus non-development aid, technical assistance, aid for trade etc.), we stick to aggregated aid. We find justification for doing so in a study by Rajan and Subramanian (2008) and Johansson and Pettersson (2009) who actually do not find

[5] In the short run, in contrast, the Granger causality test indicates that aid is exogenous and not inter-linked with exports.
[6] Through control of autocorrelation of the error terms the omitted variable bias is also attenuated.

larger (aid-elasticity) coefficients for development aid, technical assistance or aid for trade than for aggregated aid. The fungibility of aid is another reason why we think aid is not really project-or program-specific and therefore we will not be able to gain new insights by studying disaggregated aid (Morrissey, 2006).

In our model, an important underlying assumption concerning bilateral trade relations is that developing countries' exports to industrialized countries might be more advantageous than exports to equally developing countries and therefore deserve special support and attention. The benefit from exporting to industrialized countries' markets is said to be due to an enhanced learning from exporting to those markets. Positive effects from exporting are related to knowledge spillovers, improvements of product quality, management, marketing and transport capabilities etc. A further advantage from exporting to markets of industrialized countries are productivity increases through enhanced competition, economies of scale through a conquest of well-funded donor markets and eventually the alleviation of the capital and the foreign exchange constraint.

Interestingly, the results concerning the impact of aid on recipient exports in an augmented gravity model framework are dependent on the estimation technique chosen., in particular the treatment of bilateral effects and of omitted variables.

Utilizing "second best" estimation techniques that control for endogeneity (but not for the role played by bilateral trade relations and omitted variables), we find that the increase in recipients' exports induced by donors' direct bilateral aid is quite noticeable. In this setting we observe an increase in exports of about US$ 2.45 for every aid dollar received in the overall sample of 130 recipient countries. Aid's average impact on recipient countries is US$ 5.56 per $ of aid in Asia and US$ 4.14 Latin America & the Caribbean, but only US$ 0.41 in Africa.

However, this evidence is questioned by the application of "first best" estimation techniques! If we work with these more appropriate techniques that control for bilateral relations, endogeneity and autocorrelation, *aid's impact on recipient countries exports becomes insignificant.*

We must therefore acknowledge that aid does not have a *direct* impact on recipients' exports. This finding is perfectly is in line with the very weak impact of aid found on macroeconomic variables. Aid impacts weakly, but positively on investment, negatively on domestic savings (crowding out effect) and negatively on the real exchange rate (appreciation of the real exchange rate).

However, the evidence so far does not imply that aid does not impact on recipients exports in an *indirect* way. This effect might be captured in the bilateral fixed effects (dyadic effects) that reflect the average quality of bilateral (trade, entrepreneurial or diplomatic) relations.

Section 2 summarizes the transmission channels related to the aid-export link. Section 3 presents a description of the data. Section 4 explains the model specification and discusses the main results. Section 5 presents a number of robustness checks. Finally, Section 6 outlines some conclusions.

2. The aid-export link: the conceptual framework

2.1 The augmented gravity model of trade

Solid theoretical foundations that provide a consistent base for an empirical analysis of bilateral trade relations have been developed in the past three decades by Anderson (1979), Bergstrand (1985, 1989 and 1990), Helpman (1987), Deardorff (1998), Feenstra et al. (2001), Anderson and van Wincoop, 2003, Feenstra (2004), Haveman and Hummels (2004) and Redding and Venables (2004). They are based on the gravity model of trade, which enables the evaluation and quantification of the impact on exports of a variety of factors related to trade frictions. Anderson and van Wincoop (AvW) contributed to this literature by an appropriate modelling of trade costs. The AvW model has been recently extended to applications explicitly involving developed and less developed countries by Nelson and Juhasz Silva (2008). They present an extension of AvW to the asymmetric north-south case and derive some implications related to the effect of aid on trade.

According to the underlying theory of the gravity model, trade between two countries is explained by nominal incomes and the populations of the trading countries, by the distance between the economic centers of the exporter and importer, and by a number of trade impediment and facilitation variables. Dummy variables such as former colony, common language, and common border are generally used to proxy for these factors. The gravity model has been widely used to investigate the role played by specific policy or geographical variables in explaining bilateral trade flows. Consistent with this approach and in order to investigate the effect of development aid on recipient countries' exports, we augment the traditional model with bilateral exchange rates, bilateral aid (ODA), from a specific donor and the rest of the donors to a recipient country and with imputed multilateral aid. The augmented gravity model is specified as

$$X_{ijt} = \alpha_0 \; YD_{it}^{\alpha_1} YR_{jt}^{\alpha_2} YHD_{it}^{\alpha_3} YHR_{jt}^{\alpha_4} DIST_{ij}^{\alpha_5} BAID_{ijt}^{\alpha_6} BAIDI_{jt}^{\alpha_7} MAID_{ijt}^{\alpha_8} \; XCHR_{ijt}^{\alpha_9} F_{ij}^{\alpha_{10}} \; u_{ijt} \tag{1}$$

where *t* stands for year. X_{ijt} are the exports to donor *i* from recipient *j* in period *t* in current US$; YD_i *(*YR_j*)* indicates the GDPs[7] of the donor (recipient), YHD_i *(*YHR_j*)* are donor (recipient) GDPs per capita and $DIST_{ij}$ is the geographical distance between countries *i* and *j*. $BAID_{ij}$ is bilateral net official development aid from donor i to country j in current US$ and one has to be aware that it could also be an indicator of bilateral trade relations. $BAIDI_j$ is bilateral net ODA from all the other donors (excluding *i*) to recipient *j* and $MAID_{ij}$ is imputed multilateral development aid from donor *i* to country *j* in current US$. The rational of adding the latter two variables is to control for cross-correlation effects due to the fact that other donors' aid could promote their own imports from recipient *j* and may have a negative effect on recipient country's *j* exports/donor's *i* imports. $XCHR_{ijt}$ denotes nominal bilateral exchange rates[8] in units of local currency of country *i* (donor) per unit of currency in country *j* (recipient) in year *t* (indexed so that XCHR=100 in base year 2000). Finally, F_{ij} denotes other factors impeding or facilitating trade (e.g., former colony, common language, or a common border).

In Equation 2 time and country-by-country fixed effects are incorporated. Taking logarithms the basic specification of the gravity model is

$$LX_{ijt} = \gamma_0 + \phi_t + \delta_{ij} + \alpha_1 LYD_{it} + \alpha_2 LYR_{jt} + \alpha_3 LYHD_{it} + \alpha_4 LYHR_{jt} + \alpha_5 LDIST_{ij}$$
$$+ \alpha_6 LBAID_{ijt} + \alpha_7 LBAIDI_{jt} + \alpha_8 LMAID_{ijt} + \alpha_9 LXCHR_{ijt} + \beta' dummies_{ij} + \eta_{ijt} \tag{2}$$

where:

[7] We utilize GDP and not GNP in order to avoid a double-counting of income received by third countries (international transfer payments, such as aid).
[8] When the gravity model is estimated using panel data it is recommended to add bilateral exchange rates also as a control variable (Carrère, 2006).

L denotes variables in natural logs. ϕ_t are specific time effects that control for omitted variables common to all trade flows but which vary over time. Later on in our estimations we will drop the time dummies, since time fixed effects and Feasible Generalized Least Squares (FGLS) routines are not compatible. A look at the Durbin-Watson statistic, however, indicates that FGLS is called for. δ_{ij} are trading-partner fixed effects that proxy for bilateral trade relations and multilateral resistance factors. When these effects are included, the influence of the variables that are time invariant cannot be directly estimated. This would be the case for distance, contiguity, common language and colony in a fixed effects model of bilateral trade.

The model will be estimated for data on 21 donor and 130 recipient countries during the period from 1988 to 2007.

2.2 Transmission channels from aid to bilateral exports

While it is possible to study the "prima facie" impact of foreign aid on exports by means of export equations based on an augmented gravity model (treating aid as an income transfer or as a temporary increase in income), it is not possible to identify the transmission channels from development aid to bilateral exports within this framework.

First of all there might be an *unquantifiable/unobservable transmission channel*. If aid is strongly correlated with unquantifiable and/or unobservable variables such as improved trade relations (through mutual trust and support, familiarity and goodwill), it is statistically /econometrically impossible to separate these effects from the effect of the aid variable. In this case, the transmission channel between bilateral aid and bilateral exports would be that aid promotes "bilateral trade relations" and we would expect that in this case aid not only promotes donor country exports, but also recipient countries' exports. If we include only bilateral aid *(LBAID)* into the model (eq. 3), assuming bilateral exports (LX_{ijt}) to be only a

function of bilateral aid ($LBAID_{ijt}$) and some standard controls) but not bilateral trade relations *(LBTR)*, which are highly correlated with bilateral aid, then the β coefficient measures the composite impact of both bilateral aid and bilateral aid relations ($\beta = \beta_1 + \beta_2$) and will therefore have an upward bias. If , on the other hand, bilateral trade relations do not change much over time their effect will be incorporated in δ_{ij}, the bilateral (dyadic; country-by-country) fixed effect and β will measure the direct impact of bilateral aid on recipients' exports.

$$LX_{ijt} = \gamma_0 + \phi_t + \delta_{ij} + \beta\ LBAID_{ijt} + \lambda_1 control_1 + ... + \lambda_k control_k + \eta_{ijt} \quad (3)$$

However, even if we had time series data on bilateral trade relations, the true model (eq. 4) below could not be estimated due to the strong correlation between *LBAID* and *LBTR*.

$$LX_{ijt} = \gamma_0 + \phi_t + \delta_{ij} + \beta_1 LBAID_{ijt} + \beta_2 LBTR_{ijt} + \lambda_1 control_1 + ... + \lambda_k control_k + \eta_{ijt} \quad (4)$$

Besides, there are *macroeconomic transmission channels*. The gravity framework captures the supply-side effect of aid resulting in an income effect and later in a production and export effect. Its demand-side effect (Dutch disease effect) is reflected in the exchange rate, which enters the gravity model as a control variable. The exchange rate effect of aid being incorporated into the exchange rate-vector cannot be disentangled from the overall exchange rate effect. To learn more about the indirect impact of development aid, we will therefore briefly describe its macroeconomic transmission channels.

2.3 Transmission channels from aid to exports (to the world)

More recent studies on the income effect of aid (i.e. the *overall* macroeconomic impact of aid, as measured by the impact of aid on the level of per capita income or growth) have shown the impact of aid on economic development to be statistically insignificant (Rajan and Subramanian, 2008; Nowak-Lehmann D. et al., 2009; Doucouliagos and Paldam, 2005, 2008 and 2010). The main arguments used are: (1) lack of a cointegrating relationship between aid and *growth* (Nowak-Lehmann D. et al.), (2) the statistical insignificance of the aid-growth relationship when looking at hundreds of studies by way of a meta analysis (Doucouliagos and Paldam) or (3) the missing robustness and insignificance of the aid–growth coefficients when running regressions over different samples, different time horizons, different time periods and utilizing different types of aid (Rajan and Subramanian). In addition, the study of Nowak-Lehmann D. et al. even argues that development aid and the *level of per capita income* are not sufficiently related in the long run. This is said to be due to an unstable cointegrating relationship.[9]

As for the specific macroeconomic channels at work, we can think of aid as having an investment- and a savings-effect. Part of the aid transfer will be consumed and part of it will be *saved and invested*. In the medium to long term we therefore expect a supply-side impact of aid-financed public expenditure. Public investment in infrastructure generates productivity spillovers and can also provide for a learning-by-doing externality (Adam and Bevan, 2006).

The investment effect which is derived from a multiplicative model can be tested as follows:

$$LINVY_{jt} = \gamma_j + \chi_1 LDYS_{jt} + \chi_2 LEXTNSY_{jt} + \chi_3 LAIDY_{jt} + \upsilon_{jt} \qquad (5)$$

where all variables are in logs. *j* stands for recipient country *j* and *t* stands for time. $INVY_{jt}$ is the investment-to-GDP ratio in recipient country *j* at time *t*. *DSY* is the domestic savings-to-

[9] Different cointegration tests (Kao's, Pedroni's and Johansen's) came to different conclusions. The Pedroni-test rejected the existence of a cointegrating relationship, whereas the Kao and the Johansen-based tests found one or several cointegrating vectors.

GDP ratio, *EXTSNY* is net external savings (minus aid) -to- GDP and *AIDY* is the net aid-to-GDP ratio.

The impact of foreign aid on domestic savings can be tested by means of the following equation:

$$LDSY_{jt} = \varsigma_j + \delta_1 LEXTSNY_{jt} + \delta_2 LAIDY_{jt} + \nu_{jt} \quad (6)$$

Note that the impact on total savings-to-GDP is $\Delta TSY_{jt} = \Delta AIDY_{jt} + \Delta EXTSNY_{jt} + \Delta DSY_{jt}$.

As for the third macroeconomic channel, monetary trade theory emphasizes the anti-export bias (Dutch disease effect) stemming from net capital inflows in general and from development aid in specific (Rajan and Subramanian, 2005). This anti-export bias is caused by an *appreciation of the real exchange rate (LXCHR)* and is considered as a demand-side effect that arises in the short run (Adam and Bevan, 2006). In a fixed exchange rate system the real appreciation results from an increase of the monetary base, the money supply and eventually an increase in the prices of non-tradables (price of tradables remain unaltered in the small country case). In a flexible exchange rate system the real appreciation of the exchange rate results from the appreciation of the nominal exchange rate due to capital inflows in the form of foreign aid. The real appreciation of the exchange rate hurts the producers of export and import substitution goods, but makes the production of non-tradables more profitable. Therefore in the medium to long run, resources will flow into the non-tradable sector and this sector will expand. As imports become cheaper, imports will rise which will lead to trade deficits thus causing a pro-import bias. Spending development aid on imports (preferably on capital goods and intermediates) will partly reverse this appreciation effect. The effect of development aid on the real economy therefore depends on the amount of development aid (capital inflow) and the share that is spent on tradables (imports) and non-tradables (transport, construction, telecommunication, energy). It has to be kept in mind

though that a clever exchange rate management in the recipient country can crucially influence the real exchange rate.

The effect of net capital flows on the real exchange rate can be modelled as follows:

$$LXCHR_{jt} = \varphi_j + \varepsilon_1 LEXTNSY_{jt} + \varepsilon_2 LAIDY_{jt} + \omega_{jt} \quad (7)$$

2.4 Existing empirical findings on the aid-export link (the non-bilateral approach)

Studies on an aid-export link for recipient countries are very scarce. The export measure in those studies is not bilateral exports, but exports of a recipient country *j* to the world. Studies with the export-to-GDP ratio as dependent variable and the aid-to-GDP ratio and covariates as explanatory variables (Munemo et al., 2007; Kang et al., 2010) reveal mixed empirical findings.

Munemo and his co-authors apply FE-IV estimation techniques to a sample of 84 developing countries (unbalanced panel) and find a positive and significant relationship between aid and exports. They find a non-linear effect (diminishing returns) of aid in the period 1980-2003. However, in a sample of 72 recipient countries (balanced panel) this relationship becomes statistically insignificant. Running regressions on the LDCs (32 countries) they find a positive and significant but linear relationship, and for low income African economies (33 countries) the relationship is significant, positive but non-linear.

Khan and co-authors present results for 30 recipient countries utilizing data for the period 1966-2002. Applying the heterogenous panel vector-autoregression, they find a positive relationship between aid and exports for 13 countries and a negative relationship for 17 countries.

When studying the relationship between exports to the world-to-GDP ratio and aid-to-GDP ratio, the authors observe on average a negative relationship in a sample of 28 countries in the period 1979-2004. This relationship is linear and significant. These results are based on

a fixed effects model and dynamic OLS estimation controlling for endogeneity and serial correlation of the disturbances (DFGLS).

3. Description of the data sources and the data on aid

3.1 Data sources

Official Development Aid data are from the OECD Development Database on Aid from DAC Members. We consider net ODA disbursements in current US$[10], instead of aid commitments, because we are interested in the funds actually released to the recipient countries in a given year. Disbursements record the actual international transfer of financial resources, or the transfer of goods or services valued at the cost to the donor.

The original member countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States. Bilateral exports are obtained from the OECD online database (International Trade and Balance of Payments Statistics). Data on income and population variables are drawn from the World Bank (World Development Indicators Database, 2009). Bilateral exchange rates are from the IMF statistics which have been corrected for the introduction of the euro and currency reforms in the recipient countries[11]. Distances between capitals have been computed as great-circle distances using data on straight-line distances in kilometres, latitudes and longitudes. They are from the CIA World Fact Book. Trade impeding or promoting factors such as being a former colony, sharing a common language or a common border are taken from the CEPII data base (http://www.cepii.fr/anglaisgraph/bdd/fdi.htm).

[10] The gross amount comprises total grants and concessional loans extended (according to DAC criteria for concessional loans).
[11] The IFS and WDI statistics are not adjusted for currency reforms and therefore very problematic. The data had to be corrected by the authors.

3.2 Net ODA, our measure of aid

The aid given by the Development Assistance Committee (DAC) members is reported as official development aid (ODA) and other official flows (OOF). OOF are other official sector transactions which do not meet ODA criteria[12] and are therefore disregarded in our analysis.

The aid data contains the bilateral transactions as well the multilateral contributions. The former are undertaken by a donor country directly with an aid recipient and the latter are contributions of international agencies and organizations. The recipients include not only countries and territories but also multilateral organizations that are also ODA eligible.

The **total net ODA disbursements,** the aid data we will work with, are the sum of grants, capital subscriptions, total net loans and other long-term capital. The grants include debt forgiveness and interest subsidies in associated financing packages. The capital subscriptions to multilateral organizations are made in the form of notes and similar instruments unconditionally convertible at sight by the recipient institutions. Loans and other long-term capital include the total disbursements of ODA loans and equity investment. Total net loans and other long term capital represent the loans extended minus repayment received and offsetting entries for debt relief. Technical co-operation, development food aid and the emergency aid are included in grants and gross loans.

Figure 1 shows the five largest recipients of net ODA in the 1980-2007 period. Iraq is the largest recipient followed by Egypt, China and Indonesia.

[Figure 1 about here]

[12] For example, grants to aid recipients for representational or essentially commercial purposes, official bilateral transactions intended to promote development but having a grant element of less than 25 per cent or official bilateral transactions, whatever their grant element, that are primarily export-facilitating in purpose ("official direct export credits"). Net acquisitions by governments and central monetary institutions of securities issued by multilateral development banks at market terms, subsidies (grants) to the private sector to soften its credits to aid recipients, funds in support of private investment are also classified as OOF.

Figure 2 shows that net ODA disbursement have been quite volatile over the 1988-2007 period. The signing of the UN-Declaration of the Millennium Development goals in 2000 will certainly help to push up net ODA disbursements in the future.

[Figure 2 about here]

Figure 3 illustrates that countries involved in conflicts or civil wars (Congo, Rwanda, Mozambique, Bosnia-Herzegovina, Sierra Leone, Afghanistan) or countries plagued by natural disasters (Nicaragua) received huge amounts of ODA in the 1988-2007 period.

[Figure 3 about here]

3.3 Our aid variables entering the model

We will concentrate on net ODA and within this category on three types of aid: First, bilateral net ODA (aid) of a donor *i* to a recipient country *j (BAID)*, second, the sum of bilateral aid given by all donors (except *i*) to *j* (BAIDI) and third, multilateral aid *(MAID)* given by donor *i* to developing country *j* (which is the share country *j* receives approximately through a multilateral institution that is fuelled by donor country *i*; the donor remains unknown to the recipient and vice versa).

The idea of utilizing *BAID*, *BAIDI* and *MAID* is the following: With *BAID* we aim at measuring also the importance of bilateral trade relations between country pairs *ij*, with *BAIDI* we wish to check whether other donors disturb an existing bilateral trade relation between *ij* and with *MAID* we wish to find a proxy for the efficiency of aid in the absence of bilateral trade relations.

Multilateral aid (in the sense of multilateral contributions of international agencies and organizations (also part of ODA)) can be imputed back to the funders of those bodies. The OECD uses a specific methodology that we briefly explain. The approach will vary depending on whether the intention is to show the share of the receipts of a given recipient attributable to a particular donor, or the share of a given donor's outflows that can be assigned to an individual recipient. As DAC statistics are primarily designed to measure donor effort, the second approach is the one taken in DAC statistical presentations. First, the percentage of each multilateral agency's total annual gross disbursements that each recipient country receives is calculated. This calculation is carried out only in respect of agencies' disbursements of grants or concessional (ODA) loans from core resources. Then, the recipient percentages derived in the first step are multiplied by a donor's contribution in the same year to the core resources of the agency concerned to arrive at the imputed flow from that donor to each recipient. [13] This calculation is repeated for each multilateral agency. The results from the second step for all agencies are summed to obtain the total imputed multilateral aid from each donor to each recipient country.

4. Model specification, estimations and main results

4.1 Model specification and estimation issues

As we are primarily interested in the long-term effect of development aid on recipients' exports we utilize a long-run model. Since our data consists of a time span of a maximum of 20 years and a cross-section of 130 countries, we test for the presence of autocorrelation and heteroskedasticity. The results of the Wooldridge test for autocorrelation in panel data and the LR test for heteroskedasticity indicate that both problems are present in the data. Given the

[13] An example: In a given year, WFP provides 10% of its disbursements from core resources to Sudan. Donor A contributes USD 50 million to WFP core resources in the same year. Donor A's imputed multilateral ODA to Sudan through WFP is 0.1*50million = USD 5 million.

strong rejection of the null in both tests, the model is estimated by FGLS controlling for autocorrelation and by applying heteroscedasticity corrected standard errors.

In a first step, the long-run model is estimated for the full sample (130 countries). The long-run model does not describe the stage of transition and therefore does not contain lags of the covariates in levels since all adjustments have come to an end in the long term. However, it controls for endogeneity of the right hand side variables by inserting leads and lags of the explanatory variables in first differences.[14] As a prerequisite the series have to be non-stationary and co-integrated. In our case they are all integrated of order one (I(1)) and cointegrated according to Kao's residual conitegration test (see Tables A2 and A3 in the appendix for test results).

In general terms, the model is estimated by restricting the coefficients of the right hand side variables to be equal for each aid recipient. This way we get an average measure of the impact of different types of aid on bilateral exports.

We estimate three variants of the model: (1) without dyadic δ_{ij} (bilateral fixed effects), to be estimated by DOLS (column 1); (2) without dyadic δ_{ij} (bilateral fixed effects), to be estimated by DFGLS (column 2); (3) with dyadic, fixed effects δ_{ij} , to be estimated by DFGLS. The DOLS procedure goes back to Saikkonen (1991) and Stock and Watson (1993) and allows controlling for endogeneity of the explanatory variables. As we also control for autocorrelation of the error terms, we eventually estimate the model by means of panel dynamic feasible generalized least squares (DFGLS) in column 2 (with common intercept) and in column 3 with dyadic fixed effects. Individual (country-pair) effects (dyadic effects δ_{ij}) are assumed to be fixed and are considered as unobservable heterogeneous effects across trading partners. They are assumed not to vary over time. Those effects are also a proxy for the so-called "multilateral resistance" factors modelled by Anderson and van Wincoop

[14] It requires the series to be non-stationary and cointegrated in the long-run. Both the panel ADF-unit root test and Kao's cointegration tests supported these premises.

(2003). δ_{ij} stand for the autonomous rise or fall in exports to donor countries through time-invariant factors that characterize the bilateral donor-recipient relationship.

The model with the common intercepts assumes the bilateral fixed effects to be the same for all country pairs. This assumption is of course very restrictive. Testing common bilateral versus heterogeneous bilateral (δ_{ij}) effects clearly showed that individual bilateral effects effects are called for. Our preferred estimation equation is therefore (equation 8 whose estimation results will be presented in column 3) which takes the existence of bilateral relations between donor and recipient country into account.

$$LX_{ijt} = \gamma_0 + \delta_{ij} + \alpha_1 LYD_{it} + \alpha_2 LYR_{jt} + \alpha_3 LYHD_{it} + \alpha_4 LYHR_{jt} +$$

$$\alpha_5 LDIST_{ij} + \alpha_6 LBAID_{ijt} + \alpha_7 LBAIDI_{jt} + \alpha_8 LMAID_{ijt} + \alpha_9 LXCHR_{ijt} + +$$

$$\beta' dummies_{ij} + \sum_{p=-2}^{p=+2} \theta_{1p} \Delta LYD_{ijt-p} + ... + \sum_{p=-2}^{p=+2} \theta_{kp} \Delta LXCHR_{ijt-p} + \eta_{ijt} \quad (8)$$

However, the results presented in Table 1 (column 3) might underestimate the impact of variables that change with the country pairs *(i,j)* over time. In particular, the impact of bilateral development aid might be underestimated. In contrast, the results presented in Table 1 (column 2) might overestimate the impact of variables that change with the country pairs *(i,j)* over time and might therefore overestimate the impact of bilateral aid.

In a second step, the model is estimated for different regions of the developing world without and with dyadic fixed effects applying the DOLS and the DFGLS procedure.

4.2. Main results

4.2.1 Findings for the full 130-country sample

Table 1 reports the main estimation results that are relevant in the long run. We start by reporting the pooled Dynamic OLS (DOLS) results (column 1). This estimation method indicates quite a high, positive impact of bilateral aid on recipient exports (a one dollar increase in bilateral aid increases recipient exports by US$ 2.45)[15]. However, the results have to be interpreted with caution as they disregard heterogeneous bilateral trade relations and autocorrelation of the error terms. If both problems are present the estimation results will be biased and inefficient. Only endogeneity is controlled for by inserting the leads and lags of the explanatory variables in first differences. The Durbin-Watson statistic being 0.28 is very poor indicating that there is something wrong with the model specification.

Column 2 of Table 1 contains the pooled DFGLS results neglecting country-bb-country fixed effects, but controlling for autocorrelation. What we see is that the impact of bilateral aid between country *i* and *j* becomes strongly reduced. A one dollar increase of aid now leads to only a US$ 0.86 increase in exports. The Durbin-Watson statistic is now 2.29 and has substantially improved but the test on individual (heterogeneous) bilateral fixed effects rejected the common (homogeneous) bilateral effects specification of this model.

The third column of Table 1 which is based on our preferred estimation technique shows the FE-DFGLS results. By controlling for bilateral trade relations δ_{ij}, aid's impact on bilateral exports becomes even insignificant.

[Table 1 about here]

[15] The monetary impact of bilateral aid is calculated according to the following formula:
Coefficient $_{BAID}$= MEAN of X/MEAN of BAID, i.e. 0.20*271000000/22100000 = US $ 2.45

As to our variable of interest "bilateral aid /bilateral trade relations *(LBAID)"*, controlling for autocorrelation via DFGLS does change and strongly reduce the positive impact of the aid variables on recipients' export trade (compare the DFGLS results of column 2 to the DOLS results in column 1): A one dollar increase in bilateral aid increases recipient exports by US$ 2.45 in column 1 and by US$ 0.86 in column 2[16]. The contribution of US$ 2.45 - being the average contribution of aid to exports in our 130 countries sample – seems quite implausible given the low macroeconomic impact of aid (shown in Table 6). When not controlling for county-by-county (individual bilateral) fixed effects (Table 1 column 1 and 2) *LBAID* seems to become a catch-all variable, i.e. it captures the effect of bilateral trade relations which are assumed not to change over time and all other omitted variables (e.g. changes in trade relations over time) that are highly correlated with bilateral aid from donor *i* to recipient *j* . Please note that omitted variables (such as mutual trust and support, familiarity and goodwill) are sometimes hard to observe and hard to quantify so that the role of bilateral trade relations for bilateral trade cannot be determined. However, if we apply our preferred model specification and do not neglect the potential positive or negative effects of bilateral trade relations on recipients' exports, the pure (direct) effect of bilateral aid on recipients' exports becomes insignificant (Table 1, column 3).

This new finding -based on appropriate econometric methods- challenges our belief that an increase in *LBAID* should have a discernible positive impact on recipients' exports. Our view is supported by Johansson and Pettersson (2009) and Martinez-Zarzoso et al. (2010) who observed an increase of donors' exports to recipient countries supposedly due to improved trade relations. In the same vain, it could then be argued that increased aid goes hand in hand with good trade relations which will eventually strengthen and promote recipients' exports to the donor countries. If this is the case, one might conclude that aid

[16] The monetary impact of bilateral aid is calculated according to the following formula:
Coefficient $_{BAID}$= MEAN of X/MEAN of BAID, i.e. 0.07*271000000/22100000 = US $ 0.86.

impacts indirectly and positively on recipients' exports. If trade relations do not matter, then aid will not have any impact (neither direct nor indirect) according to our findings.

To comment on the other variables influencing recipients' exports: Bilateral aid given by other donors *(LBAIDI)* has a small negative effect on the exports of a specific donor-recipient pair and therefore reduces the effect of bilateral aid in a specific recipient country a little bit (Table 1, column 3). Multilateral aid (bilaterally computed) given by international organizations *(LMAID) has an insignificant impact* on recipient countries exports.. So overall we observe very small crowding out effects from aid given by other donors in the full 130 sample. This implies that when other donors give higher amounts of aid, the "goodwill" and "habit formation" factors mentioned above could vanish and decrease recipients' exports generating an indirect negative effect on a specific recipient's exports.

Most of the other variables present the expected sign and are statistically significant. The coefficients of donors' and recipients' income are positive and significant and around the theoretical value of unity. The coefficient of donors' income per capita is negative and statistically significant at the 1 percent level in most specifications, whereas the coefficient of recipients' income per capita is positive and statistically significant at the 10 percent level in all specifications. The impact of the bilateral nominal exchange rate is not significant. One could have expected a negative sign (implying that an increase (appreciation of the recipient country's currency) reduces recipient countries' exports to the respective donor country).

The effect of distance is negative as expected (Table 1, column 1 and 2). The dummy variables (common language and former colony) have the expected positive sign. The variables distance, contiguity, common language and former colony drop out when heterogeneous fixed effects are included.

4.2.2 Findings for Sub-Saharan Africa (SSA) & MENA , SSA, Asia and Latin America & the Caribbean

We further tested whether the results were similar across different regions of the world. Our hypothesis that Africa including MENA and Sub-Saharan Africa would fare worse than Latin America or Asia found support in the data, *but* only if we do not control for heterogeneous bilateral trade relations and omitted variables/autocorrelation of the disturbances. In Table 2-5, column 1 we see huge differences of the long-run coefficients of bilateral aid from donor *i* to recipient *j* and the average impact of this type of bilateral aid on recipient exports. In Africa including MENA countries aid's impact on these exports into donor countries is rather low. One dollar of aid increases Sub-Saharan & MENA exports by US$ 0.41 and SSA exports by US$ 0.31, whereas exports increase by US$ 5.56 in Asia and by US$ 4.41 in Latin America & the Caribbean for each dollar received as aid.

However, if we utilize our preferred estimation method (Tables 2-5, column 3), bilateral aid has an insignificant impact on recipients' exports. Our estimations (all controlling for endogeneity via FGLS and omitted variables) stand in contrast to the findings of Johansson and Pettersson (2009) who observe a positive impact of aid on recipients' exports.[17] This divergence in findings could be due to the leads and lags-approach to control for endogeneity of the right hand side variables, the insertion of bilateral fixed effects (dyadic effects, instead of donor fixed and recipient fixed effects) and the FGLS-technique. The latter is called for in order to fulfil the requirements of the classical linear regression model.

[Table 3 about here]

[Table 3 about here]

[Table 4 about here]

[17] Johansson and Petterson (2009) do not control for factors that have a bilateral component (such as the bilateral exchange rate, bilateral time-invariant relations (δ_{ij})). They neither mention the value of the Durbin-Watson statistic nor do they discuss the results in the Appendix when aid was instrumented.

[Table 5 about here]

4.2.3 Is the macroeconomic impact of aid in line with our findings?

As for the transmission channels of aid on the macro-economy, economic theory indicated that development aid is associated with two different effects on exports. First, an income effect which will lead to an expansion of consumption and investment in the recipient country. Eventually productive capacity will also increase in the sector of exportables and the additional supply of exportables will be absorbed by the export markets (supply-side effect).[18] Second, the income effect will also increase the demand for non-tradables thus leading to an appreciation of the exchange rate if this is not impeded by a strategic exchange rate management of the recipient country's central bank (demand-side effect).

In order to scrutinize the importance of macroeconomic transmission channels we checked those channels separately. We augmented eq. 5-7 by adding leads and lags of the regressors in first differences to control for endogeneity of all right-hand side variables. In addition we accounted for autocorrelation of the disturbances by applying the Feasible Generalized Least Squares (FGLS)-technique..

$$LINVY_{jt} = \gamma_j + \chi_1 LDYS_{jt} + \chi_2 LEXTNSY_{jt} + \chi_3 LAIDY_{jt} + \sum_{p=-2}^{p=+2} \theta_{1p} \Delta LDYS_{jt-p}$$

$$+ \sum_{p=-2}^{p=+2} \theta_{2p} \Delta LEXTNSY_{jt-p} + \sum_{p=-2}^{p=+2} \theta_{3p} \Delta LAIDY_{jt} + \upsilon_{jt}$$

[18] The developing country is considered a small country that is unable to influence the price in the world market and foreign demand is considered as perfectly elastic.

(5')

$$LDSY_{jt} = \varsigma_j + \delta_1 LEXTSNY_{jt} + \delta_2 LAIDY_{jt} + \sum_{p=-2}^{p=+2} \theta_{1p} \Delta LEXTSNY_{jt-p} + \sum_{p=-2}^{p=+2} \theta_{2p} \Delta LAIDY_{jt-p} + \nu_{jt}$$

(6')

$$LXCHR_{jt} = \varphi_j + \varepsilon_1 LEXTNSY_{jt} + \varepsilon_2 LAIDY_{jt} + \sum_{p=-2}^{p=+2} \theta_{1p} \Delta LEXTNSY_{jt-p} + \sum_{p=-2}^{p=+2} \theta_{2p} \Delta LAIDY_{jt-p} + \omega_{jt}$$

(7')

The results –based on DFGLS estimations- are summarized in Table 5 and a fictitious computation of a strong increase in aid has been performed. By means of this computation we find evidence that the macroeconomic impact of aid on the recipient country's economy is very small. Assuming that the aid-to-GDP ratio doubles (from 5% to 10%) this would lead to a 7% increase in the investment-to GDP ratio (e.g. from 15% to about to 16.05%) and a 15% decrease in the domestic savings-to-GDP ratio (e.g. from 10% to 8.5%). The ratio 'total savings-to-GDP", however, would increase from 10% to 13.5 % (8.5%+5%), taking other external savings to be zero. The real exchange rate would appreciate by 3.5% if the aid-to-GDP ratio increased by 10%.

[Table 6 about here]

Taken together, we find a small but significant positive impact on investment and a small but significant negative impact on domestic savings and the real exchange rate. This leads us to conclude that the effect of bilateral aid on bilateral exports (in Table 1) is in line with the rather weak income effect of aid, i.e. a macroeconomic improvement of the recipient country's economy which results in an insignificant impact of aid on recipients' exports. Whether aid has an indirect impact on recipients' exports via a strengthening of bilateral trade

relations which might go hand in hand with development aid cannot be empirically determined.

5. Robustness checks

Furthermore, we checked the robustness of the results by employing imports from donor countries (reported by importers as c.i.f. values) as dependent variable (the mirror statistics to exports reported by exporters as f.o.b. values). The regression results basically did not change and stayed robust. We controlled for endogeneity of the explanatory variables via dynamic ordinary least squares, which is the approach of Stock and Watson (1993). The Heckman approach, which was used to check for sample selection bias, gave inconclusive results depending on the selection variables chosen. At times it indicated no sample selection bias while in other specifications there clearly was a sample selection bias. This issue has to be settled in further research.[19] Helpman et al. (2008) find the selection bias to be economically neglible. This finding is corroborated by Johansson and Pettersson (2009). The results of the two-step estimation and the OLS estimation are very close together.

6. Conclusions

The empirical analysis showed that the direct impact of development aid on recipient countries exports is insignificant on average. This finding is in line with the very small macroeconomic impact of development aid that we observed when we investigated the impact of development aid on investment, domestic savings and the real exchange rate. Besides, we could not determine -utilizing adequate estimation methods- whether development aid was more effective (in terms of recipients' exports) in Asia and Latin America & the Caribbean than in Sub-Saharan Africa & MENA.

[19] Results are available upon request.

Neither could we establish -by applying econometric techniques- whether development aid had an indirect and positive impact on recipients' exports. We tended to believe that bilateral aid enhances bilateral trade relations and thus bilateral trade, but this effect could not be made visible. All our findings taken together suggest that aid seems to be ineffective as a direct promoter of exports, but they do not rule out that aid might play an important indirect role in promoting bilateral trade relations.

Next to this rather disappointing finding that on average bilateral aid had an insignificant impact on recipients' exports, we found some first evidence that in a few developing countries bilateral aid had a significant, positive impact on recipients' exports. Further research shall determine which factors (country characteristics, type of aid received, quality of bilateral trade relations) are decisive for this outcome.

Funding

This work was supported by the German Research Foundation (Deutsche Forschungsgemeinschaft) [GZ: DR 640/2-1].

REFERENCES

Adam, C.S. and Bevan, D.-L. (2006), 'Aid and the Supply Side: Public Investment, Export Performance, and Dutch Disease in Low-Income Countries', World Bank Economic Review 20(2), 261-290.

Anderson, J. E. (1979), 'A Theoretical Foundation for the Gravity Equation', *American Economic Review* 69, 106-116.

Anderson, J.E. and Van Wincoop, E. (2003), 'Gravity with Gravitas: A Solution to the Border Puzzle', *American Economic Review* 93, 170-192.

Arvin, M. and Baum, C. (1997), 'Tied and untied foreign aid: theoretical and empirical analysis', *Keio Economic Studies* 34(2), 71-79.

Arvin, M. and Choudry, S. (1997), 'Untied aid and exports: Do untied disbursements create goodwill for donor exports?', *Canadian Journal of Development Studies* 18(1), 9-22.

Bergstrand, J.H. (1985), 'The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence', *The Review of Economics and Statistics* 67, 474-481.

Bergstrand, J.H. (1989), 'The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade', *The Review of Economics and Statistics* 71(1), 143-153.

Bergstrand, J.H. (1990), 'The Heckscher-Ohlin-Samuelson Model, the Linder Hypothesis and the Determinants of Bilateral Intra-industry Trade', *The Economic Journal* 100: 1216-1229.

Burnside, G. and Dollar, D. (2000), 'Aid, Policies, and Growth', *American Economic Review* 90 (4), 847-868.

Carrére, C. (2006), 'Revisiting Regional Trading Agreements with Proper Specification of the Gravity Model', *European Economic Review* 50(2): 223-247.

Clemens, M.A., Radelet, S. and Bhavnani (2004), 'Counting Chickens when they Hatch: The Short-term Effect of Aid and Growth', Center for Global Development Working Paper #44.

Deardorff, A.V. (1998), 'Determinants of Bilateral Trade: Does Gravity Work in a Noeclassical World?', in: Jefrey A. Frenkel, ed. , The Regionalization of the World economy. Chicago: University of Chicago Press.

Doucouliagos, H. and Paldam, M. (2005), 'The aid effectiveness literature: the sad results of 40 years of research', Department of Economics Working Paper 2005.05, University of Aarhus.

Doucouliagos, H. and Paldam, M. (2008), 'Aid effectiveness on growth: a meta study', *The European Journal of Political Economy* 24(1): 1-24.

Doucouliagos, H. and Paldam, M. (2010), 'Conditional aid effectiveness: a meta-study', *Journal of International Development* 22(4): 391-411.

Feenstra, R. (2004), *Advanced International Trade: Theory and Evidence*, Princeton: Princeton University Press.

Feenstra, R., Markusen, J. and Rose, A. (2001), 'Using the Gravity Equation to Differentiate among Alternative Theories of Trade', *Canadian Journal of Economics* 34(2): 430-447.

Greene, W.H. (2000), *Econometric Analysis*, 4th Edition, London: Prentice-Hall International (UK) Limited.

Hassler, U. and Wolters, J. (2006), 'Autoregressive Distributed Lag Models and Cointegration', *Advances in Statistical Analysis* 90, 59-74.

Haveman, J. and Hummels, D. (2004), 'Alternative Hypotheses and the Volume of Trade: The Gravity Equation and the Extent of Specialization', *Canadian Journal of Economics* 37(1), 199-218.

Helpman, E. (1987), 'Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries', *Journal of the Japanese and International Economies* 1(1), 62-81.

Helpman, E., Melitz, M. and Rubinstein, Y. (2008), ,Estimating Trade Flows: Trading Partners and Trading Volumes', *Quarterly Journal of Economics* 123(2): 441-487.

Johansson, L.M. and Pettersson, J. (2009), 'Tied Aid, Trade-Facilitating Aid or Trade-Diverting Aid?' Working Paper 2009:5, Department of Economics, Uppsala University.

Kang, J.S., Prati, A. and Rebucci, A. (2010) Aid, Exports, and Growth. A Time-series Perspective on the Dutch Disease Hypothesis. *IDB Working Paper Series* No. IDB-WP-114. Inter-American Development Bank.

Minoiu, C. and Reddy, s.G. (2010), 'Development Aid and Economic Growth: A Positive Long-Run Relation', *The Quarterly Review of Economics and Finance* 50: 27-39.

Morrissey, O. (2006), 'Aid or Trade, or Aid and Trade?', *The Australian Economic Review* 39, 78–88.

Munemo, J., Bandyopaghyay, S. and Basistha, A. (2007), 'Foreign Aid and Export Performance: A Panel Data Analysis of Developing Countries'. *Working Paper 2007-023A. Federal Reserve Bank of St. Louis*.

Nelson, D. and Juhasz Silva, S. (2008), 'Does Aid Cause Trade? Evidence from an Asymmetric Gravity Model', University of Nottingham Research Paper No. 2008/21.

Nilsson, L. (1997), 'Aid and Donor Exports: The Case of the EU Countries', in: Nilsson, L., *Essays on North-South Trade*, Lund Economic Studies 70, Lund.

Nowak-Lehmann D., F., Martínez-Zarzoso, I., Herzer, D., Klasen, S. and Dreher, A. (2009), ,In search for a long-run relationship between aid and growth: pitfalls and findings. Discussion Paper No. 196, Ibero-America Institute, University of Goettingen.

OECD (2008), 'Development Co-Operation Report 2007', OECD Journal on Development, OECD, Paris.

Osei, R., Morrissey, O., and Lloyd T.A. (2004), 'The Nature of Aid and Trade Relationships', *European Journal of Development Research* 16, 354-374.

Rajan, R. and Subramanian, A. (2005), What undermines aid's impact on growth? *IMF Working Paper*, September 2005.

Rajan, R. and Subramanian, A. (2008), 'Aid and Growth: What does the Cross-country Evidence Really Show? *Review of Economics and Statistics* XC(4): 643-665.

Redding, S. and Venables, A. (2004), 'Economic Geography and International Inequality', *Journal of International Economics* 62(1), 53-82.

Reddy, S.G. and Minoiu, C. (2006), 'Development Aid and Economic Growth: a Positive Long-Run Relation. *DESA Working Paper* No. 29, United Nations. Department of Economic and Social Affairs.

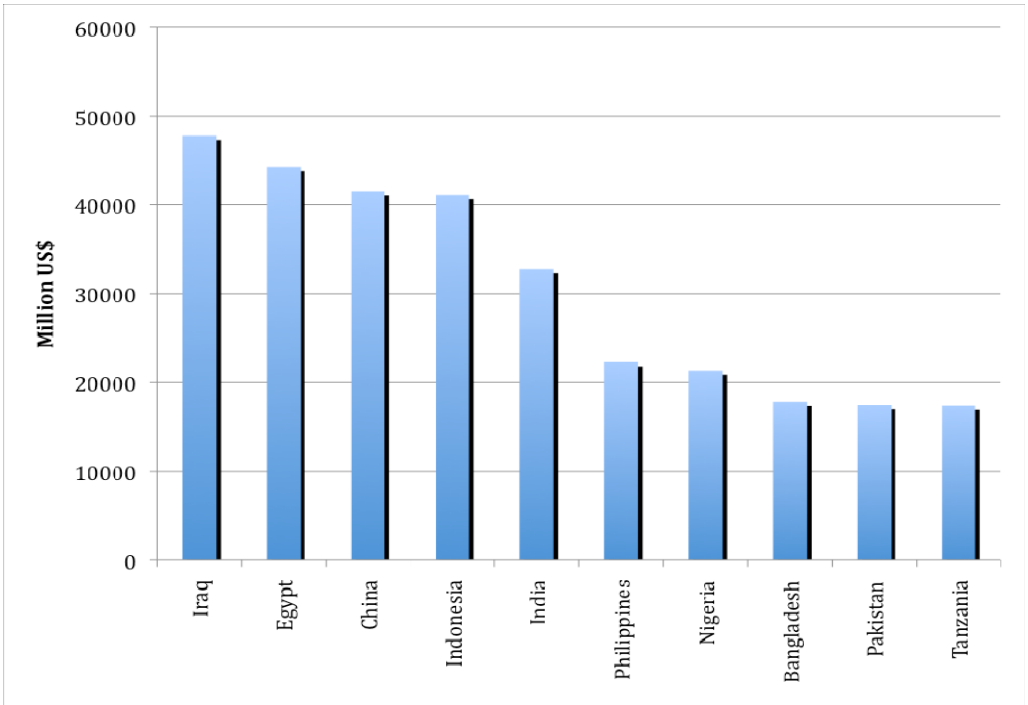
Saikkonen, P. (1991) Asymptotically efficient estimation of cointegration regression. *Econometric Theory* **7,**. 1–21.

Stock, J. H. and Watson, M.W. (1993), 'A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems', *Econometrica* 61(4), 783-820.

Wagner, D. (2003), 'Aid and Trade: An Empirical Study', *Journal of the Japanese and International Economies* 17, 153-173.

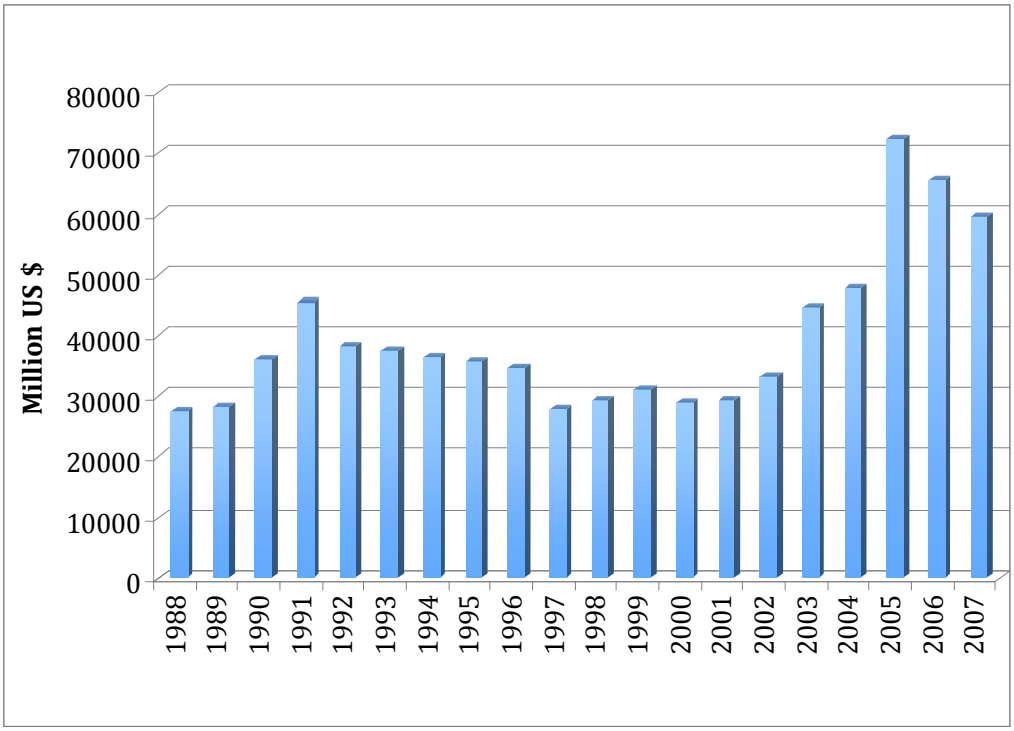
World Bank (2009), World Development Indicators 2009 CD-ROM, Washington, DC.

Figure 1. Ten largest recipients of net ODA (1988-2007)



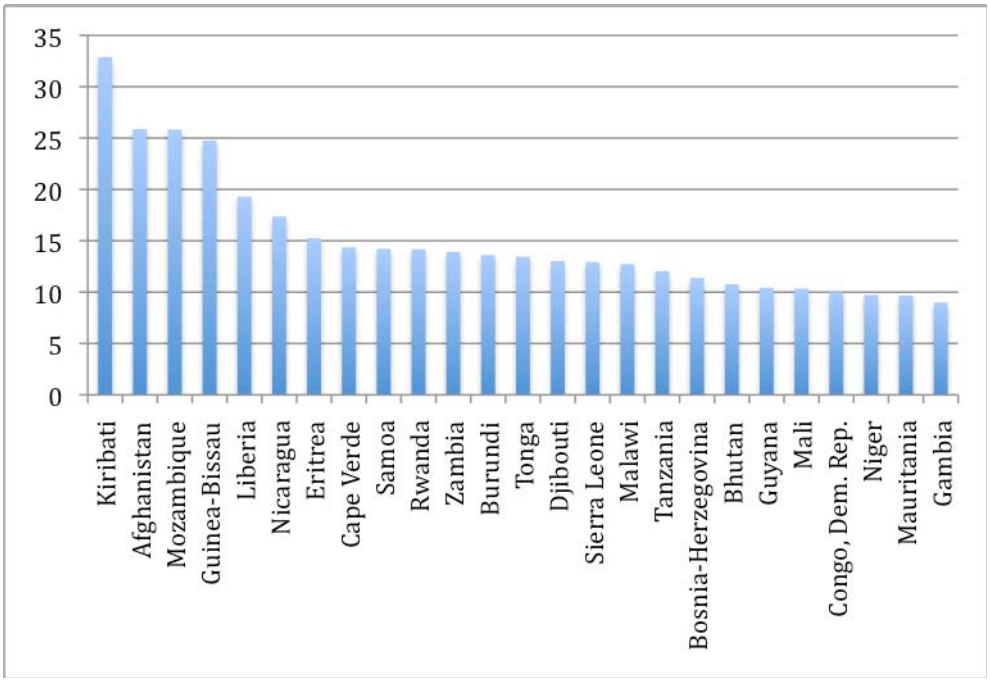
Source: OECD; own calculations.

Figure 2. Net ODA disbursements by year 1988-2007



Source: OECD; own calculations.

Figure 3. Net ODA as percentage of recipient countries GDP between 1988 and 2007 on average



Source: OECD; own calculations.

Table 1. Development aid and recipients' exports (all recipient countries)

	Common Intercept-Dynamic Ordinary Least Squares (CI-DOLS) (1)	**Common Intercept-Dynamic Feasible Least Squares (CI-DFGLS) (2)**	**FE-Dynamic Feasil Generalized Leas Squares (FE-DFGLS) (3)**
LYD	0.76***	0.81***	0.70***
	(31.55)	(13.06)	(4.63)
LYR	1.10***	1.09***	0.29**
	(57.86)	(18.64)	(2.23)
LYHD	-2.92***	-2.75***	-0.56**
	(-35.12)	(-15.06)	(-2.24)
LYHR	0.36***	0.22*	1.10***
	(8.83)	(2.36)	(6.64)
LDIST	-0.71***	-0.70***	---
	(-19.35)	(-6.64)	---
LBAID	**0.20*** **	**0.07** **	**0.00**
	(13.19)	(2.36)	(0.15)
LBAIDI	0.01	0.05	-0.09*
	(0.45)	(0.75)	(-1.88)
LMAID	0.00	0.00	0.00
	(3.32)	(0.77)	(0.16)
LXCHR	-0.07	0.01	0.05
	(-1.13)	(0.16)	(1.36)
CONTIG	-0.23*	-0.55	---
	(-1.77)	(-1.10)	---
COMLANG	0.65***	0.65***	---
	(10.08)	(2.58)	---
COLONY	0.81***	0.92***	---
	(11.07)	(4.23)	---
	common intercept (yes) leads and lags (yes)	common intercept (yes) leads and lags (yes)	dyadic effects (yes leads and lags (yes
Impact of aid in terms of US$ (rounded)	**2.45**	**0.86**	**0.00**
R-squared	0.60	0.89	0.93
N	14665	12558	12558
Log likelihood	-31730.48	-18463.32	-15913.56
Durbin-Watson-Stat.	**0.28**	**2.29**	**2.01**

Note: t-values in parentheses. Leads and lags are not reported in DOLS and DFGLS. The impact of aid was calculated as: $\beta_{\text{LBAID}} * \overline{X} / \overline{BAID} = \beta_{\text{LBAID}} * 271/22.1$. Exports and aid are in millions of current US$.

Table 2. Development aid and recipients' exports in Sub-Saharan Africa & MENA

	Common Intercept-Dynamic Ordinary Least Squares (CI-DOLS)	**Common Intercept-Dynamic Feasible Least Squares (CI-DFGLS)**	**FE-Dynamic Feasil Generalized Leas Squares (FE-DFGLS)**
	(1)	**(2)**	**(3)**
LYD	0.91***	0.94***	0.21
	(27.78)	(8.46)	(0.74)
LYR	1.08***	0.98***	0.82***
	(20.35)	(6.67)	(3.46)
LYHD	-2.86***	-2.73***	-1.13**
	(-23.07)	(-8.54)	(-2.01)
LYHR	0.37***	0.20	0.71*
	(5.04)	(1.04)	(1.64)
LDIST	-0.98***	-0.85***	---
	(-15.70)	(-4.55)	---
LBAID	**0.08*** **	**0.07**	**0.06**
	(4.60)	(1.21)	(1.31)
LBAIDI	-0.08	-0.04	-0.12
	(-1.33)	(-0.30)	(-1.17)
LMAID	0.04***	0.01*	0.01
	(8.49)	(1.82)	(1.56)
LXCHR	-0.07	-0.01	0.03
	(-0.92)	(-0.05)	(0.52)
CONTIG	---	---	---
	---	---	---
COMLANG	0.98***	0.86**	---
	(9.90)	(2.23)	---
COLONY	1.15***	1.42***	---
	(9.70)	(3.15)	---
	common intercept (yes)	common intercept (yes)	dyadic effects (yes
	leads and lags (yes)	leads and lags (yes)	leads and lags (yes
Impact of aid in terms of US$ (rounded)	**0.41**	**0.00**	**0.00**
R-squared	0.52	0.83	0.87
N	4536	3734	3734
Log likelihood	-10247.43	-6295.45	-5527.76
Durbin-Watson-Stat.	**0.37**	**2.34**	**2.05**

Note: t-values in parentheses. Leads and lags are not reported in DOLS and DFGLS. The impact of aid was calculated as: $\beta_{LBAID} * \overline{X} / \overline{BAID} = \beta_{LBAID} * 114/21.9$. Exports and aid are in millions of current US$.

Table 3. Development aid and recipients' exports in Sub-Saharan Africa

	Common Intercept-Dynamic Ordinary Least Squares (CI-DOLS)	**Common Intercept-Dynamic Feasible Least Squares (CI-DFGLS)**	**FE-Dynamic Feasil Generalized Leas Squares (FE-DFGLS)**
	(1)	**(2)**	**(3)**
LYD	0.86***	0.90***	-0.08
	(22.00)	(7.90)	(-0.25)
LYR	1.15***	1.01***	1.06***
	(20.42)	(6.47)	(3.89)
LYHD	-2.85***	-2.87***	-1.50***
	(-20.64)	(-8.00)	(-2.78)
LYHR	0.66***	0.46***	1.35***
	(9.49)	(2.59)	(3.07)
LDIST	-1.26***	-0.90***	---
	(-12.24)	(-3.00)	---
LBAID	**0.09*** **	**0.06**	**-0.03**
	(3.57)	(1.10)	(-0.70)
LBAIDI	0.07	0.14	-0.12
	(0.99)	(0.87)	(-1.06)
LMAID	0.03***	0.01	0.00
	(8.22)	(1.34)	(1.14)
LXCHR	-0.18***	-0.00	0.04
	(-3.53)	(-0.01)	(0.71)
CONTIG	---	---	----
	---	---	---
COMLANG	0.88***	0.80**	---
	(7.70)	(2.30)	---
COLONY	1.46***	1.64***	---
	(8.95)	(3.61)	---
	common intercept (yes) leads and lags (yes)	common intercept (yes) leads and lags (yes)	dyadic effects (yes leads and lags (yes
Impact of aid in terms of US$ (rounded)	**0.31**	**0.00**	**0.00**
R-squared	0.42	0.77	0.86
N	4344	3500	3500
Log likelihood	-10048.36	-6219.14	-5425.30
Durbin-Watson-Stat.	**0.41**	**2.36**	**2.05**

Note: t-values in parentheses. Leads and lags are not reported in DOLS and DFGLS. The impact of aid was calculated as: $\beta_{LBAID} * \overline{X} / \overline{BAID} = \beta_{LBAID} * 50.35/14.82$**.** Exports and aid are in millions of current US$.

Table 4. Development aid and recipients' exports in Asia

	Common Intercept-Dynamic Ordinary Least Squares (CI-DOLS) (1)	**Common Intercept-Dynamic Feasible Least Squares (CI-DFGLS) (2)**	**FE-Dynamic Feasil Generalized Leas Squares (FE-DFGLS) (3)**
LYD	0.82***	0.69***	0.77***
	(26.46)	(5.79)	(4.94
LYR	0.80***	1.00***	-0.37
	(17.50)	(9.02)	(-1.43)
LYHD	-2.51***	-2.02***	0.15
	(-22.14)	(-4.59)	(0.54)
LYHR	1.24***	0.64***	1.90***
	(17.21)	(3.05)	(5.98)
LDIST	-1.17***	-0.93***	----
	(-10.39)	(-2.33)	---
LBAID	**0.24*** **	**-0.01**	**-0.02**
	(14.52)	(-0.15)	(-1.01)
LBAIDI	0.57***	0.13	-0.25***
	(7.29)	(1.23)	(-3.74)
LMAID	-0.00***	0.00	0.00
	(-5.29)	(0.31)	(1.25)
LXCHR	-0.97***	-0.29	0.49***
	(-8.48)	(-1.42)	(5.66)
CONTIG	---	---	---
	---	---	---
COMLANG	0.53***	0.07	---
	(6.00)	(0.20)	---
COLONY	0.37***	0.48	---
	(4.55)	(1.15)	---
	common intercept (yes)	common intercept (yes)	dyadic effects (yes
	leads and lags (yes)	leads and lags (yes)	leads and lags (yes
Impact of aid in terms of US$ (rounded)	**5.56**	**0.00**	**0.00**
R-squared	0.82	0.97	0.98
N	2991	2605	2605
Log likelihood	-5075.80	-1989.26	-1401.35
Durbin-Watson-Stat.	**0.21**	**2.17**	**1.87**

Note: t-values in parentheses. Leads and lags are not reported in DOLS and DFGLS. The impact of aid was calculated as: $\beta_{LBAID} * \overline{X} / \overline{BAID} = \beta_{LBAID} * 874/37.7$. Exports and aid are in millions of current US$.

Table 5. Development aid and recipients' exports in Latin America & Caribbean

	Common Intercept-Dynamic Ordinary Least Squares (CI-DOLS)	**Common Intercept-Dynamic Feasible Least Squares (CI-DFGLS)**	**FE-Dynamic Feasil Generalized Leas Squares (FE-DFGLS)**
	(1)	**(2)**	**(3)**
LYD	0.66***	0.66***	0.55*
	(19.35)	(5.34)	(1.86)
LYR	0.88***	0.82***	0.20
	(20.21)	(5.69)	(1.08)
LYHD	-1.34***	-1.62***	-0.53
	(-9.19)	(-2.96)	(-1.27)
LYHR	1.17***	1.09***	1.50***
	(6.08)	(2.50)	(3.51)
LDIST	-2.66***	-1.77***	---
	(-17.92)	(-2.66)	---
LBAID	**0.38*** **	**0.15*** **	**0.03**
	(14.97)	(3.02)	(0.71)
LBAIDI	-0.12**	0.05	-0.04
	(-2.04)	(0.43)	(-0.50)
LMAID	0.01***	0.01***	-0.00
	(5.78)	(2.85)	(-0.59)
LXCHR	0.16***	0.01	0.03
	(3.50)	(0.10)	(0.60)
CONTIG	---	---	---
	---	---	---
COMLANG	-0.29	1.05	---
	(-0.94)	(0.46)	---
COLONY	0.57*	-0.15	---
	(1.91)	(-0.07)	---
	common intercept (yes)	common intercept (yes)	dyadic effects (yes
	leads and lags (yes)	leads and lags (yes)	leads and lags (yes
Impact of aid in terms of US$ (rounded)	**4.14**	**1.63**	**0.00**
R-squared	0.61	0.92	0.94
N	3985	3579	3579
Log likelihood	-7965.84	-4326.08	-3835.54
Durbin-Watson-Stat.	**0.23**	**2.19**	**1.96**

Note: t-values in parentheses. Leads and lags are not reported in DOLS and DFGLS. The impact of aid was calculated as: $\beta_{\text{LBAID}} * \overline{X} / \overline{BAID} = \beta_{\text{LBAID}} * 135/12.4$. Exports and aid are in millions of current US$.

Table 6 Macroeconomic transmission channels (the long-run view)

	Investment channel (LINVY)	**Savings channel (LDSY)**	**Real exchange rate channel (LXCHR)**
	Panel DFGLS (endogeneity&autocorr. control) Eq. 5'	Panel DFGLS (endogeneity&autocorr. control) Eq. 6'	Panel DFGLS (endogeneity&autocorr. control) Eq. 7'
constant	1.97***	2.80***	6.01***
	(22.67)	(33.28)	(10.63)
LDSY	0.36***		
	(12.14)		
LEXTNSY	0.14***	-0.21***	-0.30**
	(9.21)	(-4.37)	(-2.04)
LAIDY	0.07***	-0.15***	-0.35**
	(3.39)	(-3.02)	(-2.08)
AR(1)	0.72***	0.47***	0.75***
	(22.15)	(13.84)	(22.48)
Leads and lags	yes	yes	yes
Fixed effects	yes	yes	yes
R^2	0.93	0.79	0.69
Durbin-Watson statistics	1.93	1.85	2.18

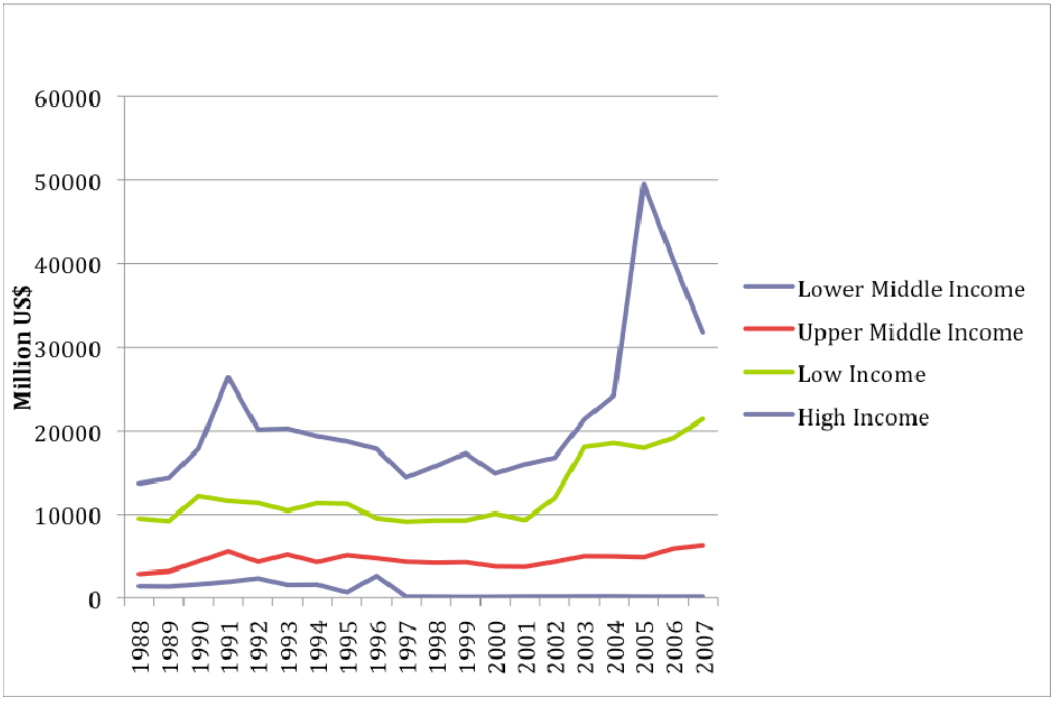
Note: t-values in parentheses. DFGLS estimation is basically a DOLS estimation in which we correct for autocorrelation. All variables are in logarithms. INY=investment-to-GDP ratio; DSY=domestic savings-to-GDP ratio; XCHR=real exchange rate (increase stands for depreciation; XCHR=100 in the year 2000); EXTNSY=net external savings (minus ODA)-to-GDP ratio; AIDY=net ODA-to-GDP ratio. AR(1)=first order autocorrelation of the disturbances.

We have tested for the macroeconomic transmission channels controlling for endogeneity and autocorrelation. For this purpose, we have applied a fixed effects Dynamic Feasible Generalized Least Squares (DFGLS) estimation[20], adding leads and lags of the explanatory variables in first differences to equations 5 to 7.

[20] Wooldridge (2009) explains how strictly exogenous explanatory variables are generated by inserting leads and lags of the first-differenced variables.

APPENDIX

Figure a. Net ODA disbursements by income group of recipient country. 1988-2007



Source: OECD

Table A1. **Summary statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
BAID	35003	2.21E+07	1.22E+08	-1.77E+07	1.12E+10
BAIDI	35003	3.85E+08	8.27E+08	-9520000	2.18E+10
MAID	46508	4.94E+09	1.43E+10	-5.53E+10	8.17E+11
X	26615	2.71E+08	1.83E+09	1	1.02E+11
M	36843	2.62E+08	1.98E+09	1	1.28E+11
XCHR	47250	118.9089	117.8249	0.0129694	2939.103
YD	51660	1.13E+12	2.05E+12	3.67E+10	1.38E+13
YR	49791	4.82E+10	1.66E+11	2.84E+07	3.38E+12
YHD	51660	24404.99	7330.851	9279.041	53432.5
YHR	47628	4738.044	7054.332	111.5047	64512.3
DIST	51660	7759.54	3791.68	270.6798	18953.23
LBAID	34921	14.49717	2.491744	9.21034	23.14166
LBAIDI	34983	5.083094	1.444329	-4.605338	9.991882
LMAID	46508	4.941066	14.30616	-55.34	816.63
LX	26615	15.54073	3.500141	0	25.34885
LM	36843	15.46038	3.423805	0	25.57454
LXCHR	49476	4.683498	1.122653	-4.345165	14.98787
LYD	51660	26.79275	1.315216	24.32498	30.25216
LYR	49791	22.65125	1.973622	17.16239	28.84957
LYHD	51660	10.05753	0.3025221	9.135513	10.88617
LYHR	47628	7.812596	1.125598	4.714067	11.07461
LDIST	51660	8.811403	0.5898773	5.600936	9.84973

Table A2. Results from panel unit root tests

Variable	ADF-Fisher Chi-square test statistics	P-value
LX	1348.87***	1.00
LYD	1368.53***	1.00
LYR	1061.61***	1.00
LYHD	1008.35***	1.00
LYHR	1109.81***	1.00
LXCHR	4089.67***	1.00
LBAID	2843.95**	0.95
LBAIDI	2041.31***	1.00
LMAID	2265.71***	1.00

Note: Null hypothesis: Unit root (individual unit root process);
*** significant at $\alpha = 1\%$; ** significant at $\alpha = 5\%$

Table A3. Results from Kao's panel cointegration test

Series in cointegration relationship: LX LD LR LHD LHR LXCHR LBAID LBAIDI LMAID		
	t-statistic	P-value
DF	-27.90	0.00
DF*	-10.68	0.00

Note: Null hypothesis: No cointegration; trend assumption: No deterministic trend; automatic lag length selection based on SIC with a max lag of 0.

Table A4: List of countries

List of recipients (j)	**130**			**List of Donors (i)**	**21**
Afghanistan	Congo, Dem. Rep.	Jamaica	Peru	Australia	
Albania	Congo, Rep.	Jordan	Philippines	Austria	
Algeria	Costa Rica	Kazakstan	Qatar	Belgium	
Angola	Cote d'Ivoire	Kenya	Rwanda	Canada	
Argentina	Croatia	Kiribati	Samoa	Denmark	
Armenia	Cuba	Korea	Saudi Arabia	Finland	
Aruba	Djibouti	Kuwait	Senegal	France	
Azerbaijan	Dominica	Laos Dem. Rep.	Seychelles	Germany	
Bahamas	Dominican Republic	Lebanon	Sierra Leone	Greece	
Bahrain	Ecuador	Lesotho	Somalia	Ireland	
Bangladesh	Egypt	Liberia	South Africa	Italy	
Barbados	El Salvador	Libya	Sri Lanka	Japan	
Belarus	Eritrea	Madagascar	Sudan	Netherlands	
Belize		Malawi	Suriname	New Zealand	
Benin	Ethiopia	Malaysia	Swaziland	Norway	
Bermuda	Fiji	Mali	Syria	Portugal	
Bhutan	Gabon	Mauritania	Taiwan	Spain	
Bolivia	Gambia	Mauritius	Tanzania	Sweden	
Bosnia and Herzegovina	Georgia	Mexico	Thailand	Switzerland	
Botswana	Ghana	Moldova	Timor-Leste	United States	
Brazil	Grenada	Mongolia	Togo	United Kingdom	
Brunei	Guatemala	Morocco	Tonga		
Burkina Faso	Guinea	Mozambique	Trinidad and Tobago		

Burundi	Guinea-Bissau	Myanmar	Tunisia
Cambodia	Guyana	Namibia	Turkey
Cameroon	Haiti	Nepal	Uganda
Cape Verde	Honduras	Nicaragua	United Arab Emirates
Central African Republic		Niger	Uruguay
Chad	India	Nigeria	Venezuela
Chile	Indonesia	Oman	Vietnam
China	Iran	Pakistan	Yemen
Colombia	Iraq	Panama	Zambia
Comoros	Israel	Paraguay	Zimbabwe

Note: Seven countries were automatically dropped from the analysis due to an insufficient number of observations when running the regressions.