# Is Aid for Trade Effective?

# A Quantile Regression Approach

By

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**Abstract**
This paper investigates using panel data and panel-quantile regression whether AfT improves export performance, i.e. is AfT associated with higher exports? Our results suggest that overall AfT-disbursements promote exports of goods and services mainly for the 50 and 75 quantiles and the effect essentially vanishes at the lower tail of the conditional distribution of exports. Hence, countries that export more are those benefiting from aid for trade. We also investigate which specific types of AfT are effective. In particular, aid used to build production capacity is found to be effective. This type of AfT is associated with higher exports for almost all quantiles, with the effect increasing at the upper tail of the conditional distribution. Also aid used to build infrastructure is found to affect exports at the upper tail of the distribution. In contrast, aid for trade policy and regulations and, for comparison aid disbursed to general budget support that is not considered as a targeted component of aid, are not associated with higher exports and this holds irrespective of the quantile.

**Key Words:** development aid; North-South trade; aid for trade; panel data; aid effectiveness
**JEL Codes**: F10

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## 1. Introduction

Aid for Trade (AfT) became a buzz word in aid policy a few years ago, yet it is far from being a new concept in development policy (Evenett, 2009). Already in the Uruguay Round (1986-1994) developing countries have demanded compensation payments for concessions made in trade liberalization negotiations[1] and have pledged for increases in development aid to be better able to integrate into the world trading system. Aid that serves this latter objective is usually considered as AfT. As trade liberalization negotiations had become more difficult in the late 1990s and early 2000s given that the "easier" concessions had already been made on both sides (developed and developing countries), the WTO-members separated the AfT initiative from the DOHA Round negotiations and established a WTO 'Aid for Trade Task Force' in July 2006. According to the WTO task force on Aid for Trade (AfT): *"[AfT] is about assisting developing countries to increase exports of goods and services, to integrate into the multilateral trading system, and to benefit from liberalised trade and increased market access. Effective [AfT] will enhance growth prospects and reduce poverty, as well as complement multilateral trade reforms and distribute the global benefits more equitably across and within developing countries."*

(Cited in OECD/WTO, 2011: 9.)

That is, the objectives of the AfT initiative were to promote growth and development through trade in all developing countries (especially in the least developed countries (LDCs)) and through integration into the world trading system. This should be achieved through more aid for trade-related infrastructure, for developing production capacity and capabilities and for support in negotiations concerning trade policy regulation and trade liberalization. As AfT is considered

[1] Compensation payments for trade liberalization were the original type of AfT.
[2] Rajan and Subramanian (2009) investigated different types of aid but could not establish significant differences between these types either.
[3] Through this paper we name this type of aid "aid to economic infrastructure".
[4] I.e. they analyse the effect of AfT on *merchandise exports*.
[5] Aid to economic infrastructure (which is part of overall AfT and is, among others, used to build roads and ports),

an important instrument of development aid, the EU, the USA and Japan made non-binding concessions to increase AfT disbursements, but in general the means for AfT have not increased substantially (García, 2008; Luke, 2009; Huchet-Bourdon et al., 2009; Karingi, 2009). In the period 2002-2009 AfT was in between 20 % and 30% of total official development aid. The AfT share in total ODA in Africa has shrank from 29% in 2002 to 21% in 2006. While AfT increased in absolute terms in this period, non-AfT increased faster than AfT (Karingi, 2009).

Especially the ineffectiveness of the overall ODA in terms of promoting trade and economic growth in developing countries caught the attention of development economists (Doucouliagos and Paldam, 2008; Rajan and Subramanian, 2008; Nowak-Lehmann D. et al., 2012; Nowak-Lehmann D. et al., (2013)). These studies found ODA to be ineffective, i.e. having an insignificant impact on increasing per capita income and recipient countries' exports. However, these studies did not differentiate[2] among different types of aid, such as AfT, technical assistance, humanitarian aid, sector-specific aid etc., and it could be that for this reason were unable to find a positive impact of aid. Thus, a promising way to directly overcome the ineffectiveness of aid might be to give aid for specific purposes, namely for trade, and eventually by monitoring and evaluating the effects of giving aid. Some authors indicate that aid ineffectiveness could also be due to structural factors, such as underdeveloped infrastructure and lack of capabilities in developing countries. Insufficient capabilities can be related to the production process, trade negotiations or the ability to improve institutions. Thus, a practical measure in the AfT framework would be to provide aid for economic infrastructure and to enhance developing countries' capabilities through a more pragmatic aid orientation.

Given the objectives of AfT, the old question arises once again: Will AfT be effective? In this paper we aim at making some progress in answering it. In particular, we investigate whether AfT is associated with higher exports of goods and services. To the best of our knowledge, relatively little research has been done on AfT-effectiveness and most of the work consists of

[2] Rajan and Subramanian (2009) investigated different types of aid but could not establish significant differences between these types either.

case-studies at the country level. As pointed out by Vijil and Wagner (2012), empirical studies that analyse the effectiveness of AfT are scarce.

Two main approaches have been commonly used to assess AfT-effectiveness. The first consists of investigating whether AfT reduces the cost of trading or other impediments to trade and the second approach, taken in this paper, analyses whether AfT is associated with improved export performance (measured by the value of exports of goods and services). Most of the studies undertaken have found a positive relationship between AfT or some of its components and trade-related outcomes. Among those studies, Bearce et al. (2013) find that AfT issued by the US government has a positive effect on the recipient countries' export performance, Vijil and Wagner (2012) suggest that aid to trade-related infrastructure[3], as part of overall AfT, has a positive impact on exports as a ratio to GDP, whereas Cali and Te Velde (2011: 725) find that AfT has an overall positive and significant effect on exports and also lowers trade costs. These findings are also in line with Milner, Morrissey and Zgovu (2008). Both, Vijil and Wagner (2012) and Cali and Te Velde (2011) emphasize that the infrastructure channel is the main driver of AfT-effectiveness. However, Helble, Mann and Wilson (2012) show that aid to trade policy and regulation (which is another AfT-category) is effective, too. The authors find that a 1 percent increase in aid to trade policy and regulation increases trade by around US$ 818 million. Hühne et al. (2013) investigate the impact of AfT both for donor and recipient countries. As to recipient countries, they find both total AfT and its components (infrastructure-related aid, aid to building productive capacity and aid to trade policy and regulation) to be effective. However, when splitting the sample into income and regional groups the results become more mixed. AfT tends to favour more the richer developing countries and the Asian and Latin American region.

The main contribution of this paper to the existent literature is to take a closer look at these mixed results. To this end, we use a different methodology, panel-quantile regression,

[3] Through this paper we name this type of aid "aid to economic infrastructure".

which allows us to investigate whether AfT has a different effect for different quantiles of the distribution of exports and thus favours countries that already possess a certain export strength.

The main results show that AfT-disbursements promote exports of goods and services mainly for the 50 and 75 quantiles, whereas the effect essentially vanishes at the lower tail of the conditional distribution of exports. Hence, countries that export more are those benefitting from aid for trade. In particular, aid used to build production capacity is found to be effective. This type of AfT is associated with higher exports for almost all quantiles, with the effect increasing at the upper tail of the conditional distribution. Also aid used to build infrastructure is found to affect exports at the upper tail of the distribution. In contrast, aid for trade policy and regulations and, for comparison aid disbursed to general budget support, which is considered as an untargeted component of aid, are not associated with higher exports and this holds irrespective of the quantile.

The paper proceeds as follows. Section 2 presents the empirical model that will be used to analyse AfT-effectiveness. In Section 3, we will discuss variables, data and descriptive statistics. Regression results are presented and evaluated in Section 4 and Section 5 concludes.

## 2. Empirical Model

### *2.1 Baseline model*

As a framework for analysis we have chosen to estimate the model proposed by Cali and Te Velde (2011) and to fill it with the most recent AfT data. The authors identify the types of aid for trade can help address governance failures in developing countries by associating the main aid categories, as classified by the OECD statistics, with a number of goals that are related to trade performance, e.g. aid for trade policy and regulations should help to improve weak institutions. They also refer to the complexity of the economic channels through which aid for trade affects export performance, which involve Dutch disease effects as well as direct and indirect competitiveness effects but claim that the causality is in any case less complex than the

aid-economic growth link. The OECD distinguishes basically five categories of AfT: (1) technical assistance for trade policy and regulations (e.g. helping countries to develop trade strategies, negotiate trade agreements, and implement their outcomes); (2) trade-related infrastructure (e.g. building roads, ports, and telecommunication networks to connect domestic markets to the global economy); (3) productive capacity building, including trade development (e.g. supporting the private sector to exploit their comparative advantages and diversify their exports); (4) trade related adjustment (e.g. helping developing countries with the costs associated with trade liberalization, such as tariff reductions, preference erosion, or declining terms of trade); (5) other trade-related needs, if identified as trade related development priorities in partner countries' national development strategies (OECD, 2014). For reasons of data availability we limit our analysis to the first three categories of AfT.

The empirical model used to analyse AfT-effectiveness is an export demand equation augmented with aid for trade variables as proposed by Cali and Te Velde (2011). The model is given by,

$$Exp_{it} = \beta_0 + \sum_k \beta_k X_{kit} + \sum_l \beta_l D_{lt} + \varepsilon_{it} \qquad (1)$$

where $Exp_{it}$ denotes exports of country $i$ in year $t$, the $X_{kit}$ variables are observed explanatory (such as AfT) and control variables, the $D_{lt}$ variables are time dummies and $\mathcal{E}_{it}$ is the error term. One may then use a *(pooled) OLS regression* to fit the model. The problem of the afore-mentioned model is that it does not allow to control for unobserved heterogeneity (unobserved effects). To capture these unobserved effects one may specify the model as,

$$Exp_{it} = \beta_0 + \sum_k \beta_k X_{kit} + \sum_l \beta_l D_{lt} + \alpha_i + \delta_t + \varepsilon_{it} \qquad (2)$$

where $\alpha_i$ denotes country-specific unobserved heterogeneity, $\delta_t$ are time fixed effecs and $\mathcal{E}_{it}$ is the error term. The unobserved effect $\alpha_i$ is country-specific and time-invariant. We could then

use a *fixed* or *random effects regression* to fit the model. The baseline model of this paper is the following static unobserved effects model,

$$\ln(Exp_{it}) = \beta_0 + \beta_1 POP_{it} + \beta_2 \ln(MP_{it}) + \beta_3 GE_{it} + \beta_4 \ln(CPI_{it}) + \sum_h \beta_h \ln(AfT_{hit-x}) + \sum_l \beta_l D_{lt} + \alpha_i + \delta_t + \varepsilon_{it} \quad (3)$$

in which we regress (the log of) exports ($Exp_{it}$) on (the logs of) lagged proxies for AfT ($AfT_{hit-x}$) while controlling for population size ($POP_{it}$), for (the log of) market potential ($MP_{it}$), for government effectiveness ($GE_{it}$) and for (the log of) the consumer price index ($CPI_{it}$). Furthermore, time dummies ($D_{lt}$) and the unobserved effect ($\alpha_i$) are included.

Model (3) is a generalized version of the model used by Cali and Te Velde (2011: 730). The authors (2011: 735) regress (the log of) merchandise exports on (the logs of) aid disbursed to economic infrastructure and aid disbursed to production capacity - which are both proxies for AfT - while controlling for population size, (the log of) market potential, government effectiveness and for (the log of) the CPI. They also include country and time effects. I.e. their model can be obtained from (3) by defining $Exp_{it}$ to be merchandise exports and by using aid disbursed to economic infrastructure and aid disbursed to production capacity to measure AfT.

Our empirical strategy differs from the work done by Cali and Te Velde (2011) in several aspects. Firstly, Cali and Te Velde (2011: 735) use merchandise exports as dependent variable.[4] There is, however, no fundamental reason to limit the scope of analysis to merchandise exports. Service exports could also be fostered by aid. AfT is neither aiming at merchandise exports only nor would we expect the export performance of service sectors to be unaffected by AfT.[5] In consequence, we will use *exports of goods and services* as dependent variable in our regressions.

[4] I.e. they analyse the effect of AfT on *merchandise exports*.
[5] Aid to economic infrastructure (which is part of overall AfT and is, among others, used to build roads and ports), e.g., is likely to have an impact on the tourism sector (which, especially in developing countries, may account for a substantial portion of total exports).

Secondly, when analysing the effect of AfT on exports, one has to decide on how to measure AfT (i.e. which AfT-categories to include). Cali and Te Velde (2011: 735) use two proxies for AfT, namely aid disbursed to economic infrastructure and aid disbursed to production capacity. In contrast to that, we will make use of three AfT-proxies: aid to trade policies and regulation (*TPR*), aid to economic infrastructure (*EI*), aid to building production capacity (*BPC*). In this way we overcome one possible shortcoming of the approach taken by Cali and Te Velde (2011), which by focusing on only two AfT-categories may result in an omitted variable bias. This is true if, e.g., aid disbursed to TPR - which is omitted by Cali and Te Velde (2011) - has, say, a positive effect on exports (as found by Helble, Mann and Wilson, 2012) and is positively correlated with, e.g., aid disbursed to EI (which is included in their regressions). In this particular case the influence of aid disbursed to EI would be overestimated.

To put our results in perspective, we compare the impact of AfT to the impact of aid to general budget support (*GBS*) which might be used by recipients for trade development but which is not counted as AfT. Thirdly, while Cali and Te Velde (2011) solely use data on AfT-disbursements, we will also use data on AfT-commitments. Cali and Te Velde (2011: 732) argue that one should focus on the former because "(...) it is the actual disbursement of the funds rather than its commitments that is likely to have an impact (...)." Without question, this argument is justified. There is, however, also a good reason to use the latter: data-coverage for commitments - which may be used as a proxy for disbursements - is superior. Particularly, data on AfT-disbursements is only available from 2002 onwards. By also (i.e. additionally) using data on AfT-commitments we may increase the time span covered in the analysis and the number of observations that our regressions are based on.

And finally, while the baseline model is - despite the differences already discussed - basically the same as in Cali and Te Velde (2011), we will experiment with three alternative measures of market potential. The concept of market potential dates back to Harris (1954). Cali

and Te Velde (2011: 730) calculate the market potential[6] of country *i* at time *t* as the sum of the (inverse) bilateral distance ($d_{ij}$) weighted GDPs of *all* other countries, i.e.

$$MP_{it} = \sum_{j} \frac{GDP_{jt}}{d_{ij}} \tag{4}$$

Generally, as explained in Overman, Redding and Venables (2001: 12), market potentials can be computed as:

$$MP_{\gamma it} = \sum_{j} GDP_{jt} d_{ij}^{\gamma} \tag{5}$$

where γ serves as a "distance weighting parameter". By varying the size of the distance weighting parameter we obtain different measures of market potential:

$$MP1 = MP_{it}(\gamma = -1) = \sum_{j} \frac{GDP_{jt}}{d_{ij}}$$

$$MP2 = MP_{it}(\gamma = -0.5) = \sum_{j} \frac{GDP_{jt}}{\sqrt{d_{ij}}}$$

$$MP3 = MP_{it}(\gamma = -2) = \sum_{j} \frac{GDP_{jt}}{d_{ij}^{2}} \tag{6}$$

These different measures of market potential will be discussed in greater detail in the next section. Note that we would expect greater market potentials to be (ceteris paribus) associated with higher exports.

## *2.1 Quantile regression model*

A second specification we considered is based on quantile regression for panel data. Recently Canay (2011) proposed a simple transformation to get rid of the fixed effects, assuming that these effects are location shifters.

[6] Note that market potential of country *i* at time *t* is calculated as the sum of the (inverse) bilateral distance weighted GDPs of *all* other countries and *not only* of all countries for which we analyse the effect of AfT on exports - which are, of course, mostly developing countries.

Canay proposes a two-step approach that consist on estimating the country fixed effects using a within FE model in a first step and in a second step to use the consistently estimated fixed effects to demean the dependent variable (log of exports) and use this transformed variable as dependent variable in a quantile regression.

The model estimated in the first step is given by equation (3) above. Then the estimated $\alpha_i$ are used to transform ln (Xit) into $\widetilde{X}_{it} = \ln(X_{it}) - \hat{\alpha}_i$ .

The quantile regression is estimated as,

$$\hat{\beta}(\tau) = \arg\min_{\beta \in \Theta} (nT)^{-1} \sum_{T=1}^{T} \sum_{i=1}^{n} \rho_\tau (\widetilde{X}_{it} - X'_{it}\beta) \qquad (7)$$

## 3. Variables, Data and Descriptive Statistics

After having presented the empirical model in the preceding section, we will now discuss the panel dimensions, variable-descriptions and -sources as well as descriptive statistics. The panel dataset used in our empirical analysis is composed of data from several sources. Limited data availability influenced the time- as well the country-dimension of the panel. Our analysis focuses on the 2000-2011 decade. This is due to the fact that data coverage on AfT - our key explanatory variable - for the years before 2000 is incomplete and 2011 is the last year available. The set of countries included in the panel comprises 162 countries (see Table A.1 in the Appendix).[7] Figure A.1 shows the regional distribution. It is worth noting that 19% of the countries are landlocked.

Table A.2 presents a description of the variables used in the analysis, the corresponding abbreviation, and the source of the data. The three boxes in the first column indicate which role

[7] While data on AfT is available for 179 countries, there are only 168 countries for which we have data on both AfT and exports - our dependent variable. For six of these 168 countries we are not able to calculate market potentials - an important control variable - because data on bilateral distances is missing. We confine the analysis ex ante to those 162 countries for which data on exports, AfT and bilateral distances (market potentials) is on hand (which, of course, does not mean that the data for these 162 countries is complete).

the variables will play in our empirical analysis - i.e. whether the variable is a key explanatory variable (i.e. a AfT-proxy), the dependent variable (which is true, of course, just for exports), an important control variable (which are control variables in our baseline model) or some "other" control variable.

Data on AfT - our key explanatory variable - stems from the Creditor Reporting System (OECD, 2011a).[8] According to OECD (2011b) "[t]he objective of the CRS Aid Activity database is to provide (…) data that enables analysis on where aid goes, what purposes it serves and what policies it aims to implement (…)." Data on commitments and disbursements of official development assistance (ODA) is, e.g., available by sector, policy objective, type of aid and purpose code. We use data on commitments and disbursements of ODA (in constant 2009 US$) by sector for the 162 countries included in our analysis for the 2000-2011 period. With the data on ODA by sector we calculated AfT-proxies as illustrated in Table A.3.

Data on exports of goods and services (in constant 2005 US$) - our dependent variable - stems from the World Bank`s World Development Indicators (WDI) database (World Bank, 2011a). From the same database we obtained data on two important control variables in our baseline model: data on *Population* (in millions) and data on the *CPI* (with 2005 as the base year). Data on GDP (in constant 2000 US$) - which we need to compute market potentials - also comes from the WDI database. Data on bilateral distances (which - as explained in Section 2 - is also needed to calculate market potentials) stems from CEPII (2011a/b). Data on government effectiveness (*GE*) - which is another important control variable in our baseline model - comes from the Worldwide Governance Indicators (WGI) project (World Bank, 2011b). *GE* indicates the strength of governance performance. Finally, data on the strength of legal rights index (*SOLR*) - which "measures the degree to which (...) laws protect the rights of borrowers and lenders and thus facilitate lending" (World Bank, 2011a) - comes from the WDI database

[8] The CRS is maintained by the Development Assistance Committee (DAC) which is part of the OECDs Development Co-operation Directorate (DCD).

(World Bank, 2011a). The *SOLR* is not part of our baseline model (see Section 2). We will use it as an alternative to the government effectiveness (*GE*) index in some regressions.

Table 1 contains the summary statistics of the main variables used in the empirical analysis. The first part of Table 1 contains summary statistics for the AfT-proxies. For each proxy, commitment and disbursement data is available. Proxies for "total" AfT-commitments (*C_A4T_TOTAL*) and "total" AfT-disbursements (*D_A4T_TOTAL*) are calculated as the sum of the proxies for commitments and disbursements, respectively.

***Table 1:*** *Summary statistics for the AfT-proxies, dependent variable and controls*

| **Target Variables** | **Obs** | **Mean** | **Std. Dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| Commitments | | | | | |
| C_A4T_TPR | 1312 | 4.631 | 17.779 | 0.000 | 461.053 |
| C_A4T_EI | 1623 | 123.562 | 288.600 | 0.000 | 3787.111 |
| C_A4T_BPC | 1692 | 80.110 | 152.452 | 0.000 | 1989.448 |
| C_A4T_GBS | 810 | 87.058 | 159.957 | 0.000 | 1730.520 |
| C_A4T_TOTAL | 1704 | 242.184 | 450.746 | 0.000 | 5375.200 |
| Disbursements | | | | | |
| D_A4T_TPR | 1204 | 3.360 | 15.781 | 0.000 | 403.724 |
| D_A4T_EI | 1391 | 84.550 | 185.843 | 0.004 | 2107.355 |
| D_A4T_BPC | 1421 | 63.535 | 114.457 | 0.003 | 1179.496 |
| D_A4T_GBS | 742 | 70.240 | 122.008 | 0.000 | 1066.810 |
| D_A4T_TOTAL | 1425 | 185.302 | 325.919 | 0.006 | 3042.281 |
| **DependentVariable** | | | | | |
| Exports | 1228 | 29051.210 | 108752.000 | 15.785 | 1677840.000 |
| **Control Variables** | | | | | |
| Population | 1788 | 35.552 | 142.991 | 0.009 | 1344.130 |
| MP1 | 1728 | 7907.086 | 3447.210 | 3291.178 | 24758.810 |
| GE | 1628 | -0.464 | 0.679 | -2.454 | 1.590 |
| CPI | 1562 | 296.858 | 7418.968 | 0.288 | 293318.000 |
| MP2 | 1728 | 558266.100 | 103877.000 | 354308.800 | 966380.700 |
| MP3 | 1728 | 4.273 | 8.793 | 0.329 | 93.052 |
| SOLR | 1075 | 4.805 | 2.342 | 0 | 10 |

***Notes:*** *Originally, C_A4T_GBS, C_A4T_TPR, D_A4T_EI, D_A4T_GBS and D_A4T_TPR had negative min-values. However, the problem was not severe since the first percentile for each of these five variables was positive and only (1, 1, 2, 2, 3) observations were negative. All negative values were comparatively small (smaller than one US$ million). Moreover, the problem was neither time- nor country-specific. We set these 9 negative data points as missing. 2.) C_A4T_TOTAL is calculated as the sum of C_A4T_TPR, C_A4T_EI, C_A4T_BPC and C_A4T_GBS. If data on some of the four addends is missing, C_A4T_TOTAL is calculated as the sum of the others- i.e., when calculating the sum over all corresponding proxies, missing values are set equal to 0 as long as not all values are missing. Similarly for D_A4T_TOTAL. Values are in constant 2009 US$ millions. Exports = Exports of goods and services (constant 2005 US$ millions). Population = total Population (in millions).*

*MP1 = Market Potential 1 (with simple distances). GE = Gov. Effectiveness (-2.5 = weak to 2.5 = strong gov. performance). CPI = Consumer price index (2005 = 100). MP2/3 = Market Potential 2/3 (with square root/squared distances). SOLR = Strength of legal rights index (0 = weak to 10 = strong). Also see Table 2.*

In what follows we will discuss the data on our AfT-proxies in some detail.[9] Descriptive statistics for all other variables will be presented thereafter. Firstly, note that the number of observations for AfT-commitments is significantly larger than for AfT-disbursements (see Table 4). This is mostly due to the fact that data on disbursements is completely missing for the years before 2002 (i.e., in our case, for 2000 and for 2001).

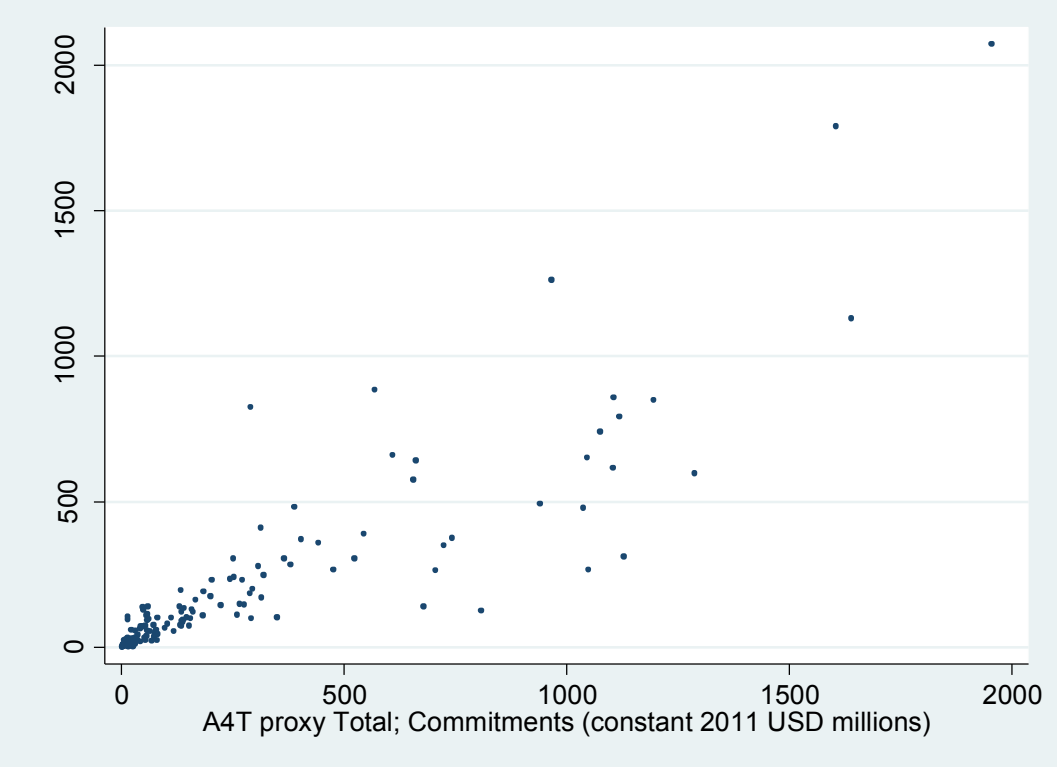
Secondly, the (average) size of AfT-commitments and -disbursements is notable. The mean value of AfT-commitments for economic infrastructure (*C_A4T_EI*) - i.e. the average commitment on aid to economic infrastructure per country per year - is, e.g., about 103 US$ million. That AfT is sizeable can best be seen when expressed relative to GDP. The ratio of the sum of all AfT-proxies (*C_A4T_TOTAL* or *D_A4T_TOTAL*) to GDP has a median value of 1.4% for commitments and 1% for disbursements. The 75$^{th}$ percentile is about 6% (4%) for commitments (for disbursements). The largest AfT-to-GDP-ratio amounts to roughly 70% - both for commitments and disbursements.

Thirdly, AfT-commitments tend to be larger and more volatile than AfT-disbursements. As can be seen in Table 1, mean commitments are strikingly larger than mean disbursements. The correlation coefficient between "total" commitments (*C_A4T_TOTAL*) and "total" disbursements (*D_A4T_TOTAL*) is "only" about 86% (p-value: 0). Figure 1 shows a scatter plot for *C_A4T_TOTAL* and *D_A4T_TOTAL*. The majority of observations (62%) lie well below the 45°-line. The average shortfall of "total" disbursements below commitments is about 65 US$ million. This indicates that - on average - donor-countries do not fully match their commitments

[9] This is - next to our primary analysis (the analysis of AfT-effectiveness) - also the main contribution that this paper makes to the literature.

with actual disbursements. For aid on economic infrastructure, e.g., the correlation coefficient between commitments (*C_A4T_EI*) and disbursements (*D_A4T_EI*) is only about 79%.[10]

***Figure 1:*** *Scatter plot for AfT commitments and AfT disbursements*



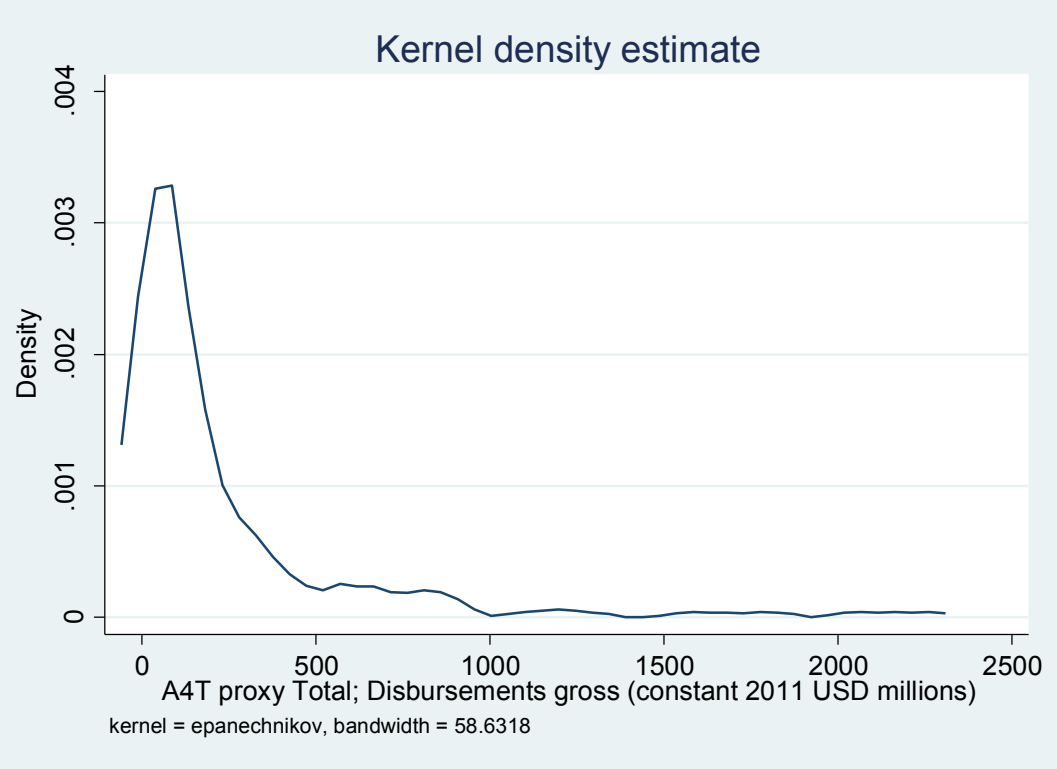

***Source:*** *Own illustration based on own calculations.* ***Data:*** *OECD (2011a).* ***Notes:*** *Due to illustrational purposes the range is limited to [0, 2100].*

And fourthly, the distribution of AfT-commitments (or -disbursements) seems to be skewed to the right (positive skewness). This cannot be seen in Table 1, but it can already be inferred from the scatter plot in Figure 1. There are many observations with relatively small AfT-commitments and few observations with high commitments. Stated differently, the mass of the distribution lies on the left. The skewness can also be seen in Figure 2, which depicts a Kernel density function - an estimate of the density function - for *D_A4T_TOTAL* for the year 2011. It is immediately seen that the (estimated) distribution is skewed to the right. The bulk of the countries receive relatively little AfT and some countries get a lot.[11] Another way to

[10] That there is a "Gap between Commitment[s] and Disbursement[s]" is also pointed out by Adhikari (2011: 9).
[11] That "[AfT] (...) is relatively concentrated" is also discussed in OECD/WTO (2011: 14).

illustrate this is to compute percentiles for the distribution of *C_A4T_TOTAL* and *D_A4T_TOTAL*. This is done in Table A.4. While, e.g., the median value - i.e. the 5th decile or the 50th percentile - of *D_A4T_TOTAL* is smaller than 50 US$ million, the 90th percentile is almost ten times as big.

***Figure 2:*** *Kernel density estimate for AfT Disbursements (D_A4T_TOTAL) for the year 2009.*




***Source:*** *Own illustration based on own calculations.* ***Data:*** *OECD (2011a).* ***Notes:*** *Kernel = Epanechnikov; bandwidth = 53.3482.*

The second part of Table 1 reports summary statistics on the dependent variable and a number of control variables.

It is immediately seen that there is an anomaly in our dataset. The *CPI* (base year: 2005) ranges between 0.288 and 293318. These values seem to be extreme for a ten year time-period. Hence, we need to take a closer look at our *CPI*-data. The first percentile is around 36 and the 99th percentile around 198. This seems to be fine. However, there are two observations smaller than 1 and two observations greater than 1000 - one of which is 293318. The outliers belong to

Zimbabwe which - recently - indeed experienced a period of hyperinflation (see, e.g., Hanke, 2008). These outliers inflate the standard deviation and the mean. When excluding the observations for Zimbabwe the mean (standard deviation) of the *CPI* drops from above 300 (7800) to around 100 (25).

After having presented the empirical model in Section 2 and data, data-sources and descriptive statistics in this section, we will now discuss the results of the regression analysis.

## 4. Main Results

In this section, we are going to fit the model specified in Section 2 by using (i) a (*pooled) OLS regression* (as a benchmark) and (ii) a *fixed* or *random effects regression*. The choice between using fixed or random effects ultimately depends on our assumption about the correlation between the unobserved effect and the explanatory variables (see, e.g., Wooldridge, 2001: 288). We run a Hausman test in order to check whether using fixed or random effects is appropriate. We have to reject the null hypothesis that the unobserved effects are uncorrelated with the explanatory variables, i.e. the results indicate that fixed effects should be used.[12]

Table 2 reports the results of the regression analysis. When running the OLS-regressions, we include dummies for time and region. For the fixed effects regressions, year-dummies are included. We also performed some regression diagnostics. For the *(pooled) OLS-regressions*, the residuals are close to normal and homoscedastic. Furthermore, there is no multicollinearity problem. In the *fixed effects models*, heteroscedasticity and autocorrelation was present. In consequence, we use standard error estimates that are robust to these disturbances (Hoechle, 2007: 285). We will now discuss our results in some detail.

[12] We assume that the requirements and assumptions of the Hausman test are fulfilled. A discussion of these issues goes well beyond the scope of this paper.

***Table 2:*** *Regression results. Dependent variable: ln (Exports of goods and services in constant 2000 US$ millions). Key explanatory variables: 2nd lag of log-AfT-disbursements.*

| | OLS1 | OLS2 | FE1 | FE2 |
|---|---|---|---|---|
| | b/se | b/se | b/se | b/se |
| L2_ln_D_A4T_TOTAL | 0.064** | | -0.002 | |
| | (0.03) | | (0.01) | |
| L2_ln_D_A4T_TPR | | 0.192*** | | -0.010 |
| | | (0.02) | | (0.01) |
| L2_ln_D_A4T_EI | | 0.012 | | 0.010 |
| | | (0.04) | | (0.02) |
| L2_ln_D_A4T_BPC | | 0.349*** | | 0.050* |
| | | (0.07) | | (0.03) |
| L2_ln_D_A4T_GBS | | -0.213*** | | -0.003 |
| | | (0.02) | | (0.00) |
| Population | 0.004*** | 0.003*** | 0.005*** | 0.003*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| ln_MP1 | -0.110 | -0.268* | 0.338 | 0.786 |
| | (0.15) | (0.16) | (0.52) | (0.83) |
| GE | 0.908*** | 0.639*** | 0.022 | 0.106 |
| | (0.07) | (0.10) | (0.09) | (0.14) |
| ln_CPI | 0.055 | -0.077* | -0.034* | -0.040*** |
| | (0.04) | (0.04) | (0.02) | (0.01) |
| AfricaDummy | -1.066*** | -0.237 | | |
| | (0.19) | (0.20) | | |
| AmericaDummy | -0.045 | 0.403** | | |
| | (0.18) | (0.20) | | |
| AsiaDummy | -0.186 | 0.102 | | |
| | (0.17) | (0.18) | | |
| PacificDummy | -2.814*** | -1.587*** | | |
| | (0.57) | (0.59) | | |
| Constant | 9.057*** | 5.896*** | 4.772 | 1.633 |
| | (1.59) | (1.93) | (4.77) | (8.06) |
| Obs | 724 | 356 | 724 | 356 |
| R-sqr(within) | 0.398 | 0.533 | 0.996 | 0.994 |

***Notes:*** ** p<0.10, ** p<0.05, *** p<0.01. Year- and region-dummies are included in the OLS-regressions, i.e. in (1) and (2). Coefficients for these dummies are not reported due to illustrational purposes. For the fixed effects regressions, i.e. in columns (1) and (2), we use the option "cluster(id)" in Stata. Hence, standard error estimates in columns (1) to (4) are robust to heteroscedasticity and autocorrelation (see Hoechle, 2007: 285). Time dummies included in columns(3) and (4) regressions.*

In columns (1) and (2), we run *(pooled) OLS-regressions*. In (1), we regress the log of exports of goods and services on the log of "total" AfT-disbursements lagged by two years while controlling for *Population* size, for the log of *MP1*, for government effectiveness and for

the log of the *CPI*. Furthermore, year- and region-dummies are included. In (2), we make use of our four "original" aid categories (three AfT categories and global budget support) and regress the log of exports on the logs of aid disbursed to TPR, aid disbursed to EI, aid disbursed to BPC and aid disbursed to GBS (all lagged by two years) and on our baseline controls. In column (1), the coefficient of *L2_ln_D_A4T_TOTAL* - the log of "total" AfT-disbursements lagged by two years - is positive and statistically significant. Hence, the results of the *(pooled) OLS-regression* suggest that larger "total" AfT-disbursements are, ceteris paribus (c.p.) and on average, associated with higher exports of goods and services in the future. The coefficients of our lagged and logged AfT-proxies in (2) are statistically significant and positive for aid disbursed to TPR, BPC and negative for GBS (used for contrasting the results obtained for AfT). The coefficient of aid disbursed to GBS is statistically significant but has a negative sign - which is plausible when recipient countries do not stress trade development. The coefficient of our baseline controls in (1) and (2) have the expected signs except for the log of market potential (which has a negative, but statistically insignificant, coefficient). The coefficients of *Population* and government effectiveness are statistically significant at the one percent level. To conclude, most coefficients - except for the coefficients of (logged and lagged) aid disbursed to GBS and the coefficient of (the log of) *MP1* - have the expected signs. "Total" AfT-disbursements, aid disbursed to TPR and aid disbursed to BPC seem to be effective. The effect of aid disbursed to EI cannot be distinguished from zero and aid disbursed to GBS even seems to be counter-productive. However, these findings should be gauged with caution Since we did not control for unobserved (time-invariant) heterogeneity yet.

Columns (3) and (4) in Table 2 present the results obtained by estimating *fixed effects regressions*. The coefficients of (the logs of) aid disbursed to PC, population and of the *CPI* are statistically significant in all specifications in which they are included. In (3), the coefficient of "total" AfT-disbursements is not statistically significant. A larger population and a smaller *CPI* are, c.p. and on average, associated with higher exports. The coefficients of *GE* and market

potential are positive but insignificant. The main finding of (3) is that "total" AfT-disbursements seem not to be effective. In (4), only the coefficient of aid disbursed to BPC is positive and statistically significant at the 10 percent level. The coefficients of all other AfT-proxies cannot be distinguished from zero.

To conclude, the main finding of (4) is that aid disbursed to BPC is associated with higher future exports. Other AfT-disbursements seem to be ineffective. We also experimented with alternative controls. We substituted the log of *MP1* by the logs of *MP2* and *MP3*, respectively. The coefficient of market potential was positive and not statistically significant when using fixed effects irrespective of the size of the distance weighting parameter (see Section 2). The size of all other coefficients does not change much and the coefficient of government effectiveness stays statistically insignificant. Finally, we use the *SOLR* instead of *GE* to control for institutional quality. This leaves all other coefficients almost unaffected. The coefficient of *SOLR* has a positive sign - as expected - but is statistically insignificant. Note that the coefficient of (the log of lagged) aid disbursed to BPC is positive and statistically significant, whereas the coefficients of all other AfT-proxies cannot be distinguished from zero. Based on these results it can be said that aid disbursed to PBC is effective. If aid disbursed to BPC increases by 100%, we would expect exports of goods and services to be about 5 percent higher two years later (c.p. and on average).

To put it in a nutshell, the regression results indicate that "total" AfT-disbursements are not effective because they are not associated - c.p. and on average - with higher exports of goods and services in the future. When controlling for country heterogeneity and using our three "original" AfT-proxies, we find that aid disbursed to BPC is associated with higher future exports. Other AfT-disbursements seem to be ineffective. These results are in line with those of Vijil and Wagner (2012) and Cali and Te Velde (2011). It is noteworthy that things do not

change if we run the regressions shown with AfT-disbursements lagged by one year instead of two years[13].

It could also be that the effectiveness of AfT depends on the level of exports and it could vary for different quantiles of the distribution. To investigate this hypothesis, in what follows we present the results obtained when using quantile regressions.

**Table 3: Panel-Quantile regression results**

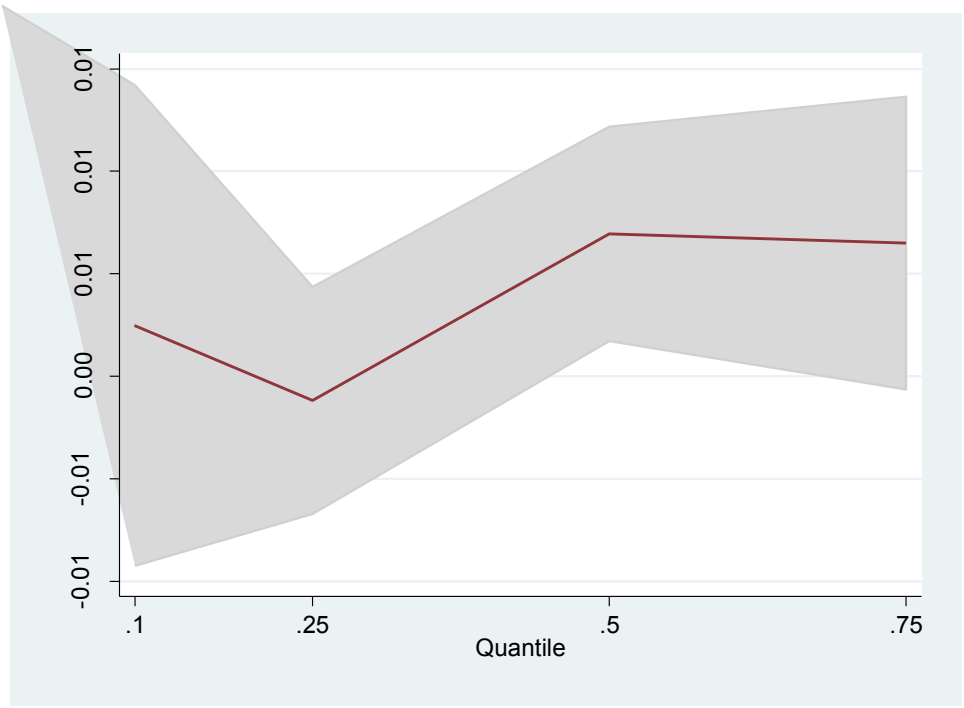
| | (1) M1(Q.1) | (2) M2(Q.25) | (3) M3(Q.5) | (4) M4(Q.75) |
|---|---|---|---|---|
| l2lnDTOTAL | -0.006 | 0.000 | 0.007*** | 0.006* |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Population | 0.005*** | 0.005*** | 0.005*** | 0.005*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| ln MP1 | 0.501*** | 0.491*** | 0.475*** | 0.483*** |
| | (0.03) | (0.01) | (0.01) | (0.02) |
| GE | 0.041*** | 0.021** | -0.00100 | -0.020* |
| | (0.01) | (0.01) | (0.00) | (0.01) |
| ln CPI | -0.025*** | -0.034*** | -0.042*** | -0.0100 |
| | (0.00) | (0.00) | (0.00) | (0.26) |
| d2005 | 0.128*** | 0.087*** | 0.037*** | -0.00400 |
| | (0.04) | (0.02) | (0.01) | (0.02) |
| d2006 | 0.173*** | 0.117*** | 0.098*** | 0.057* |
| | (0.05) | (0.02) | (0.02) | (0.03) |
| d2007 | 0.256*** | 0.186*** | 0.150*** | 0.103** |
| | (0.05) | (0.03) | (0.02) | (0.04) |
| d2008 | 0.263*** | 0.224*** | 0.187*** | 0.139** |
| | (0.05) | (0.03) | (0.02) | (0.07) |
| d2009 | 0.208*** | 0.153*** | 0.138*** | 0.113 |
| | (0.06) | (0.04) | (0.02) | (0.08) |
| d2010 | 0.293*** | 0.225*** | 0.191*** | 0.172* |
| | (0.05) | (0.03) | (0.03) | (0.10) |
| d2011 | 0.316*** | 0.247*** | 0.248*** | 0.250*** |
| | (0.05) | (0.03) | (0.03) | (0.09) |
| cons | 3.709*** | 3.849*** | 3.990*** | 3.864*** |
| | (0.27) | (0.14) | (0.08) | (1.26) |
| Nobs | 724 | 724 | 724 | 724 |
| R2 | 0.983 | 0.984 | 0.984 | 0.984 |

***Notes:*** *Dependent variable: ln(Exports of goods and services in constant 2005 US$ millions)-FE estimated in Table*

[13] We also run all regressions presented thus far also with commitments instead of disbursements. Results - which are available upon request - are far from being satisfactory. When running the regressions with commitments (lagged by one and two years), the coefficients of the vast majority of AfT-proxies are statistically insignificant. It seems that data on AfT-commitments has very little explanatory power for export performance.

*2, column 3. Key explanatory variables: 2nd lag of log-AfT-disbursements. Robust s*tandard errors in parentheses.
** p<0.10, ** p<0.05, *** p<0.01.*

**Figure 4. Panel-Quantile regression results for AfT**




Our main findings can be summarised as follows. The regression results indicate that "total" AfT-disbursements are effective only for higher levels of exports. For the 50 and 75 percentile of the conditional distribution of exports they are associated - c.p. and on average - with higher exports of goods and services two years later (i.e. in the medium run). An increase of "total" AfT-disbursements by 100 percent is associated - c.p. and on average - with a 0.6 percent increase of exports of goods and services two years later (see Table 3). For the lower tail

of the distribution of exports, the effect of "total" AfT-disbursements cannot be distinguished from zero (see Table 3).

We also find that only specific types of AfT are effective. Aid disbursed to EI is associated with higher exports in the 2 upper quartiles. All other things equal, if aid disbursed to EI increases by 100%, we would expect exports of goods and services to be on average about 1 percent higher two years later (see Table 4). Also aid given to enhance production capacity appears to be effective in the medium run (Aid to TPR effectiveness decreases with the volume of exports), aid disbursed to GBS does not promote export performance.

**Table 4. Panel-quantile regression results for specific types of aid**

| | (1) M1(Q.1) | (2) M2(Q.25) | (3) M3(Q.5) | (4) M4(Q.75) |
|---|---|---|---|---|
| l2lnD TPR | -0.010** | -0.009* | -0.006 | -0.016*** |
| | (0.00) | (0.00) | (0.01) | (0.00) |
| l2lnD EI | 0.0180 | 0.00600 | 0.007** | 0.013*** |
| | (0.01) | (0.00) | (0.00) | (0.00) |
| l2lnD BPC | 0.0180 | 0.037*** | 0.044*** | 0.050*** |
| | (0.02) | (0.01) | (0.01) | (0.01) |
| l2lnD GBS | -0.00600 | -0.008*** | -0.003 | -0.002 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Population | 0.003*** | 0.003*** | 0.003*** | 0.003*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| ln MP1 | 1.007*** | 0.949*** | 0.912*** | 0.915*** |
| | (0.04) | (0.01) | (0.01) | (0.02) |
| GE | 0.101*** | 0.090*** | 0.088*** | 0.074*** |
| | (0.03) | (0.01) | (0.01) | (0.01) |
| ln CPI | -0.030** | -0.047*** | -0.045*** | -0.051*** |
| | (0.02) | (0.01) | (0.01) | (0.00) |
| d2005 | 0.180*** | 0.122*** | 0.0700 | 0.0400 |
| | (0.06) | (0.03) | (0.04) | (0.03) |
| d2006 | 0.230*** | 0.155*** | 0.115** | 0.076** |
| | (0.08) | (0.02) | (0.05) | (0.04) |
| d2007 | 0.304*** | 0.231*** | 0.172*** | 0.130*** |
| | (0.07) | (0.03) | (0.05) | (0.03) |
| d2008 | 0.310*** | 0.253*** | 0.210*** | 0.190*** |
| | (0.08) | (0.03) | (0.05) | (0.04) |
| d2009 | 0.317*** | 0.281*** | 0.206*** | 0.175*** |
| | (0.11) | (0.03) | (0.05) | (0.04) |
| d2010 | 0.375*** | 0.300*** | 0.252*** | 0.243*** |
| | (0.08) | (0.03) | (0.05) | (0.05) |
| d2011 | 0.402*** | 0.374*** | 0.293*** | 0.297*** |
| | (0.09) | (0.03) | (0.05) | (0.05) |
| cons | -1.612*** | -0.969*** | -0.798*** | -0.814*** |

| | | | | |
|---|---|---|---|---|
| | (0.46) | (0.14) | (0.13) | (0.18) |
| Nobs | 356 | 356 | 356 | 356 |
| R2 | 0.946 | 0.949 | 0.951 | 0.950 |

***Notes:*** *Dependent variable: ln(Exports of goods and services in constant 2005 US$ millions)-FE estimated in Table 2, column 4. Key explanatory variables: 2nd lag of log-AfT-disbursements. * p<0.10, ** p<0.05, *** p<0.01.*

Note that our analysis may suffer from a couple of limitations. Firstly, in the regression analysis, we implicitly assumed AfT to be exogenous. However, it may well be that AfT is endogenous, i.e. that exports affect AfT ("reverse causality"). In this case, our analysis is subject to an endogeneity problem and our estimates are likely to be biased or inconsistent. However, we alleviate the endogeneity problem by working with lagged values of AfT. Cali and Te Velde (2011) are also aware of the endogeneity problem. They use instrumental variable estimators to get rid of it. This changes the size of the coefficients, but the main conclusion about AfT-effectiveness does not change. And secondly, in our static model we did not allow for any "dynamics". Cali and Te Velde (2011: 731) stress "exports are fairly persistent over time, as they tend to depend on previous exports." To deal with this issue, they test some dynamic specifications. We leave these extensions for further research.

## 5. Conclusion

One of the objectives of Aid for Trade (AfT) is to promote exports of goods and services. Given this objective, the question arises whether AfT is effective. We addressed this question in this paper. Particularly, we analysed whether AfT improves export performance, i.e. whether AfT is associated with higher exports of goods and services and whether this depends on the conditional distribution of exports.

We found that total AfT-disbursements are only slightly effective at the upper tails of the distribution (50% and 75% quantile) where they promote exports of goods and services in the medium run to a small degree. Other things equal, an increase of "total" AfT-disbursements by 100% is associated on average with a less than 1% increase of exports two years later. However,

"total" AfT-disbursements appear to have no impact on export performance on the lower tails of the distribution (10% and 25% quantile).

We also pointed out that only specific types of AfT are effective. We found a bit stronger evidence for the effectiveness of aid disbursed to building production capacity (BPC). This type of AfT is associated with higher exports for the 25%, 50% and 75% exports strata. If aid disbursed to BPC increases by 100%, we would expect exports of goods and services to be (c.p. and on average) about 4 -6% higher two years later. Effectiveness of aid to EI can only be found in the upper quantiles as well. A doubling of infrastructure-related aid in these strata leads to an increase of exports of about 1%. Other types of AfT-disbursements seem to have no discernible effect or even a negative impact on exports. For comparison, aid disbursed to general budget support (GBS) is in general not associated with higher exports.

To sum up, contrary to some studies (see, e.g., Cali and Te Velde, 2011), aid disbursed to building production capacity (BPC) seems to be effective. To conclude, our results indicate that certain types of AfT are slightly effective in the upper tails of the export distribution, whereas others are not.

Further research should investigate the topic of AfT-effectiveness in greater detail. Up to date, we know which types of AfT are working and which are not. A related question is the following: Why are some types of AfT ineffective? Furthermore, it is indispensable to analyse the relationship between AfT and social outcomes (such as poverty rates) - if there is any - because, increased trade is only a means to an end and not an end in itself.

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