

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

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## Foreign aid and recipient countries' exports: How important are improved bilateral trade relations?

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**FOREIGN AID AND RECIPIENT COUNTRIES' EXPORTS :**  
**HOW IMPORTANT ARE IMPROVED BILATERAL TRADE RELATIONS?**

**Felicitas Nowak-Lehmann D.**

Ibero-America Institute for Economic Research and Center for European, Governance and Economic  
Development Research at the University of Göttingen

**Inmaculada Martínez-Zarzoso**

Ibero-America Institute for Economic Research at the University of Göttingen and Universidad Jaume I  
(Spain)

**Adriana Cardozo**

Ibero-America Institute for Economic Research at the University of Göttingen

**Stephan Klasen**

Department of Economics, University of Göttingen

**Abstract**

*This paper uses the gravity model of trade to investigate the link between foreign aid and exports in recipient countries and tests for the transmission channels between aid and exports/economic development in developing countries. Most of the theoretical work emphasizes the negative impact of aid on recipient countries' exports primarily due to exchange rate appreciation, disregarding the positive impact of aid linked to the income effect. The empirical findings, in contrast, indicate that the net impact of aid on recipient countries' exports is positive and that the average return for recipients' exports is about 1.50 US\$ for every aid dollar spent. The paper also estimates the effect of different types of aid (bilateral aid [from one donor to one specific recipient, and bilateral aid from all the other donors to one specific recipient], as well as multilateral aid flowing to a specific recipient) and finds that at least two types of aid have a positive and significant effect on recipients' exports, thus ruling out a major crowding out effect. It is further found that aid is hardly export-enhancing in Africa.*

Key Words: International trade; foreign aid; recipient exports; exchange rate

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). The Doha Round, even though at a standstill at the moment, has the objective to lower tariff and non-tariff barriers for developing countries and to cut production- and export-related subsidies in industrialized countries in order to promote DCs' exports and their integration into the world trading system. The Millennium Development Goal number eight (MDG8: "Develop a global partnership for development") also strives for a 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.<sup>1</sup>

Overall, the "development part" of the Doha Round considers progress of trade liberalization talks between developed and developing countries and eventually a strong boost of developing countries' exports to crucially depend on market access concessions of industrialized countries (especially to the least developed countries (LDCs))<sup>2</sup> and a noticeable increase of developed countries' net ODA and Aft disbursements to LDCs. Foreign aid is seen as a means to alleviate the lack of net capital inflows to LCDs and to overcome severe supply-side constraints (physical and social infrastructure, insufficient capabilities in agriculture, manufacturing and services).

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<sup>1</sup> 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.

<sup>2</sup> Similar to the trade preferences for LCDs and other underdeveloped countries (see Everything but Arms initiative (EBA) and the Generalized System of Preferences Plus (GSP+)).

Since trade liberalization talks ask for mutual concessions, concessions from the part of developing countries to liberalize their imports do depend on an expected benefit, e.g. in terms of an increase of their exports. Therefore, it is of utmost importance to study the impact of aid on LDCs' exports to see whether they are indeed an appropriate means to promote the production of exportables in LDCs and thus enhance an export-led development which, in the end, would decrease aid-dependency of developing countries.<sup>3</sup> Also donors are more and more interested in aid effectiveness having agreed on an increase of their aid-to-GDP ratio to 0.7 percent in the year 2015, which would imply for donors like Germany a doubling of the current ratio.

Given that it is not only in the interest of recipient countries but also of donor countries to analyze and evaluate factors such as aid that influence their bilateral trade relations, it is crucial to determine whether trade relations (in terms of increased recipient countries exports and imports) are strengthened through bilateral aid and whether there is such a thing as mutual support, goodwill and familiarity between trading partners, i.e. favourable relations that might be building up through enhanced trade.

In this respect, 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 and 1989), 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 that allows to evaluate and quantify the impact on exports of a variety of factors that are able to enhance or impede exports. Exporter and importer GDPs, exporter and importer population, development aid, exchange rates and trade costs are considered important determinants of a country's exports. The major contribution of Anderson and van Wincoop (AvW) was the

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<sup>3</sup> 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.

appropriate modelling of trade costs to explain bilateral exports. 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.

We will rely on a bilateral trade model, which will be an augmented gravity model with many control variables, as we focus on bilateral trade relations between donors and recipient countries. In our case an important, underlying assumption concerning bilateral trade relations is that developing countries' exports to industrialized countries are more advantageous than exports to equally 'underdeveloped' 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. Our starting points for bilateral trade analyses are the studies done by Nilsson (1997) and Wagner (2003) who, however, focus on the effects of aid on donors' exports. We will depart from those studies by examining the export development in recipient countries, and differentiating between two types of bilateral aid and multilateral aid. Eventually, we will search for crowding out effects among different types of foreign aid and the transmission channels from development aid to exports.

Applying the augmented gravity model, we find that the increase in recipients' exports induced by donors' direct bilateral aid is quite noticeable. We observe an increase in exports, which is worth about US\$ 1.50, for every aid dollar received. Aid's average impact is around US\$ 3.00 in Asia and Latin America, but only US\$ 0.16 in Africa. In Sub-saharan Africa

aid's impact is even insignificant. Interestingly, the evidence indicates that the positive impact of bilateral aid takes time to evolve and to become visible, whereas the impact of multilateral aid is minute (around zero), but negative. This could be an indication that multilateral aid does not strengthen trade links between the North and the South. We furthermore find that the exchange rate does not play a role in the long term, whereas it does play a role in the short to medium term. Given that the gravity model leaves the transmission channels of aid unexplained we eventually test for aid's transmission channels. It turns out that aid impacts positively on investment, negatively on domestic savings (crowding out effect) and negatively on the real exchange rate (appreciation of the real exchange rate).

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. Transmission channels from aid to exports**

While it is possible to study the “total” impact of foreign aid on exports by means of export equations based on an augmented gravity model, it is not possible to identify the transmission channels from development aid to exports within this framework. The gravity framework basically catches 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, but the exchange rate effect of aid being incorporated into the exchange rate 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 potential transmission channels.

As to the first channel, we can think of aid as having an income 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). In the very long term public expenditures on health and education would generate a further supply side effect which, however, will not be tested in this paper.

As to the second 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. It is 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.

Third, next to the effect the real exchange rate we can also observe structural effects in the real economy arising from net capital inflows (Hoffmann, 1985). For simplicity we will first assume the small country case with constant terms of trade when studying the impact of aid on the production and trade. Under constant returns to scale a capital inflow in the form of development aid leads to an expansion of the industry that uses capital intensively and a squeeze in the industry that uses labor intensively (Rybczynski-Theorem, 1955). So the structure of production is altered in favor of the capital-intensive industries (this could be import substitution industries) and to the detriment of the export industries which are more likely to be labor-intensive (production of light manufactures and or agricultural goods)<sup>4</sup>. However, the impact on the structure of trade depends both on the supply-side and demand side effect. While development aid increases income we assume that the additional income is spent equally on both capital- and labor intensive products. This leads to an excess supply of the capital-intensive good and an excess demand for the labor-intensive product. Given the factor endowment in developing countries (they have a scarcity in capital and abundance in labor) this development hurts labor-intensive exports and is considered as an ultra-import biased trade effect. Assuming small country case and increasing returns to scale in the production of tradables, we expect the same effects as in the constant returns case but more pronounced. Assuming decreasing returns to scale and the small country case, we expect the same effects as in the constant returns to scale case but less pronounced. So in both cases we expect an anti-export bias if that developing country's exports are labor-intensive.

However, development aid will not have detrimental effects on the production and trade structure if the labor force outgrows capital accumulation. In this case labor gets

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<sup>4</sup> We would assume that the ores, steel, copper, oil, natural gas industries are capital intensive export industries.



relatively cheaper and capital gets more expensive. The wage-return to capital rate ratio declines and the production process becomes more labor-intensive. If comparative advantage is based on an abundance of labor and a scarcity of capital then this will strengthen labor-intensive exports industries and promote recipient country's exports.

To summarize, economic theory indicates that development aid is associated with three different effects that can occur in theory: first, an income effect that 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).<sup>5</sup> 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). Third, development aid can influence the structure and capital intensity of an economy. However, it will hardly have any structural effects if capital inflows go hand in hand with a strong population/ labor force growth.

### **3. Description of the Data**

#### **3.1 Development Aid**

The Development Assistance Committee (DAC) is the section of the OECD which deals with development co-operation matters of its member states (donors). The aid given by its members is reported as official development aid (ODA) and other official flows (OOF).

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<sup>5</sup> 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.

OOF are other official sector transactions which do not meet ODA criteria<sup>6</sup> and are therefore disregarded in our analysis.

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

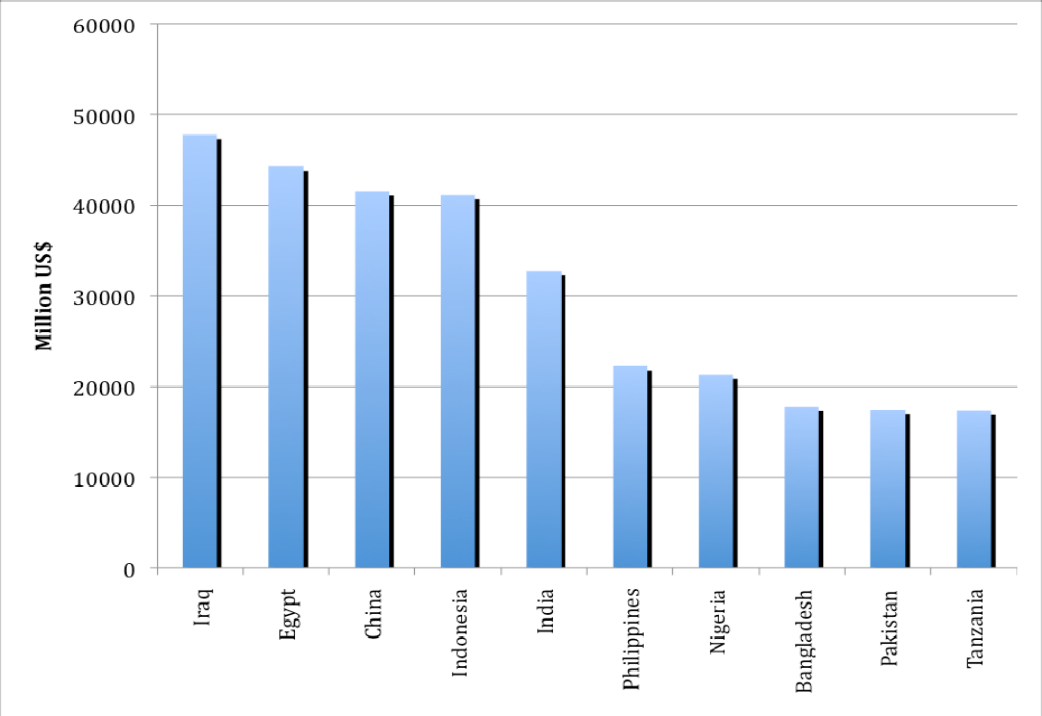
The **total net ODA Disbursements** are the sum of grants, capital subscriptions, total net loans and other long-term capital. The grants include debt forgiveness and interest subsidies in associated financing packages. The capital subscriptions to multilateral organizations are made in the form of notes and similar instruments unconditionally encashable 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 in the 1980-2007 period. Iraq is the largest recipient followed by Egypt, China and Indonesia.

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<sup>6</sup> 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 1.** Ten largest recipients of Net ODA (1988-2007)

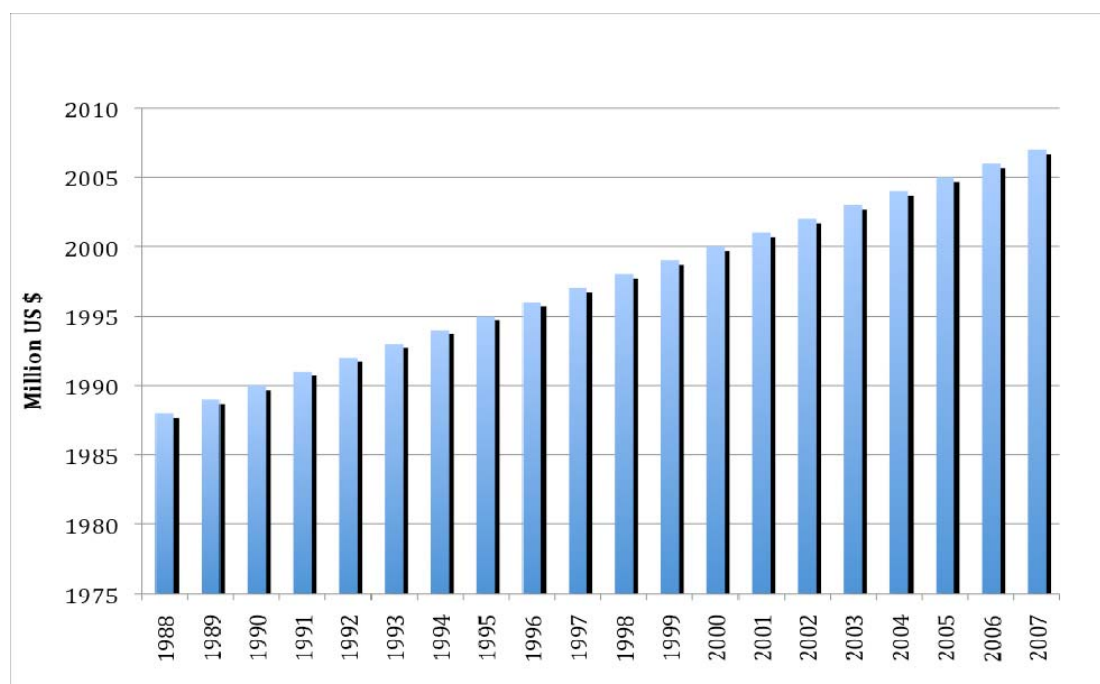


Source: OECD

Figure 2 shows that net ODA disbursement have steadily increased over the 1988-2007 period. The signing of the UN-Declaration of the Millennium Development goals in 2000 certainly helped to push up net ODA disbursements.

Table 1 shows the ODA-GDP ratio of the biggest recipients of ODA in selected years. 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 2. Net ODA disbursements by Year 1988-2007 (Million USD)



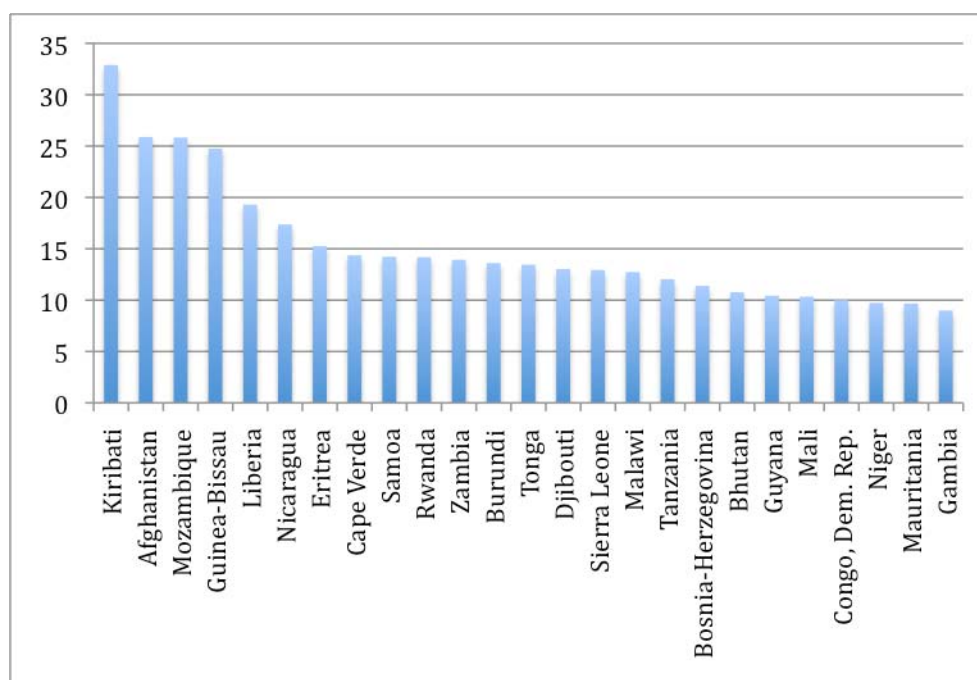
Source: OECD

**Table 1. ODA as percentage of recipient's GDP. Highest 20 observed ratios between 1988 and 2007 in selected years**

Country	Year	ODA as % of GDP
Congo, Dem. Rep.	2003	90.9
Liberia	1996	71.4
Rwanda	1994	65.2
Kiribati	1992	64.8
Nicaragua	1991	63.5
Mozambique	1992	56.0
Guinea-Bissau	1994	52.4
Guyana	1991	46.3
Bosnia-Herzegovina	1995	39.3
Burundi	2004	32.6
Afghanistan	2005	31.6
Eritrea	2003	31.1
Albania	1991	28.3
Sierra Leone	1993	27.1
Haiti	1994	26.4

Samoa	1993	25.3
Zambia	1992	24.8
Egypt	1991	24.5
Congo, Rep.	2005	23.8
Cape Verde	1990	22.4

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



Since 2005 **Aid for Trade** which is part of ODA (usually around 20 per cent of ODA) has received more attention and is seen as the key factor that is supposed to contribute to the trade development in recipient countries. Aid for Trade consists of three spending categories/groups (1) technical assistance to trade<sup>7</sup>, (2) trade-related infrastructure and (3) capacity building through the promotion of capabilities in all trade-related sectors (agriculture, manufacturing, energy, telecommunications), but figures on Aid for Trade have only been imputed and compiled since 2002.

<sup>7</sup> Capabilities of DCs in trade negotiations have to be strengthened and structural adjustment has to be buffered by aid for trade disbursements.

**Table 2. Trade for Aid. Commitments and disbursements by income group and aid category**

Year	Groups	Least Developed	Other Low Income	Lower Middle Income	Upper Middle Income	MADCT, Total
Commitments ODA by Income Groups, 2007						
2007	1	70.77	31.51	182.16	17.52	0
2007	2	5010.9	2698.64	4461.57	644.07	0.58
2007	3	2770.41	1506.85	4067.22	967.55	0.69
Disbursements ODA by Income Groups, 2007						
2007	1	145.72	33.38	137.7	36.51	0
2007	2	1725.79	900.2	4533.44	750.48	0.58
2007	3	1845.21	766.72	2880.06	927.4	0.68

Source: OECD; group 1: technical assistance to trade; 2: trade-related infrastructure; 3: capacity building

In the year 2007 (and also for earlier years) we observe that commitments usually exceeded disbursements in categories (groups) 2 and 3. Table 2 also shows that the lower middle income countries received the bulk of Aid for Trade (Aft).

The 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. (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  $0.1 * 50 \text{ million} = \text{USD } 5 \text{ million}$ ). 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. In practice, imputed multilateral percentages are calculated for about 20 agencies per year. These account for about 90% of donors' multilateral ODA. Total imputed multilateral flows in combination with bilateral ODA are assumed to provide the most complete picture possible of the total ODA effort the donor makes with respect to individual recipient countries. Finally, it is worth noting that any methodology for imputing multilateral flows can only be an approximation also because multilateral flows in a given year are not exactly imputable to donors' contributions in that year.

### 3.2 Data Sources

The used data sets are the following ones: Official Development Aid data are from the OECD Development Database on Aid from DAC Members. We consider net ODA disbursements in current US\$<sup>8</sup>, 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<sup>9</sup>. 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>).

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<sup>8</sup> The gross amount comprises total grants and loans extended (according to DAC).

<sup>9</sup> The IFS and WDI statistics are not adjusted for currency reforms and therefore very problematic. The data had to be corrected by the authors.



## 4. Model specification and main results

### 4.1 Model specification

The gravity model of trade is nowadays the most commonly accepted framework to model bilateral trade flows (Anderson, 1979; Bergstrand, 1985; Anderson and Van Wincoop, 2003). According to the underlying theory, 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, or a 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 aid (ODA), from a specific donor and the rest of the donors to a recipient country. Among the variables that might also influence trade we add imputed multilateral aid. The augmented gravity model is specified as

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

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<sup>10</sup> of the donor (recipient),  $YHD_i$  ( $YHR_j$ ) are donor (recipient) GDPs per capita,  $DIST_{ij}$  is geographical distances between countries  $i$  and  $j$ .  $BAID_{ij}$  is bilateral net official development aid from donor  $i$  to country  $j$  in current US\$;  $BAIDI_j$  is bilateral net ODA from all the other donors (excluding  $i$ ) to recipient  $j$  and  $MAID_{ij}$  is imputed

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<sup>10</sup> 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).

multilateral development aid from donor  $i$  to country  $j$  in current US\$. The rationale 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<sup>11</sup> 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

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

where:

$L$  denotes variables in natural logs.  $\phi_t$  are specific time effects that control for omitted variables common to all trade flows but which vary over time.  $\delta_{ij}$  are trading-partner fixed effects that proxy for 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 in a fixed effects model of bilateral trade.

The model will be estimated for data on 21 donors' exports and development aid (ODA) to 130 recipient countries during the period from 1988 to 2007. It is further estimated by restricting the coefficients of the right hand side variables to be equal for each aid recipient.

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<sup>11</sup> When the gravity model is estimated using panel data it is recommended to add bilateral exchange rates also as a control variable (Carrere, 2006).

In a first step, the model is estimated as a long-run model (eq. 3) following the dynamic OLS procedure (DOLS) proposed by Stock and Watson (1993) controlling for endogeneity of the explanatory variables. As we also control for autocorrelation and heteroskedasticity of the error terms, we eventually estimate the model by means of panel dynamic feasible generalized least squares (DFGLS). 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.<sup>12</sup> 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 cointegration test (see tables in the appendix for test results).

$$\begin{aligned}
LX_{ijt} = & \gamma_0 + \delta_{ij} + \alpha_1 LYD_{it} + \alpha_2 LYR_{jt} + \alpha_3 LYHD_{it} + \alpha_4 LYHR_{jt} + \\
& \alpha_5 LBAID_{ijt} + \alpha_6 LBAIDI_{jt} + \alpha_7 LMAID_{ijt} + \alpha_8 LXCHR_{ijt} + \alpha_9 LDIST_{ij} + \\
& \beta \text{ dummies}_{ij} + \sum_{p=-2}^{p=+2} \theta_{1p} \Delta LYD_{ijt-p} + \dots + \sum_{p=-2}^{p=+2} \theta_{kp} \Delta LXCHR_{ijt-p} + \eta_{ijt}
\end{aligned}
\tag{3}$$

In a second step, the model is estimated as an autoregressive distributed lag (ADL) model (eq. 4) (Greene, 2000). This model gives us both short- and long-term coefficients and controls for autocorrelation and heteroskedasticity and is estimated via panel FGLS.<sup>13</sup>

<sup>12</sup> 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.

<sup>13</sup> The Granger-causality test which was performed before running the regression based on equation (4) indicated exogeneity of the right-hand variables in the short-to medium run. Therefore the explanatory variables were not instrumented.

$$\begin{aligned}
LX_{ijt} = & \gamma_0 + \delta_{ij} + \theta_t + \sum_{p=1}^{p=2} \lambda_p LX_{ijt-p} + \sum_{p=0}^{p=2} \alpha_{1p} LYD_{it-p} + \sum_{p=0}^{p=2} \alpha_{2p} LYR_{jt-p} + \\
& \sum_{p=0}^{p=2} \alpha_{3p} LYHD_{it-p} + \sum_{p=0}^{p=2} \alpha_{4p} LYHR_{jt-p} + \sum_{p=0}^{p=2} \alpha_{5p} LBAID_{ijt-p} + \sum_{p=0}^{p=2} \alpha_{6p} LBAIDI_{jt-p} + \\
& \sum_{p=0}^{p=2} \alpha_{7p} LMAID_{ijt-p} + \sum_{p=0}^{p=2} \alpha_{8p} LXCHR_{ijt-p} + \alpha_9 LDIST_{ij} + \beta' dummies_{ij} + \eta_{ijt}
\end{aligned} \tag{4}$$

Alternatively, the model could be estimated as a partial adjustment model

$$\begin{aligned}
LX_{ijt} = & \gamma_0 + \delta_{ij} + \theta_t + \lambda LX_{ijt-1} + \alpha_1 LYD_{it} + \alpha_2 LYR_{jt} + \alpha_3 LYHD_{it} + \\
& \alpha_4 LYHR_{jt} + \alpha_5 LBAID_{ijt} + \alpha_6 LBAIDI_{jt} + \alpha_7 LMAID_{ijt} + \alpha_8 LXCHR_{ijt} + \\
& \alpha_9 LDIST_{ij} + \beta' dummies_{ij} + \eta_{ijt}
\end{aligned} \tag{5}$$

by means of Generalized Method of Moments (GMM). We have estimated the model by GMM, but report the results only in the Appendix as the model did not pass the test on second order autocorrelation in first differences implying that the instruments used become invalid.

## 4.2. Main Results

Table 3 reports the main estimation results that are relevant in the long run.

We start by reporting the pooled OLS results (column 1) which indicate quite a high, positive impact of bilateral aid on recipient exports (a one dollar increase in bilateral aid increases recipient exports by US\$ 1.64)<sup>14</sup>. These results have to be taken with caution as they disregard heteroskedasticity and autocorrelation of the error terms and are therefore inefficient if both problems occur. Besides, OLS delivers biased and inconsistent estimates if right-hand side variables are endogenous.

Since our data consists of a time span of a maximum of 20 years and a cross-section of 130 countries, we tested for the presence of autocorrelation and heteroskedasticity. The results of the Wooldridge test for autocorrelation in panel data and the LR test for heteroskedasticity

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<sup>14</sup> The monetary impact of bilateral aid is calculated according to the following formula: Coefficient<sub>BAID</sub> = MEAN of X / MEAN of BAID, i.e. 0.134 \* 271000000 / 22100000 = US \$ 1.64

indicate that both problems are present in the data. Hence, given the strong rejection of the null in both tests, the model is estimated by means of dynamic feasible generalized least square (DFGLS). The second column shows the DFGLS results. Individual (country-pair) effects are assumed to be random 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 (2003). We rely on the DFGLS estimates with random effects, since they are more efficient than the fixed effect estimates (the within estimates). The DFGLS estimations in which we control for heteroskedasticity and autocorrelation of the error terms remain therefore our estimation method of choice.

With respect to the variable of interest, bilateral aid (LBAID), controlling for autocorrelation via DFGLS does change and slightly reduce the positive impact of the aid variables on recipients’ export trade (compare column 2 to the OLS results in column 1). A one dollar increase in bilateral aid increases recipient exports by US\$ 1.50<sup>15</sup>). From now on we will relate to the results estimated by DFGLS and depicted in column 2.

Bilateral aid given by other donors (LBAIDI) also has a positive effect on the exports of a specific donor-recipient pair and therefore does not reduce the effect of bilateral aid in a specific recipient country. Multilateral aid given by international organizations (LMAID) does impact slightly negatively on recipient countries exports, but its effect is minute. So overall, there is no observable crowding out effect from these two alternative sources of aid. This suggests that overall recipients’ exports are positively influenced by aid given by other DAC members. We could have expected, however, a negative relationship: when other donors give higher amounts of aid, the “goodwill” and “habit formation” factors mentioned above could decrease recipients’ exports generating an indirect negative effect on a specific recipient’s exports.

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<sup>15</sup> The monetary impact of bilateral aid is calculated according to the following formula:  
Coefficient<sub>BAID</sub> = MEAN of X / MEAN of BAID, i.e.  $0.122 * 271000000 / 22100000 = \text{US } \$ 1.50$ .

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

**Table 3. Development aid and recipients' exports (long-run model)**

	<b>OLS-benchmark (inconsistent and inefficient) (1)</b>	<b>Dynamic Feasible Generalized Least Squares (DFGLS) (2)</b>
LYD	1.005*** (55.742)	0.995*** (140.756)
LYR	1.149*** (85.014)	1.196*** (169.071)
LYHD	-1.456*** (-12.886)	-1.199*** (-31.238)
LYHR	0.298*** (10.719)	0.282*** (18.616)
LBAID	0.134*** (15.290)	0.122*** (28.721)
LBAIDI	0.075*** (3.894)	0.033*** (2.821)
LMAID	0 (-0.721)	-0.001** (-2.08)
LXCHR	0.068*** (3.695)	0.005 (0.379)
LDIST	-0.612*** (-26.631)	-0.622*** (-40.565)
CONTIG	0.506* (1.654)	2.302*** (7.113)
COMLANG	0.863*** (14.302)	1.087*** (45.157)
COLONY	0.896*** (12.675)	0.791*** (17.19)
_cons	-22.762*** (-18.182)	-25.651*** (-50.905)
	year dummies (yes)	leads and lags (yes)
R-squared	0.607	
N	18779	12391

LI	-40540.84	
Rmse	2,097,515	
Note: t-values in parentheses. Year dummies are not reported in OLS. Leads and lags are not reported in DFGLS		

recipients' income per capita is positive and statistically significant at the 1 percent level in all specifications. The effect of distance is negative as expected. 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 dummy variables contiguity, common language and former colony all have the expected positive sign. The year dummies (not reported in the OLS-results of Table 3) are all positive and significant and increasing over the years, thus implying a strengthened integration of developing countries into the world trading system in the last twenty years.

Table 4 shows the regression results of the dynamic models (Equation 4) which depict the transition. It contains the results of the regression formulated as an autoregressive distributed lag model ADL(2, 2) which starts out with two lags of the dependent and the independent variables. This model is obtained by applying Hendry's general- to-specific method and is estimated by panel FGLS (left-hand side of the table). The alternative dynamic model used is a partial adjustment model (with a lagged dependent variable) and is estimated by GMM (see Table A4 in the Appendix). The results show that autocorrelation was present in GMM, thus causing invalidity of our instruments.

**Table 4. Development aid and recipients' exports in the short-to-medium run**

	Short to Medium Run ADL(2,2)-Model (FGLS)	
	Without time dummies	With time dummies

L.LX	0.610***	0.622***
	(391.562)	(161.352)
L2.LX	0.286***	0.282***
	(99.439)	(76.243)
LYD	0.640***	0.087***
	(25.769)	(21.719)
L.LYD	-0.379***	0
	(-11.910)	.
L2.LYD	-0.164***	0
	(-8.086)	.
LYR	0.225***	0.197***
	(10.255)	(8.989)
L.LYR	-0.122***	-0.101***
	(-5.567)	(-4.659)
LYHD	0.767***	0.330***
	(11.181)	(4.798)
L.LYHD	-1.074***	0
	(-11.182)	.
L2.LYHD	0.149*	-0.493***
	(1.923)	(-7.321)
LYHR	0.588***	0.410***
	(9.300)	(10.319)
L.LYHR	-0.151*	0
	(-1.814)	.
L2.LYHR	-0.397***	-0.382***
	(-7.611)	(-9.676)
LBAID	0.006***	0.008***
	(2.922)	(3.557)
L.LBAID	0.008***	0.009***
	(3.419)	(3.754)
L2.LBAID	0.006***	0.002
	(2.58)	(0.973)
LBAIDI	-0.012**	-0.009
	(-2.438)	(-1.583)
L2.LBAIDI	0.036***	0.029***
	(7.467)	(5.341)
LXCHR	-0.025**	-0.030**
	(-1.984)	(-2.546)
L.LXCHR	0.056***	0.096***
	(3.199)	(5.394)
L2.LXCHR	-0.035***	-0.043***
	(-3.646)	(-4.441)
LDIST	-0.070***	-0.072***



	(-15.175)	(-14.966)
COMLANG	0.067***	0.068***
	(6.235)	(6.150)
COLONY	0.076***	0.065***
	(6.468)	(4.986)
_cons	-1.876***	-1.517***
	(-10.758)	(-7.798)
R-squared		
N	13685	13685

In the short-to medium run the exchange rate has the expected negative impact on recipient countries' exports, i.e. the appreciation leads to a decline in exports. As to bilateral aid, it is often argued that aid ceases to have a positive impact after a certain time has elapsed. From the short-to medium run model (Table 4) we can infer that the effect of bilateral aid is indeed non-linear over time and of an inverse u-shape<sup>16</sup>, i.e. it increases, reaches a maximum after one period and then decreases again. The impact of bilateral aid takes up to two years to evolve. We observe that current, one- and two period lagged bilateral aid all contribute to current recipients' exports. The short-to medium run impact of a one dollar rise in aid is around US\$ 0.25, which is about one sixth of the long-run effect.<sup>17</sup>

### 4.3 Transmission Channels from Aid to Exports

In a third step, we tested for three transmission channels (see Table 5). The models referring to the transmission channels are estimated via Dynamic Feasible Generalized Least

<sup>16</sup> Non-linear effects of aid with increasing amounts of aid (decreasing returns of aid) were tested in a short-to medium term model. These effects were not encountered. The coefficients on the squared aid terms were insignificant.

<sup>17</sup> The monetary impact of bilateral aid is calculated according to the following formula:  
Coefficient<sub>LB<sub>AID</sub></sub> = MEAN of X / MEAN of BAID, i.e.  $0.02 * 271000000 / 22100000 = \text{US } \$ 0.245$ .

Squares (DFGLS), i.e. Dynamic Ordinary Least Squares (DOLS) controlling for autocorrelation) including fixed effects. First, the effect of aid (more specifically, the net ODA-to-GDP ratio) on the investment-to-GDP ratio (LINVY) controlling for domestic savings (the domestic savings-to-GDP ratio) and net external savings minus net ODA (LEXTNSY) is estimated (see column 1). Aid has a very small positive, but significant impact on investment. Second, the impact on the domestic savings-to-GDP ratio is evaluated (see column 2). It turns out that aid does have a significant, negative impact on domestic savings, thus indicating a crowding out effect. Third, the Dutch disease effect is tested (see column 3). The impact of aid is -0.35 which implies a noticeable real appreciation (Dutch disease) effect. A 10 percent increase in the net ODA-to-GDP ratio (e.g. from 5.0 to 5.5 percent) leads to an appreciation of 3.5 percent.

To sum up, given that control for autocorrelation is indispensable and DFGLS the method of choice, we can conclude that aid impacts significantly on investment, domestic savings and the real exchange rate. It impacts positively on investment and negatively on domestic savings. Furthermore, it goes hand in hand with a Dutch disease effect. This finding supports the supply-side effect detected by the gravity model and the demand-side effect that is due to an appreciation of the real exchange rate, but not relevant in the long term. The latter effect is hidden in the exchange rate effect of the gravity model.

**Table 5** Transmission channels

	<b>Investment channel (LINVY)</b>	<b>Savings Channel (LSY)</b>	<b>Real exchange rate channel (LRER)</b>
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	Panel DFGLS (autocorr. control)	Panel DFGLS (autocorr. control)	Panel DFGLS (autocorr. control)
constant	1.97*** (22.67)	2.80*** (33.28)	6.01*** (10.63)
LSY	0.36*** (12.14)		
LEXTNSY	0.14*** (9.21)	-0.21*** (-4.37)	-0.30** (-2.04)
LODA	0.07*** (3.39)	-0.15*** (-3.02)	-0.35** (-2.08)
AR(1)	0.72*** (22.15)	0.47*** (13.84)	0.75*** (22.48)
Leads and lags	yes	yes	yes
R <sup>2</sup>	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; SY=domestic savings-to-GDP ratio; RER=real exchange rate (increase stands for depreciation; RER=100 in the year 2000); EXTNSY=net external savings minus ODA; ODA=net ODA-to-GDP ratio. AR(1)=first order autocorrelation of the disturbances.

## 5. Robustness Checks

Furthermore, we checked the robustness of the results by employing imports from donor countries as dependent variable (mirror statistics). 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, in other specifications there clearly was a sample selection bias. This issue has to be settled in further research.<sup>18</sup>

We further tested whether the results were similar across different regions of the world. Our hypothesis that Africa would fare worse than Latin America or Asia found support in the data. In Table 5 we only report the long-run coefficient of bilateral aid from donor *i* to recipient *j* and the average impact of this type of bilateral aid on recipient exports. In Africa aid's impact on African exports into donor countries is extremely low. One dollar of aid increases African exports by US\$ 0.16, whereas exports increase by US\$ 3.22 in Asia and by US\$ 2.98 in Latin America and the Caribbean for each dollar received as aid. The long-run coefficient of bilateral aid for Sub-saharan Africa was positive, but not significant. It was negative, but not significant for the Eastern European and Central Asian countries.

### **Table 6. Different impact of bilateral aid in different regions of the world**

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<sup>18</sup> Results are available upon request.

	<b>Developing countries</b>	<b>Africa</b>	<b>Asia</b>	<b>Latin America &amp; Caribbean</b>
<b>Coefficient (<math>\beta_{LBAID}</math>)</b>	0.122***	0.03***	0.139***	0.274***
<b>Mean of exports (<math>\bar{X}</math>) in millions of US\$</b>	271	114	874	135
<b>Mean of bilateral aid (<math>\overline{BAID}</math>) in millions of US\$</b>	22.1	21.9	37.7	12.4
<b>Impact of aid in terms of US\$ (rounded)</b>	US\$ 1.50	US\$ 0.16	US\$ 3.22	US\$ 2.98

Note: Impact of aid was calculated as:  $\beta_{LBAID} * \bar{X} / \overline{BAID}$ . Exports and aid are in current US\$.

## 6. Conclusions

The empirical analysis showed that development aid has a positive and significant impact on recipient countries exports in Asia and Latin America and the Caribbean, whereas aid's impact on exports is hardly noticeable in Africa. In the successful countries, the income effect of aid seems to translate into more consumption and investment thereby expanding the productive capacity not only in the overall economy but also in the export industry of the recipient countries. This effect evolves slowly so that the specification with aid in lags reflects the adjustment over time. Furthermore, we could not detect crowding out effects between different types of bilateral and multilateral aid. In the short-to medium run, the exchange rate seemed to influence recipient countries' exports in the expected way, i.e. an appreciation of the recipient country's bilateral exchange rate led to a decrease in its exports. In the long run, this effect was absent. Overall, it seems that the income (supply side) effect is dominant and the Dutch disease effect of development aid, which has been emphasized in theoretical models, is

less severe in econometric models with elasticities determined by real data and only present in the short- to medium run.

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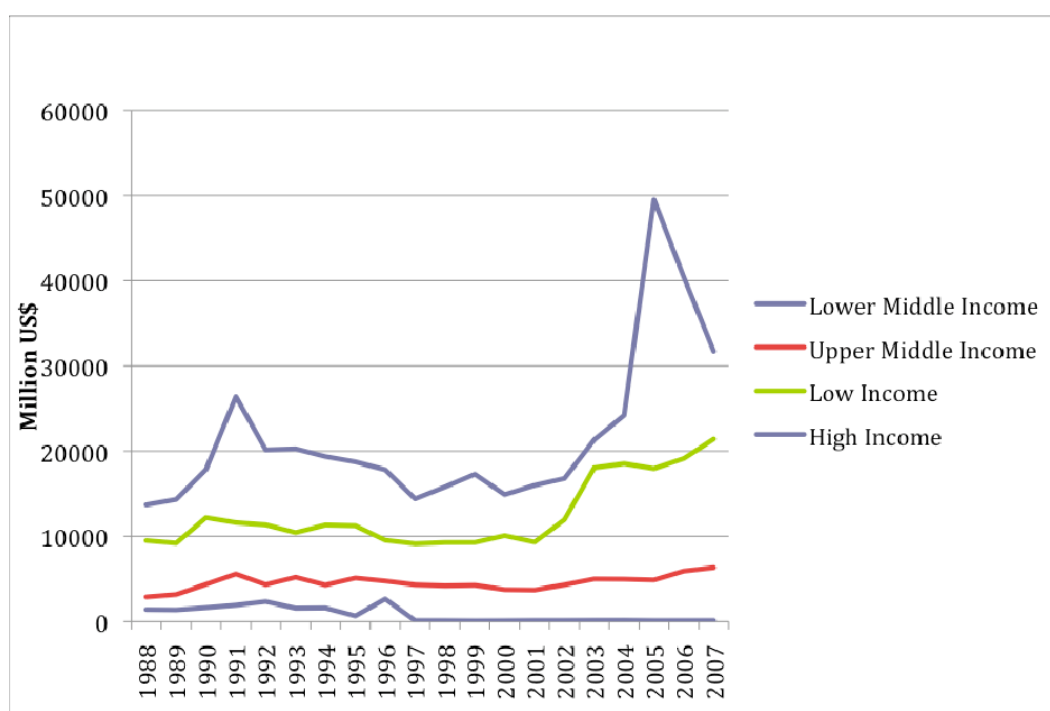
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## APPENDIX

**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.** Results from the partial adjustment model

Partial Adjustment Model (GMM)	
	b/t
L.LX	0.542*** (8.042)
LYD	0.429*** (4.837)
LYR	0.514*** (6.664)
LYHD	-0.468* (-1.882)
LYHR	0.087* (1.712)
LBAID	0.059 (1.044)
LBAIDI	0.018 (0.545)
LMAID	-0.000 (-0.484)
LXCHR	0.028 (1.406)
LDIST	-0.282*** (-5.251)
CONTIG	0.206 (0.690)
COMLANG	0.351*** (3.540)
COLONY	0.399*** (2.803)
_cons	-10.806*** -3.004

R-squared	
N	16754

Arellano-Bond test for AR(1) in first differences:  $z = -8.63$   $Pr > z = 0.000$

Arellano-Bond test for AR(2) in first differences:  $z = 3.87$   $Pr > z = 0.000$

Sargan test of overid. restrictions:  $\chi^2(140) = 263.29$   $Prob > \chi^2 = 0.000$ . (Not robust, but not weakened by many instruments.)

**Table A5:** List of countries

List of recipients (j)	132			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	Estonia	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	Hungary	Niger	Uruguay		
Chad	India	Nigeria	Venezuela		
Chile	Indonesia	Oman	Vietnam		
China	Iran	Pakistan	Yemen		
Colombia	Iraq	Panama	Zambia		
Comoros	Israel	Paraguay	Zimbabwe		