Erasmus University Rotterdam
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# Effectiveness of aid for trade on export performance: Evidence from developing countries

**Abstract**

Aid for trade, an essential component of foreign aid, aims to improve trade-related capacities in developing countries, yet its effectiveness remains inconclusive. This paper aims to estimate the effect of several categories of aid for trade on export performance in a large sample of developing countries. Findings reveal that aid for trade facilitation is associated with increased exports, while aid for economic infrastructure, productive capacity and trade policy and regulations lack any correlation. Sector-specific analysis indicates that aid to monetary institutions, water transport, and training and education are positively related to export performance. Further firm-level analysis shows that trade education, trade policies and regulations, and business policy may be relevant for firms to engage in international trade.

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# 1. Introduction

Improving trade in developing countries is essential, particularly for the least developed countries (LDCs), which face considerable constraints in accessing international markets due to insufficient resources. In this context, the mere removal of tariff barriers, while relevant, is often ineffective in increasing export levels (Cali & Te Velde, 2011; Hühne & Nunnenkamp, 2014). After the major debates in the Doha Development Round and the 'Paris Declarations', the international community increasingly turned to aid for trade as a means for developing countries to increase their production of export goods and improve export development. This initiative, officially launched in 2005 and facilitated by the Official Development Assistance (ODA) as part of the OECD, aims not only to integrate developing countries into the multilateral trading system, but also to mitigate poverty and stimulate economic growth (Vijil & Wagner, 2012).

In theory, the relationship between aid for trade, trade, and economic development is clear. Aid for trade initiatives are expected to create more opportunities for production and investment by reducing trade costs and improving competitiveness. This, in turn, can lead to trade expansion, which is related to the further development of countries due to the various benefits associated with trade liberalization. Gains from trade include productivity improvements arising through a reallocation of resources towards the most productive firms or due to an increased volume of imported input varieties (Amiti & Konings, 2007; Melitz, 2003). Trade can likewise increase income levels (Frankel & Romer, 2017), promote economic growth (Wacziarg, 2001), enhance social welfare (Davies & Quinlivan, 2006) and contribute to reducing poverty and wage inequality (Fajgelbaum & Khandelwal, 2016).

Empirical research on aid for trade has focused predominantly on whether aid for trade effectively increases export levels and trade volumes between recipient and donor nations. Several studies indicate that improvements in trade facilitation positively impacts trade outcomes. Nonetheless, the causal relationship remains ambiguous, as the non-random allocation of aid for trade may introduce certain level of bias. Most importantly, donors are rarely perceived to be purely altruistic; they may seek market access or aim to strengthen bilateral trade relations with the recipient countries (Pettersson & Johansson, 2013). It is equally unclear whether countries that achieve better export outcomes tend to receive more aid for trade compared to other countries. Moreover, the existing literature differs on which types of aid for trade are considered to be the most effective.

Therefore, this study focuses on the impact of aid for trade on developing countries' export performance from 2005 to 2022, considering various types of aid and firm-level data. Aid for trade is categorized into economic infrastructure, trade facilitation, productive capacity, and trade policies and regulations. Each of these interventions has distinct objectives and consequently, different effects on export performance. The extensive and detailed OECD Creditor Reporting System (CRS) dataset allows for a further disaggregation into aid by sectors. Thus, the study assesses the impact of aid to financial institutions, SMEs, transport, education and policies on the level of exports. The main empirical analysis employs regression models to examine the effects of total aid for trade and specific aid categories on export outcomes. Moreover, the research includes an additional cross-sectional study of the impact of aid for trade on firm-level export performance utilizing data from the UN Enterprise Surveys.

The findings suggest that while aid allocated to trade facilitation is positively associated with increased exports, the remaining categories – aid for economic infrastructure, productive capacity, and trade policy and regulations – do not show a statistically significant correlation with export levels. Sector-specific analysis indicates positive and significant associations between aid to monetary institutions, water transport, and general education with export performance. Additionally, cross-sectional results suggest that targeted aid for trade policies and regulations, business policy and trade education are positively associated with the percentage of firms engaged in export activities. Meanwhile, total AfT and the majority of categories may contribute to reduce constrained firms and dependence on foreign inputs.

This study considerably contributes to the existing literature by exploring disaggregated aid allocation across specific sectors, which holds relevant policy implications. For instance, the effectiveness of aid directed at productive capacity may vary due to its average effect, as it includes several types of programs, each with potentially positive and negative impacts. By examining different types of aid, this paper aims to determine the most effective interventions in different contexts. Furthermore, the use of firm-level export performance data from the UN Enterprise Surveys closes a notable gap in the literature, which relies predominantly on aggregate export data.

The paper is organized as follows. In Section 2, a large part of the existing literature is presented. The data is analyzed in Section 3 and subsequently, Section 4 provides the methodology and the empirical models of this study. The results are interpreted in Section 5. Section 6 discusses the methodological limitations and Section 7 concludes the findings.

## 2. Literature Review

### 2.1. Gains from trade

The majority of the trade literature coincides that openness to trade yields numerous benefits and positively impacts various development indicators. First, evidence shows that trade can improve productivity. Melitz (2003) utilizes a dynamic industrial model to demonstrate that trade stimulates a shift towards the most productive firms, thereby improving the industry's overall productivity. This productivity increase can occur through two mechanisms: stronger competition and a greater variety of imported inputs, due to lower input and output tariffs (Amiti and Konings, 2007; Topalova and Khandelwal, 2011). Similarly, De Loecker (2007) found that Slovenian firms experience increased productivity once they start exporting, leading to a productivity gap between domestic firms that further widens over time.

Although there are some mixed findings regarding trade liberalization and the reduction of poverty and wage inequality, the findings of Fajgelbaum & Khandelwal (2016) reveal that, in general, trade benefits the poor, as they tend to spend a larger portion of their income in highly traded sectors, which typically exhibit lower price elasticities. In contrast, high-income households tend to consume more services, which are less traded and less affected by trade policies. Winters et al. (2004) suggest that the long and medium-term effects of trade liberalization are likely to significantly reduce poverty, with no consistent evidence that trade would increase overall poverty or vulnerability. However, in the short run, the poor may be less equipped to shield themselves from negative impacts and benefit from positive opportunities.

Davies & Quinlivan (2006) explore the impact of trade on social progress, measured by the Human Development Index (HDI), which includes education, literacy, and income. By applying a generalized method of moments (GMM) with panel data, they determine that increased trade is associated with future improvements in social welfare. Furthermore, Frankel & Romer (2017) identify that trade liberalization generally increases income levels. However, the statistical significance is moderate, suggesting that the strength of this effect may vary. Finally, Wacziarg (2001) indicates that trade openness positively affects economic growth. Notably, more than half of this impact is attributed to the acceleration of physical capital accumulation, while increased technology transfers and improvements in macroeconomic policy have a minor impact.

## 2.2. Foreign aid

The long-standing debate around the effectiveness of foreign aid provided to developing countries – as part of the Official Development Assistance (ODA) – has given rise to extensive literature analyzing its impact. Nonetheless, the evidence remains inconclusive, with conflicting results on whether foreign aid has a positive, mixed, or negative impact on developing countries. This section of the literature review first explores the findings on foreign aid effectiveness. Subsequently, literature that specifically examines the impact of aid for trade on export performance will be presented.

Arndt et al. (2015) investigate the causal relationship between foreign aid allocation and key socio-economic outcomes, distinguishing between intermediate (human accumulation) and final outcomes (economic growth). The results show that over four decades (1970-2007), foreign aid has facilitated structural transformation towards modern sectors, improved social indicators, stimulated economic growth and reduced poverty. The proposed mechanisms include public revenues, public spending, and investment. Similarly, Karras (2006) utilizes panel data from 71 developing countries for the period 1960-1997. The findings provide evidence of a favorable, sustained, and statistically significant effect of foreign aid on real GDP per capita growth rate. Specifically, a $20 increase of foreign assistance per individual in the recipient country leads to a steady rise of about 0.16% in the real GDP per capita growth rate. Furthermore, increasing aid by 1% of the recipient country's GDP results in a permanent increase of 0.14% to 0.26% in the per capita growth rate.

Clemens et al. (2012) conduct a re-analysis to address the major methodological limitations of the existing literature, particularly due to low-quality instrumental variables and the timing of aid effects. Accounting for time lags and focusing on aid likely to produce growth within a short time frame, the authors suggest that aid generally leads to a modest increase in investment and growth, although the extent of this effect differs among countries and decreases with increased levels of aid. In contrast, Rajan & Subramanian (2008) find no solid evidence of a positive relationship between aid and growth. Even after accounting for the biases of traditional estimation methods, which occur since aid flows are influenced by country-specific conditions, the researchers conclude that there is no causal relationship between foreign aid and economic growth. Moreover, their analysis does not support the notion that foreign aid is more effective in countries with better policies or institutions, nor does it indicate that certain types of aid have more impact than others.

Young & Sheehan, (2014) explore the impact of foreign aid on institutional quality and economic growth using data from 116 countries spanning 1970 to 2010. Their findings reveal that foreign aid fails to improve political and economic institutions or to increase economic growth. They suggest degradation of international trade freedoms as a major mechanism through which aid negatively impacts growth. A study that analyses the impact of foreign aid on trade is the one by Silva & Nelson (2012). Using an asymmetric expansion of the Anderson-vanWincoop model, their results show that while foreign aid positively influences exports from donor to recipient countries, this effect is offset by the adverse multilateral effect, which reflects changes in trade barriers.

### 2.3. Aid for trade

In this context, the body of literature on Aid for Trade (AfT) has been expanding in recent years, suggesting that AfT improves export performance rather than import levels in recipient countries. However, when distinguishing different categories of AfT, there is certain variation in the conclusions reached. For instance, Wilson et al. (2005) employ a panel of disaggregated manufactured goods from 75 countries for the years 2000 and 2001. The paper evaluates the impact of AfT on bilateral trade flows using a gravity model and classifies AfT into four subcategories: infrastructure, customs environment, policy and regulation, and e-commerce infrastructure. Their findings indicate that improvements in AfT in all areas increase both imports and exports, however, in most recipient countries, the increase in exports tends to be larger than the increase in imports. This is due to the increase in export activities to high-income countries, mainly represented by the OECD market, which is consistent with the results of Atkin et al. (2017), who find that when given the opportunity to export to developed markets, Egyptian rug manufacturers experience notable improvements in their overall performance.

Employing an aggregated and asymmetric gravity model approach, Hühne & Nunnenkamp (2014) test the hypothesis that AfT benefits donor countries as equally as it promotes exports of recipient countries. Thus, their study estimates the effect of AfT on trade flows in both directions, considering total AfT and its subcategories between 1990 and 2010. The estimates indicate that AfT increases recipient countries' exports by roughly 5% and imports by 3%, with the impact on exports dominating. Taking into account subcategories of AfT – aid to economic infrastructure, aid to productive capacity, and aid to trade policy and regulations – the most substantial impact is observed in aid for trade and regulatory policy, doubling this support would result in a 10% increase in exports. Nevertheless, the positive

effects of AfT are only observed in middle-income countries, predominantly in Latin America and South Asia. This suggests that these regions may face fewer structural constraints, enabling them to benefit more from AfT. No positive impact is found for Sub-Saharan Africa.

Similarly, Helbe et al. (2012) analyze 40 donor countries and 170 trading pairs during 16 years of trade. Their study presents empirical evidence indicating that AfT has a significant positive effect on trade flows, with a particularly strong impact on recipient exports compared to imports. The results show that a 1 percentage increase in AfT correlates with an additional US$290 million in exports from aid-receiving countries. Furthermore, when considering aid to economic infrastructure, trade policy and regulations, and trade development, the researchers find the largest impact on aid for trade policy and regulations. Concretely, a 1% increase in this type of aid is associated with approximately US$291 million in exports.

Making use of panel data for 124 countries, Martínez-Zarzoso et al. (2017) adopt a panel quantile regression and two approaches to tackle endogeneity: AfT with two lag periods and dynamic OLS. Their results indicate that AfT mostly increases exports in countries with initially lower levels of trade. While aid for trade policy and regulations increases exports in all countries, aid for infrastructure and aid for productive capacity predominantly impact countries with initially lower export volumes, namely lower-income countries. Iwanow & Kirkpatrick (2007) utilize a gravity model combined with indicators for trade facilitation, regulation quality, and infrastructure to measure the benefits of AfT on trade performance. Their findings indicate that while a 10% improvement in AfT leads to a 5% increase in exports, improvements in regulatory quality and infrastructure would lead to larger increases in exports, varying between 9%-11%, and 8%, respectively.

Furthermore, Cali & Te Velde (2011) suggest that for 130 developing countries, aid for economic infrastructure has a large and causal impact on increasing the recipient countries' exports, especially in Sub-Saharan African countries (SSA). A 100% increase in aid to economic infrastructure leads to 2.9% increase in exports. Aid for trade facilitation leads to a reduction in trade costs, notably, a 100% rise in aid for trade facilitation correlates to a reduction of 5% in importing costs and 4.7% in exporting costs. This impact is again particularly pronounced in SSA. However, the impact of aid for trade policies and regulations on trade costs is mixed and not clear. Finally, aid to productive capacity appears not to have any major effect on the level of exports due to a biased allocation of aid towards already successful sectors.

In the same line, Vijil & Wagner (2012) only find aid to economic infrastructure to be effective in increasing exports over the GDP ratio. Specifically, a 10% rise in aid for infrastructure results in an average increase in the ratio of exports to GDP of 2.34% for aid recipients, which is equivalent to a 2.71% reduction in tariff and non-tariff barriers. This suggests that investment in infrastructure may be the most effective channel for improving export performance in developing countries. Further research shows that when AfT is combined with measures of economic integration, it proves more effective in rising trade flows (Vijil, 2014). AfT can also lead to product export diversification (Gnangnon, 2019) and to a more liberalized trade policy (Gnangnon, 2018).

This paper builds on the work of Cali & Te Velde (2011) to examine the impact of AfT on export performance but with several notable differences. While their analysis also utilizes data from the OECD Creditor Reporting System database, it focuses on the period from 2002 to 2007 due to pre-2003 data limitations. In contrast, this study employs more recent data, from 2005 to 2022. Furthermore, whereas Cali & Te Velde (2011) analyze the impact of AfT on trading costs, this study focuses exclusively on the effect of AfT categories – aid for trade policy and regulations, aid for trade facilitation, aid to economic infrastructure, and aid to productive capacity – on export performance. The research further explores the effects of disaggregated aid by sectors, which adds to Cali & Te Velde (2011) and to the literature in general. This approach holds relevant policy implications, aid to productive capacity may not have any impact since it is an average effect, likely to be produced by positive and negative impacts. Finally, the existing literature, including Cali & Te Velde (2011), predominantly relies on aggregate export data, limiting the analysis of the impact of AfT at the firm level. Thus, this study addresses the gap by incorporating firm-level data from the UN Enterprise Surveys.

## 3. Data

The data on AfT is sourced from the Creditor Reporting System (CRS) database, which includes information on aid distribution by sector and recipient countries. This data is reported by the members of the Development Assistance Committee (DAC) as part of the Official Development Assistance, provided by the OECD. The DAC serves as the primary platform for donors to coordinate their development efforts. The analysis employs aid disbursements (in USD) rather than aid commitments, as the former is more likely to have a larger impact. The data covers 91 developing countries from 2005 to 2022, since AfT was formalized in 2005 and due to data quality concerns before 2003. It is important to note that disbursements are

voluntarily reported by the DAC members, potentially introducing some measurement error due to differences in data collection methods. Given that the error would affect the independent variables, this may bias the estimations.

For this study, the AfT data is classified into four main categories (OECD, 2024):

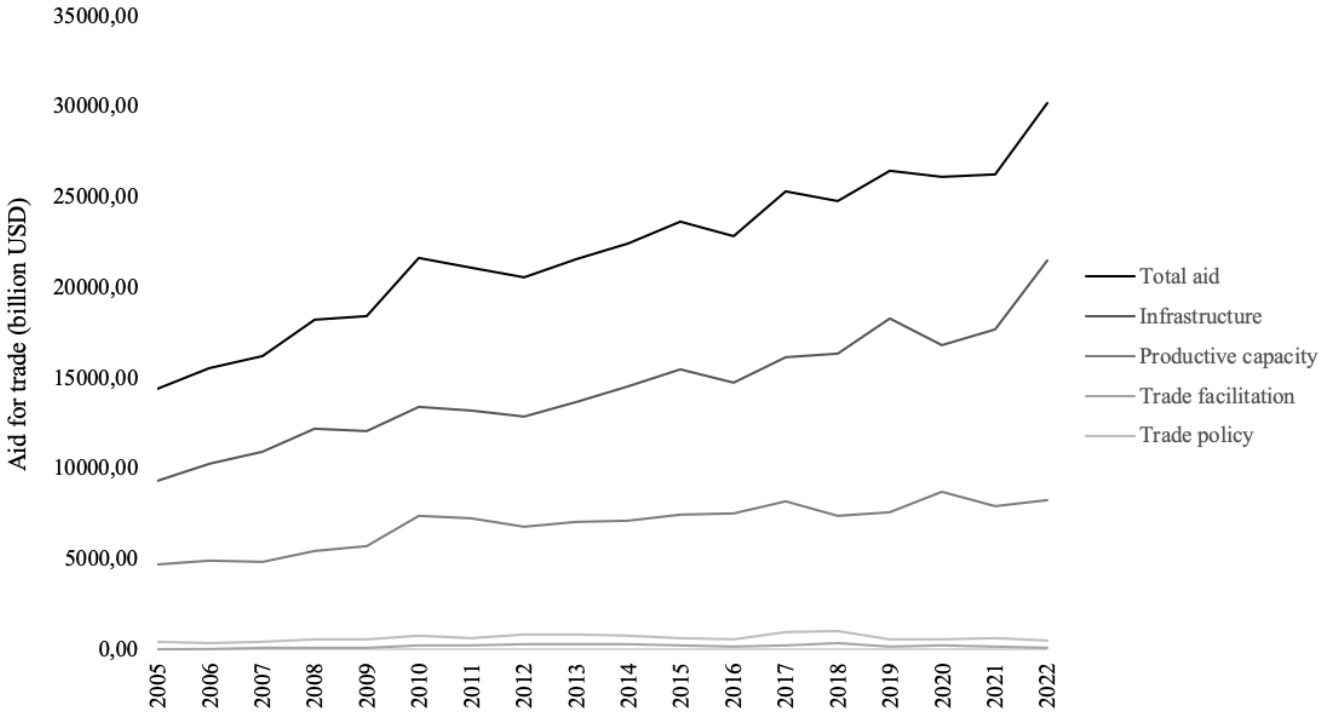
(1) Aid directed to economic infrastructure focuses on the construction of roads, ports and telecommunications systems to connect developing markets to the global economy. This category also includes support to business activities, banking and financial services.

(2) Aid allocated to productive capacity aims to strengthen firms to diversify their goods and enhance their comparative advantages. The sectors included are agriculture, industry, energy, and mining.

(3) Trade facilitation helps managing the costs arising from trade liberalization, including tariff reductions and terms-of-trade deterioration.

(4) Aid directed to trade policies and regulations assist countries in designing trade strategies, negotiating and implementing agreements. Trade facilitation is placed in this group, however, due to its relevance, it is analyzed separately and excluded from this category.

Figure 1: Evolution of aid for trade




*Notes*: The graph presents the evolution of total AfT and the four main categories.

In terms of export performance data, this paper utilizes two different datasets. First, the UN Comtrade database provides information on total aggregate exports and imports in USD for 86 developing countries for all commodities, covering the period from 2005 to 2022. Second, firm-level export data is obtained from the UN Enterprise Surveys. This includes the following indicators: (1) the percentage of firms engaged in exports, (2) the percentage of firms exporting directly, (3) the share of total sales that are derived from direct exports, (4) the percentage of inputs and/or supplies of foreign origin used by firms, and (5) the percentage of firms identifying customs and trade regulations as important constraints. Although this dataset is not structured as panel data, it includes information from 96 countries over several years. The data from the 2023 surveys is used to represent 2022.

Finally, regarding data for control variables, the Consumer Price Index (CPI) is sourced from the International Monetary Fund (IMF). This indicator measures variations in the prices of goods and services purchased or acquired by households. It is computed as a weighted average of the percentage cost changes for a specific basket of products, reflecting the cost of living and inflationary trends within a country. The World Bank's World Development Indicators provide data on the Worldwide Governance Indicators (WGI) and the GDP growth. The WGI covers around 200 countries, each rated from -2.5 (least effective) to 2.5 (most effective). It includes "Government Effectiveness", which assesses the perceived quality of public services, the independence of the civil service from political influence, and the strength of policy design and implementation. "Political Stability and Absence of Violence/Terrorism" measures the perceived probability of political instability, political-driven agitation and violence, including terrorist acts. Finally, "Control of Corruption" evaluates the perception of how much public power is exploited for personal benefit and the degree to which the state is captured by powerful elites and corporate interests.

### 3.1. Descriptive statistics

Before delving into the analysis, it may be valuable to review the available data. Table 1 presents an overview of the main variables in this study, which provides remarkable insights. Regarding exports and imports, there is a high standard deviation, suggesting substantial disparities in export capacities and market access among developing countries. Furthermore, only a modest proportion of firms, representing approximately 12%, are actively engaged in export activities, which decreases when considering direct exporting firms, accounting for only 8%. This reflects the barriers faced by firms in developing countries in order to export. Along

the same line, a substantial share of firms, 19% of the total, claim to face trade-related constraints, including regulatory burdens and logistical problems. Conversely, firms show a relatively high dependence on foreign inputs, with an average of 55% of inputs coming from other countries.

The negative values for Government Effectiveness (-0.50), Control of Corruption (-0.50), and Political Stability (-0.53) imply that public services in developing countries are of low quality, and corruption is pervasive. These factors can lead to inefficiencies in policy implementation and create an unpredictable environment, discouraging foreign investment and limiting export growth (Decker & Lim, 2009). A more detailed Table A1 in the appendix provides information on the data availability for each country included in the study.

Table 1. Summary statistics of the main variables

| | Mean | Std. dev. | Min | Max | Obs. | Source |
|---|---|---|---|---|---|---|
| Exports (million, USD) | 225000 | 819000 | 2.59 | 8420000 | 1707 | UN Comtrade |
| Imports (million, USD) | 208000 | 730000 | 1.25 | 7760000 | 1709 | UN Comtrade |
| | | | | | | |
| Exporting firms (%) | 13 | 6.73 | 3.8 | 31.9 | 82 | UN Enterprise Survey |
| Direct exporting firms (%) | 8.72 | 5.36 | 0.9 | 23.6 | 82 | UN Enterprise Survey |
| Direct export sales (%) | 4.33 | 3.31 | 0.3 | 15.8 | 82 | UN Enterprise Survey |
| Firm foreign input (%) | 55.26 | 22.03 | 4.5 | 98.6 | 82 | UN Enterprise Survey |
| Constrained firms (%) | 19.56 | 12.31 | 0.1 | 50.8 | 82 | UN Enterprise Survey |
| | | | | | | |
| Total $AfT$ (million, USD) | 708.90 | 2535.40 | -1.91 | 30202.42 | 1853 | OECD CRS |
| Infrastructure (million, USD) | 474.00 | 1710.78 | -2.24 | 21466.73 | 1853 | OECD CRS |
| Trade facilitation (million, USD) | 7.02 | 28.90 | -0.3 | 383.24 | 1531 | OECD CRS |
| Productive capacity (million, USD) | 191.25 | 734.68 | 0.00 | 8718.24 | 2151 | OECD CRS |
| Trade policy (million, USD) | 17.18 | 75.05 | 0.00 | 1055.21 | 1853 | OECD CRS |
| | | | | | | |
| Consumer Price Index (CPI) | 8.10 | 23.36 | -16.85 | 557.20 | 1216 | IMF |
| GDP growth | 3.55 | 5.22 | -78.38 | 22.41 | 1403 | World Bank WDI |
| Government Effectiveness | -0.50 | 0.60 | -2.36 | 1.23 | 1466 | World Bank WDI |
| Control Corruption | -0.50 | 0.60 | -1.71 | 1.70 | 1466 | World Bank WDI |
| Political Stability | -0.53 | 0.85 | -2.50 | 1.20 | 1466 | World Bank WDI |

*Note:* This table shows the descriptive aggregate statistics for all countries for the years 2005-2022. Means and standard deviations are computed using the overall data, so they do not distinguish between countries or years.

## 4. Methodology

The empirical analysis is divided into two parts. First, the impact of total AfT on export performance is estimated with the following form:

$$E_{it} = \alpha_i + \gamma \ln(AfT)_{it-x} + X_{it} + \delta_t + \in_{it} \quad (1)$$

where E is the (log of) aggregate export value in constant prices for country *i* and time *t.* $a_i$ are country fixed effects and $\delta_t$ are year fixed effects, which control for time-variant confounders that affect all countries. $\in_{it}$ is the error term and $\gamma$ is the coefficient of interest, which denotes total aid for trade disbursements one year lagged. X is a vector of time-varying control variables. First, following Cali & Te Velde (2011), the Consumer Price Index (CPI) is utilized as a control to account for relative price levels and inflation, which may affect the competitiveness of a country's exports.

GDP growth acts as a proxy for the economic performance and the size of countries, which directly influences its export capacity and trade performance. Furthermore, countries with larger GDPs generally have more developed infrastructure and institutional capacity, potentially influencing both the reception of aid and export performance. The Worldwide Governance Indicators (WGI) are included since overall, democratic governance correlates with better economic policies and stable business environments favorable to trade. Furthermore, countries with better governance are more likely to receive more aid and utilize it more efficiently, which can positively influence export performance.

After having established the impact of total AfT on export performance, the effect of different types of aid is estimated separately in order to determine which category has a larger impact, with the following regression:

$$E_{it} = \alpha_i + \gamma_1 \ln(A_{INF})_{it-x} + \gamma_2 \ln(A_{TF})_{it-x} + \gamma_3 \ln(A_{PC})_{it-x} + \gamma_4 \ln(A_{PR})_{it-x} + X_{it} + \delta_t + \in_{it} \quad (2)$$

where $A_{INF}$ is aid to economic infrastructure, $A_{TF}$ is aid for trade facilitation, $A_{PC}$ is aid to productive capacity, and $A_{PR}$ is aid for trade policy and regulations. The study further looks at different subcategories – aid to financial institutions, SMEs, transport infrastructure, education and policies – with separate regressions, being aggregate exports the dependent variable and AfT disaggregated by sectors the independent variable. It is worth noting that, for both specifications (1) and (2), the transformation of the AfT variables in logarithmic form involves the loss of the zero-aided observations. Therefore, one common approach to tackle this problem

used in this study is ln(1 + AfT). This approach ensures the retention of observations, thus preserving the complete dataset.

In the second part of the analysis, firm-level data from the UN Enterprise Survey is utilized to explore the impact of AfT on various indicators of export performance. Unlike the panel data structure employed in the first part of the analysis, the dataset in this section is cross-sectional, thus a cross-country comparison is conducted. Given the cross-sectional nature of this dataset, the analysis serves as an additional perspective. Separate regression models will be estimated for each of the five dependent variables: (1) the percentage of firms engaged in exports, (2) the percentage of firms exporting directly, (3) the share of total sales derived from direct exports, (4) the percentage of inputs and/or supplies of foreign origin used by firms, and (5) the percentage of firms identifying trade regulations as important constraints.

Each regression model is specified as follows:

$$Y_i = \gamma \ln(AfT)_i + X_i + \in_i \quad (3)$$

$$Y_i = \gamma_1 \ln(A_{INF})_i + \gamma_2 \ln(A_{TF})_i + \gamma_3 \ln(A_{PC})_i + \gamma_4 \ln(A_{PR})_i + X_i + \in_i \quad (4)$$

where $Y$ represents the respective dependent variable for firm $i$. $\gamma$ is the coefficient of interest, which denotes the total aid for trade disbursements in Equation 3 and the different AfT categories in Equation 4. X is a vector of time-varying control variables.

### 4.1. Endogeneity

Endogeneity represents a major concern in estimating the impact of AfT on export performance and the direction of causality remains unclear. Donors may prefer to provide aid to developing countries that already exhibit favorable export performance, with whom they share important ties or with whom they wish to strengthen their relationship. If this is the case, aid allocation would be influenced by self-interest or strategic trade considerations. Therefore, countries may be selected based on observable and unobservable characteristics that also contribute to their export success. This non-random allocation of aid can potentially lead to selection bias and upward-biased estimates.

To mitigate endogeneity, the use of GDP and WDI as control variables is of crucial relevance. The use of GDP minimizes the bias arising from differences in economic size that may cause developing countries with higher economic growth to receive more aid. By including the WGI, the analysis can account for the quality of governance and institutions that

may influence aid allocation, which would be the case if donors prefer countries with democratic systems. This ensures that the estimated effect of aid is not confounded by better performing countries. However, other unobservable attributes that are complex to measure may remain as confounders, leading to omitted variable bias. For instance, historical ties, donor-specific strategic interests, cultural affinities, and geopolitical considerations.

In this context, the use of lagged variables is particularly important as it mitigates simultaneity bias by ensuring that changes in aid would lead to changes in exports and not the contrary. If exports influence aid, it would confirm that better performing countries receive more aid. Furthermore, lagged values capture delayed effects, which is relevant since the impact of aid on export performance may not be immediate. Despite these attempts, endogeneity may persist, requiring further robustness checks and, potentially, the use of instrumental variables to better isolate the causal impact of aid on export outcomes.

# 5. Results

This section first delves into the results derived from the OECD CRS panel data, which employs total aggregate exports and imports, and the second part includes an additional cross-sectional analysis with data from the UN Enterprise Surveys.

## 5.1. Panel data results

### 5.1.1. Total AfT

The first part of this analysis focuses on the effect of total Aid for Trade (AfT) on the aggregate total volume of exports and imports of developing countries, as modeled by equation (1). The results are reported in Table 2. Initially, AfT shows a positive but statistically insignificant association with aggregate exports, indicating that a 100% increase in AfT may be correlated with 4.8% rise in exports from recipient countries. However, as additional controls are introduced, the coefficient declines to 1.7%. Regarding import levels, AfT has a non-significant and negative correlation on aggregate total imports. These findings are consistent with existing literature, which suggests that exports from recipient countries increase more than imports (Wilson et al. 2005; Helble et al. 2012).

GDP growth shows a positive sign for all specifications and becomes significant for imports. This result may be driven by increased domestic demand. As GDP grows, the aggregate income within a country rises, leading to higher consumption. In this situation, donor countries may respond by increasing their exports to these economies. Government

effectiveness consistently shows a positive and significant relationship with export and import performance in all specifications, suggesting the relevant role of a strong governance in promoting and facilitating international trade.

The coefficients for control of corruption and political stability exhibit negative signs, although these effects are not statistically significant. This implies that contrary to expectations, better control of corruption and greater political stability may be associated with worse export performance. Furthermore, not adding these controls do not change the results since they may be already captured by government effectiveness. Thus, control of corruption and political stability are not used in the subsequent regressions. Finally, the Consumer Price Index (CPI) shows a negative and significant coefficient in Column (2), indicating that higher domestic price levels may reduce export competitiveness.

Table 2. Effect of aid for trade on exports and imports

| | (1) Export | (2) Export | (3) Import | (4) Import |
|---|---|---|---|---|
| $\ln(AfT)_{it-1}$ | 0.048 | 0.017 | -0.067 | -0.092 |
| | (0.035) | (0.034) | (0.055) | (0.667) |
| ln(GDP growth) | 0.702 | 0.207 | 0.995** | 0.783** |
| | (0.458) | (0.371) | (0.390) | (0.372) |
| Government | 0.547** | 0.345** | 0.437* | 0.653* |
| | (0.258) | (0.133) | (0.240) | (0.356) |
| Corruption | | -0.041 | | -0.228 |
| | | (0.147) | | (0.360) |
| Stability | | -0.300 | | -0.144 |
| | | (0.074) | | (0.137) |
| ln(CPI) | | -0.050* | | -0.160 |
| | | (0.027) | | (0.038) |
| Observations | 1200 | 970 | 1201 | 972 |
| Countries | 76 | 74 | 76 | 74 |
| R-sq. (within) | 0.271 | 0.234 | 0.228 | 0.160 |

*Notes:* This table presents the estimated coefficients of the effect of total AfT on exports from columns 1-2 and imports from columns 3-4. The dependent variables (log) are the value of total aggregate exports and imports in US$. Total AfT is in log form and lagged by one period. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. $*p<0.1$; $**p<0.05$; $***p<0.01$

### 5.1.2. Main types of AfT

The study continues exploring the impact of the main AfT categories as detailed in Table 3. The results indicate that across the AfT categories examined, only trade facilitation (Columns 2-4) demonstrates a positive and statistically significant correlation with total aggregate exports. However, statistical significance is lost with the addition of the Consumer Price Index

as a control. This could indicate that omitted variable bias are driving the initial result. The coefficient estimates suggest that a 100% increase in trade facilitation is associated to 3.4-4.2% increase in total exports from recipient countries. Trade facilitation remains positive and significant with larger coefficients in Columns (9)-(10) when included with all specifications. Particularly, coefficients show a potential increase in exports by 6.2-8.1%.

In contrast, aid to productive capacity and aid to economic infrastructure demonstrate no statistically significant correlation with total exports, despite being positive. A 100% increase in aid to economic infrastructure corresponds to only 0.7-2% increase in exports. Similarly, a 100% increase in aid to productive capacity is associated with 1.5-6% increase in exports. Interestingly, aid allocated for trade policy and regulations exhibits a negative coefficient in columns (7-8), and when all types of aid are included in the same model specification in columns (9-10), the relationship becomes statistically significant. Specifically, a 100% increase in aid for trade policy and regulations correlates to 4.8-7.5% decrease in the level of exports.

To some extent, these findings are consistent with Cali and Te Velde (2011), who suggest that trade facilitation decreases trade costs while aid to productive capacity does not appear to have any significant influence on exports. Nevertheless, the results differ from a large body of literature indicating that support for economic infrastructure has the largest significant impact on exports (Vijil & Wagner, 2012; Cali and Te Velde, 2011; Iwanow & Kirkpatrick, 2007). Other studies also demonstrate that aid to trade policies and regulations significantly enhance export performance (Helble et al., 2012; Martínez-Zarzoso et al., 2017; and Hühne & Nunnenkamp, 2014).

It is noteworthy that, while in this paper, trade facilitation remains the only category that shows a significant correlation with aggregate exports, trade facilitation receives the least financial support when compared to aid directed to economic infrastructure and productive capacity, as illustrated in Figure 1. Regarding control variables, GDP growth continues to be positive and government effectiveness consistently shows a positive and significant relationship with export performance across nearly all specifications, suggesting that better governance and institutional quality enhances the benefits from AfT. The CPI shows practically an identical, negative and significant coefficient (-0.050) in all specifications in which it is included, implying that CPI is correlated with AfT regardless of the category.

Table 3. Effect of main types of aid for trade on exports

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| $\ln(A_{INF})_{it-1}$ | 0.020 | 0.007 | | | | | | | -0.023 | 0.009 |
| | (0.024) | (0.023) | | | | | | | (0.045) | (0.023) |
| $\ln(A_{TF})_{it-1}$ | | | **0.042**$^{*}$ | 0.034 | | | | | **0.081**$^{***}$ | **0.062**$^{**}$ |
| | | | (0.025) | (0.025) | | | | | (0.027) | (0.025) |
| $\ln(A_{PC})_{it-1}$ | | | | | 0.060 | 0.015 | | | 0.043 | -0.030 |
| | | | | | (0.040) | (0.044) | | | (0.377) | (0.413) |
| $\ln(A_{PR})_{it-1}$ | | | | | | | -0.015 | -0.016 | **-0.075**$^{***}$ | -0.048 |
| | | | | | | | (0.022) | (0.028) | (0.026) | (0.030) |
| ln(GDP growth) | 0.717$^{**}$ | 0.212 | 0.731 | 0.213 | 0.685 | 0.198 | 0.770 | 0.067 | 0.756 | 0.083 |
| | (0.348) | (0.378) | (0.544) | (0.520) | (0.447) | (0.373) | (0.504) | (0.352) | (0.507) | (0.362) |
| Government | 0.487$^{*}$ | 0.313$^{**}$ | 0.548$^{*}$ | 0.313$^{**}$ | 0.551$^{**}$ | 0.313$^{**}$ | 0.580$^{*}$ | 0.300 | 0.571 | 0.293$^{**}$ |
| | (0.282) | (0.123) | (0.261) | (0.123) | (0.261) | (0.123) | (0.290) | (0.123) | (0.287) | (0.131) |
| ln(CPI) | | -0.050$^{*}$ | | -0.050$^{*}$ | | -0.050$^{*}$ | | -0.050$^{*}$ | | -0.050$^{*}$ |
| | | (0.027) | | (0.027) | | (0.027) | | (0.026) | | (0.026) |
| Observations | 1200 | 970 | 1200 | 971 | 1200 | 971 | 1103 | 897 | 1102 | 896 |
| Countries | 76 | 74 | 76 | 74 | 76 | 74 | 76 | 74 | 76 | 74 |
| R-sq. (within) | 0.268 | 0.233 | 0.270 | 0.438 | 0.272 | 0.233 | 0.344 | 0.344 | 0.355 | 0.345 |

*Note*s: This table presents the estimated coefficients of the effect of the main AfT categories on the level of exports. The dependent variable (log) is the value of total aggregate exports in US$. $A_{INF}$, $A_{TF}$, $A_{PC}$, and $A_{PR}$ are in log form and lagged by one period. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.

The correlation of the same AfT variables on total aggregate imports is shown in Table A2 in the appendix. Trade facilitation is the only type of aid that exhibits a positive but insignificant coefficient on total imports. However, aid for economic infrastructure, productive capacity, and trade policies and regulations show negative and insignificant coefficients. The negative relationship of the majority AfT categories with imports helps to mitigate endogeneity concerns. If donor countries were primarily allocating aid to enhance their own export markets, a positive correlation with imports in recipient countries would be expected. Furthermore, the positive and significant results of trade facilitation – which theoretically only promotes trade in recipient countries – on both exports and imports further supports the idea that aid allocation may be more focused on improving developing countries' self-sufficiency rather than merely promoting donor exports and trade interests.

### 5.1.3. AfT disaggregated by sectors

In order to identify the sectors or projects driving a positive or negative impact of AfT, the analysis focuses into aid disaggregated by sectors. The main subcategories examined in this part of the study are related to financial institutions, SMEs, infrastructure, education, and sector development policies. In the first place, Table 4 indicates that aid directed to informal financial institutions has a statistically significant negative relationship with aggregate exports, as 100% increase in this type of support is correlated with 4.4% decrease in exports of the recipient countries. Despite this negative coefficient, informal financial institutions are particularly relevant in developing countries. 'Money lenders' frequently work through social networks and without traditional collateral requirements, thus achieving high repayment rates. Nevertheless, their target may be predominantly lower-income households or small and medium-sized enterprises (SMEs) unable to access other types of formal financing, which are less inclined to engage in export activities, thus limiting the overall positive impact on exports.

On the other hand, aid to formal financial institutions shows a modest and positive, albeit statistically insignificant, correlation with recipient countries' exports. In theory, the impact of formal financial institutions on export performance would be attributed to their support for larger and export-oriented firms, which informal institutions generally do not assist. Moreover, aid to monetary institutions is positively and significantly associated with the level of exports, with a 100% increase in this type of aid corresponding to 0.7% increase in exports. Solid monetary institutions can facilitate direct investments, stabilize exchange rates, and lower transaction costs and currency risks, all of which may contribute to export growth.

Table 4. Financial/Monetary institutions, and SMEs on exports

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $\ln(A_{FORMAL})_{it}$ | 0.010 | | | | 0.008 |
| | (0.010) | | | | (0.009) |
| $\ln(A_{INFORMAL})_{it}$ | | **-0.044*** | | | **-0.047*** |
| | | (0.026) | | | (0.026) |
| $\ln(A_{MONETARY})_{it}$ | | | **0.007**** | | **0.008**** |
| | | | (0.003) | | (0.003) |
| $\ln(A_{SMEs})_{it}$ | | | | 0.009 | 0.007 |
| | | | | (0.034) | (0.033) |
| ln(GDP growth) | 0.214 | 0.168 | 0.213 | 0.212 | 0.160 |
| | (0.378) | (0.400) | (0.376) | (0.376) | (0.402) |
| Government | 0.314** | 0.305** | 0.315** | 0.312** | 0.305** |
| | (0.123) | (0.121) | (0.124) | (0.123) | (0.120) |
| ln(CPI) | -0.050* | -0.048* | -0.048* | -0.050* | -0.048* |
| | (0.027) | (0.027) | (0.027) | (0.027) | (0.027) |
| Observations | 970 | 971 | 971 | 975 | 970 |
| Countries | 74 | 74 | 74 | 74 | 74 |
| R-sq. (within) | 0.234 | 0.236 | 0.234 | 0.300 | 0.240 |

*Note*s: This table presents the estimated coefficients of the effect of aid directed to financial institutions and SMEs on exports from the recipient countries. The dependent variable (log) is the value of total aggregate exports in US$. $A_{FORMAL}$ refers to formal financial institutions, $A_{INFORMAL}$ to informal financial institutions and $A_{MONETARY}$ to monetary institutions. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Finally, aid to Small and Medium Enterprises (SMEs) exhibits a positive and non-significant correlation with exports. This may be explained by the challenges that SMEs face in accessing global markets due to their limited resources and constraints. Indeed, according to Freund & Pierola (2015), only a few 'superstars' firms are able to export. Hence, to increase SMEs' presence in international trade, effective aid may require a more targeted focus on training, productivity gains, and export opportunities, as demonstrated by the Randomized Control Trial conducted by Atkin et al. (2017), which achieved positive results when rug producers in Egypt were provided with the opportunity to export. Overall, the results remain consistent when all variables are combined in the same specification in Column (5) and control variables generally exhibit the expected signs.

The results presented in Table A3 in the appendix indicate the impact of aid to financial institutions and SMEs on imports. The coefficient on monetary institutions continues to be positive and significant, which closely mirrors the coefficient on exports. A 100% increase in aid to monetary institutions correlates with 0.8% increase in imports, which rises to 1.2% when the specification includes all variables in Column (5). This parallelism in the coefficients for imports and exports can be interpreted as indicative of the role of monetary institutions in

facilitating international trade, rather than exclusively exports. In contrast, aid to formal and informal financial institutions and SMEs are non-significant and negatively related to imports.

Focusing on infrastructure, Table 5 illustrates that investments in all transport infrastructure are associated with enhanced export performance. However, only aid directed to water transport is significant, suggesting that a 100% increase in this type of aid may potentially result in 5.2% increase in exports from the recipient countries. The result holds in Column (5), where all variables are included in the same specification. Global trade heavily relies on maritime transport, as evidenced by disruptions in ports or maritime routes that can severely impede trade. For instance, the Suez Canal, which suffered a six-day blockage due to a stranded ship incident in 2021, exposed the vulnerability of global logistics and maritime routes (UNCTAD, 2023). Investment in port infrastructure in developing countries is therefore essential as it reduces transportation costs, improve supply chain efficiency, and facilitate access to global markets, increasing a country's capacity to handle higher export and import volumes. Table A4 in the appendix reports water transport as the only type of transport aid that positively correlates with imports, although this result is not significant. The remaining coefficients are negative and insignificant.

Table 5. Transport infrastructure on exports

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $\ln(A_{WATER})_{it}$ | **0.052*** | | | | **0.053*** |
| | (0.030) | | | | (0.030) |
| $\ln(A_{ROAD})_{it}$ | | 0.034 | | | 0.035 |
| | | (0.027) | | | (0.026) |
| $\ln(A_{AIR})_{it}$ | | | 0.024 | | 0.022 |
| | | | (0.030) | | (0.028) |
| $\ln(A_{RAIL})_{it}$ | | | | 0.003 | -0.008 |
| | | | | (0.025) | (0.025) |
| ln(GDP growth) | 0.177 | 0.197 | 0.195 | 0.211 | 0.142 |
| | (0.403) | (0.381) | (0.380) | (0.373) | (0.407) |
| Government | 0.308** | 0.323*** | 0.317** | 0.313** | 0.320** |
| | (0.124) | (0.120) | (0.124) | (0.124) | (0.121) |
| ln(CPI) | -0.050* | -0.051* | -0.050* | -0.050* | -0.052* |
| | (0.027) | (0.026) | (0.027) | (0.027) | (0.027) |
| Observations | 971 | 971 | 971 | 971 | 971 |
| Countries | 74 | 74 | 74 | 74 | 74 |
| R-sq. (within) | 0.240 | 0.400 | 0.353 | 0.233 | 0.246 |

*Notes*: This table presents the estimated coefficients of the effect of aid to transport on exports from the recipient countries in all columns. The dependent variable (log) is the value of total aggregate exports in US$. The independent variable values are in logarithm and not lagged. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Furthermore, education generally benefits export performance in recipient countries, as it is shown in Table 6, with the notable exception of trade education, which has a negative coefficient. This negative sign is unexpected, as one would anticipate that trade education would enhance firms' capabilities and knowledge about international markets, thereby increasing their participation in trade activities. Conversely, aid allocated for general education and training exhibits a positive and statistically significant correlation with exports. Specifically, a 100% increase in aid for education and training would result in a 6.8% increase in exports, with a similar coefficient of 7.2% when all variables are included in the same specification. Nevertheless, the lack of impact from trade education remains unclear. Aid to agricultural and energy education are positively related to export performance, although these results are not statistically significant. When aid for agricultural and energy education is increased by 100%, it may be correlated with 8% and 4.5% increase in exports, respectively. These coefficients have zero or minor variation when including all variables in the same specification, reinforcing the robustness of the findings.

Table 6. Education on exports

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $\ln(A_{TRADE\ EDUCATION})_{it}$ | -0.064 | | | | -0.090 |
| | (0.152) | | | | (0.151) |
| $\ln(A_{GENERAL\ EDUCATION})_{it}$ | | **0.068*** | | | **0.072*** |
| | | (0.041) | | | (0.041) |
| $\ln(A_{AGRI\ EDUCATION})_{it}$ | | | 0.080 | | 0.080 |
| | | | (0.056) | | (0.054) |
| $\ln(A_{ENERGY\ EDUCATION})_{it}$ | | | | 0.045 | 0.050 |
| | | | | (0.048) | (0.047) |
| ln(GDP growth) | 0.224 | 0.222 | 0.220 | 0.191 | 0.215 |
| | (0.376) | (0.370) | (0.380) | (0.372) | (0.371) |
| Government | 0.312** | 0.315** | 0.318** | 0.317** | 0.320*** |
| | (0.123) | (0.122) | (0.122) | (0.123) | (0.120) |
| ln(CPI) | -0.050* | -0.050* | -0.052* | -0.050* | -0.053* |
| | (0.027) | (0.027) | (0.027) | (0.027) | (0.027) |
| Observations | 971 | 971 | 971 | 971 | 971 |
| Countries | 74 | 74 | 74 | 74 | 74 |
| R-sq. (within) | 0.233 | 0.235 | 0.236 | 0.234 | 0.240 |

*Notes*: This table presents the estimated coefficients of the effect of educational aid to different sectors on exports from the recipient countries in all columns. The dependent variable (log) is the value of total aggregate exports in US$. The independent variable values are in logarithm and not lagged. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Regarding the impact on imports, for all types of education, the coefficients turn negative and statistically insignificant, as shown in Table A5 in the appendix. This aligns with the aims of educational aid, which is intended to improve skills and productivity in recipient countries,

thus enabling firms in developing economies to become more competitive and capable of producing goods that comply with international standards for export rather than import.

The results in Table 7 suggest a concerning trend in the relationship of policy aid allocated to several sectors and recipient countries' export performance. In particular, more than half of the aid assigned to these policies – transport, business, and trade policy – show a negative coefficient, while those exhibiting a positive coefficient – financial and energy policy – the correlation is rather minimal. The results are also statistically insignificant. The negative relationship may be attributed to the misallocation of resources due to corruption, where funds intended for policy improvements are redirected for personal gain or misused. Even when aid is allocated appropriately, the lack of resources can result in poorly designed or executed policies that do not address the firms' needs.

Table 7. Policies on exports

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| $\ln(A_{TRANSPORT})_{it}$ | -0.135 | | | | | -0.137 |
| | (0.132) | | | | | (0.133) |
| $\ln(A_{FINANCIAL})_{it}$ | | 0.024 | | | | 0.028 |
| | | (0.028) | | | | (0.027) |
| $\ln(A_{BUSINESS})_{it}$ | | | -0.025 | | | -0.026 |
| | | | (0.035) | | | (0.035) |
| $\ln(A_{ENERGY})_{it}$ | | | | 0.009 | | 0.003 |
| | | | | (0.017) | | (0.018) |
| $\ln(A_{TRADE})_{it}$ | | | | | -0.038 | -0.040 |
| | | | | | (0.028) | (0.028) |
| ln(GDP growth) | 0.156 | 0.191 | 0.206 | 0.214 | 0.240 | 0.140 |
| | (0.350) | (0.380) | (0.375) | (0.377) | (0.365) | (0.346) |
| Government | 0.300** | 0.312** | 0.310** | 0.314** | 0.307** | 0. 286** |
| | (0.125) | (0.124) | (0.126) | (0.124) | (0.125) | (0.129) |
| ln(CPI) | 0.044 | -0.051* | -0.047* | -0.050* | -0.050* | 0.046 |
| | (0.071) | (0.027) | (0.027) | (0.027) | (0.027) | (0.072) |
| Observations | 971 | 971 | 971 | 971 | 971 | 970 |
| Countries | 74 | 74 | 74 | 74 | 74 | 74 |
| R-sq. (within) | 0.235 | 0.234 | 0.234 | 0.233 | 0.235 | 0.240 |

*Note*s: This table presents the estimated coefficients of the effect of policy aid to different sectors on exports from the recipient countries in all columns. The dependent variable (log) is the value of total aggregate exports in US$. The independent variable values are in logarithm and not lagged. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

It is worth noting that the descriptive statistics (Table 1) indicate that for the countries in the sample, control of corruption and government effectiveness are considered to be at low levels. Moreover, in this context, the coefficient of government effectiveness remains positive and significant in all specifications, reaffirming the importance of good governance in ensuring that

aid is used effectively and that policies are properly implemented, directly benefiting the exporting firms. Therefore, policy support may not be as effective as aid for other purposes. Likewise, the results in Table A6 show that aid to policy sectors is diversely related to imports, with some sectors showing positive and some negative coefficients, although these effects are generally statistically insignificant.

The findings in this section are arguably the most relevant outcome of this paper, as they indicate – but do not definitively prove – that aid allocated towards monetary institutions, water transport, and education and training are significantly correlated to an increase in total aggregate exports in recipient countries. However, due to the endogeneity issues discussed in section 4.1, these results cannot be interpreted as a causal relationship and the allocation of aid may be biased towards well-performing sectors. Despite this limitation, the significant positive correlation is a noteworthy result, since it addresses a gap in the existing literature, which has not explored aid disaggregated by sector.

#### 5.1.4. Robustness checks

In order to strengthen the validity of the results, two robustness checks are proposed in this section. Firstly, the use of a different dependent variable, 'exports normalized' (exports/population), adjusts for population size, providing a more accurate measure of export performance relative to the size of each country's economy. Secondly, the exclusion China and India from the sample since their influence in international trade and rapid growth rates can drive the results, leading to biased estimates.

The robustness checks in Table 8 reaffirms several findings observed in Table 3, albeit with reduced magnitudes across all estimates. In particular, aid for trade facilitation continues to show the most consistent and positive relationship with export performance. A 100% increase in aid for trade facilitation corresponds to 2-3% increase in population-standardized exports, which turns statistically significant in Column (5) and correlates with the previous results. Conversely, the coefficients for aid allocated to infrastructure and productive capacity, while positive, become less pronounced when exports are normalized by population, remaining statistically insignificant. Aid directed towards trade policies and regulations maintains a negative and insignificant coefficient. Overall, this approach shows a marginal decline in the coefficients, which suggests that the initial results in Table 3 are robust. Thus, the observed impact of AfT holds when per capita measures are considered.

Table 8. Robustness checks: Exports/Population

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $\ln(A_{INF})_{It-1}$ | 0.004 | | | | 0.005 |
| | (0.001) | | | | (0.001) |
| $\ln(A_{TF})_{It-1}$ | | 0.020 | | | **0.030**** |
| | | (0.004) | | | (0.001) |
| $\ln(A_{PC})_{It-1}$ | | | 0.001 | | -0.003 |
| | | | (0.002) | | (0.002) |
| $\ln(A_{PR})_{it-1}$ | | | | -0.004 | -0.002 |
| | | | | (0.034) | (0.002) |
| ln(GDP growth) | 0.010 | 0.011 | 0.009 | 0.095 | 0.000 |
| | (0.025) | (0.022) | (0.025) | (0.022) | (0.024) |
| Government | 0.017** | 0.016** | 0.018** | 0.020** | 0.016** |
| | (0.008) | (0.007) | (0.008) | (0.008) | (0.008) |
| ln(CPI) | -0.003 | -0.003 | -0.003 | -0.002 | -0.003 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Observations | 958 | 971 | 961 | 894 | 894 |
| Countries | 74 | 74 | 74 | 74 | 74 |
| R-sq. (within) | 0.145 | 0.236 | 0.147 | 0.192 | 0.216 |

*Note*s: This table presents robustness checks. The dependent variable (log) is 'exports normalized' which is the value of total aggregate exports in US$ divided by population. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Furthermore, Table 9 excludes China and India from the sample to assess whether these leading exporting countries are driving the previous results. In particular, aid for trade facilitation remains positively and significantly related with exports in Column (5), which is closely aligned with the coefficients in Table 3. Specifically, a 100% increase in aid of this type would potentially lead to 3.6-6.4% increase in exports. In contrast, the coefficient associated with aid to economic infrastructure decreases from 0.007 in Table 3 to 0.003 in Table 9, and minimal changes are observed for aid to productive capacity and trade policies and regulations. This indicates that results in earlier specifications are not driven by China and India. Therefore, the concern that better-performing countries receive higher levels of AfT and thus bias the results could be mitigated.

Across the different specifications and checks in Tables 8 and 9, the results consistently confirm the initial finding that only trade facilitation is positively and significantly associated with export performance, although this relationship cannot be considered as causal. This further suggests that similar robustness is likely to hold when other aid types and subcategories are analyzed.

Table 9. Robustness checks: China and India

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $\ln(A_{INF})_{It-1}$ | 0.003 | | | | 0.012 |
| | (0.024) | | | | (0.023) |
| $\ln(A_{TF})_{It-1}$ | | 0.036 | | | **0.064**** |
| | | (0.026) | | | (0.026) |
| $\ln(A_{PC})_{It-1}$ | | | 0.018 | | -0.003 |
| | | | (0.034) | | (0.042) |
| $\ln(A_{PR})_{it-1}$ | | | | -0.015 | -0.050 |
| | | | | (0.030) | (0.031) |
| ln(GDP growth) | 0.640 | 0.644 | 0.605 | 0.422 | 0.460 |
| | (0.482) | (0.475) | (0.488) | (0.713) | (0.710) |
| Government | 0.300** | 0.300** | 0.300** | 0.286** | 0.280** |
| | (0.134) | (0.128) | (0.132) | (0.139) | (0.139) |
| ln(CPI) | -0.048* | -0.048* | -0.048* | -0.047 | -0.047 |
| | (0.027) | (0.027) | (0.028) | (0.026) | (0.026) |
| Observations | 934 | 947 | 937 | 873 | 872 |
| Countries | 72 | 72 | 72 | 72 | 72 |
| R-sq. (within) | 0.222 | 0.225 | 0.224 | 0.330 | 0.336 |

*Note*s: This table presents robustness checks. The dependent variable (log) is the value of total aggregate exports in US$. China and India are excluded from the sample in all the regressions. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

## 5.2. Cross-sectional results

The second part of the study includes an additional cross-sectional analysis with data from the UN Enterprise Surveys, revealing a slightly different trend. Notably, the relationship of total AfT and firm-level export performance is negative and non-significant, except for the percentage of foreign input used and the percentage of constrained firms, which show a significant negative correlation. According to appendix Table A7, a 100% increase in total AfT is associated with 5.3% reduction in the percentage of foreign input used by firms and 1.5% reduction of the percentage of constrained firms in developing countries. This pattern is consistent across both aid to economic infrastructure and aid to productive capacity (Tables A8 and A10 in the appendix). For the remaining variables, aid to economic infrastructure and productive capacity do not appear to be beneficial for firms' export performance.

These results hold relevant implications for the empirical studies by Amiti and Konings (2007) and Topalova and Khandelwal (2011), both of which suggest the importance of imported inputs in improving firm productivity. In this study, the observed reduction in the use of foreign inputs in response to AfT suggests that firms may achieve productivity gains through alternative mechanisms, including the development of local supply chains or the improvement of the quality of domestic inputs. Furthermore, the unexpected negative or non-significant result for aid to productive capacity and the share of exporting firms can be caused by

imbalances in aid provided and the needs of firms, or by aid being targeted to sectors that are currently well-performing.

Nevertheless, the analysis shows that aid directed towards trade policies and regulations is positively and significantly correlated with the percentage of exporting firms. A 100% increase in aid of this type corresponds to 1.5% increase in the proportion of firms engaging with exports, as illustrated in Table A11 in the appendix. These findings are consistent with Hühne & Nunnenkamp (2014), Helbe et al. (2012), and Martínez-Zarzoso et al. (2017), who identify aid for trade policies and regulations as the most influential in increasing exports. While the coefficient for direct sales remains positive yet insignificant, the coefficients for the percentage of constrained firms and the use of foreign inputs are negative and significant, with reductions of 2% and 8%, respectively. In Table A9, trade facilitation shows positive but non-significant coefficients, which deviates from the results observed at the aggregate level.

AfT aims to provide resources to address trade-related constraints through improved infrastructure and regulatory environment. However, at the firm level, the impact may vary considerably. Larger firms, which frequently dominate the export market, are better positioned to benefit from AfT due to their resources, consolidated market access and internal capabilities. In this context, improvements in infrastructure are likely to provide greater advantages to large exporting firms. In contrast, firms not engage in exporting may derive limited to no benefit from these improvements and may remain non-exporters. These non-exporting firms need more targeted forms of assistance – training programs, technological improvements or subsidies – in order to develop their capabilities and competitiveness in international markets.

Considering that aid directly targeting firms is anticipated to have a more pronounced impact on their performance, it is essential to examine the impact of subcategories with this attribute. Therefore, the subsequent analysis focuses on aid to trade education, Small and Medium Enterprises (SMEs), and business policy. As indicated in Table 10, a 100% increase on aid to trade education corresponds to 9% increase in the percentage of exporting firms and 8% increase in the percentage of direct exporting firms. These coefficients are statistically significant. The same increase on this type of aid can raise direct export sales by approximately 6%. The percentage of foreign inputs used by firms and the percentage of firms that are constrained show negative and non-significant coefficients.

Table 10. Trade Education

| | (1) Export firms | (2) Direct export firms | (3) Direct export sales | (4) Foreign input | (5) Constrained firms |
|---|---|---|---|---|---|
| $\ln(A_{TRADE\ EDUCATION})_i$ | **9.601*** | **8.194**** | **6.260**** | -26.908 | -5.929 |
| | (4.840) | (3.301) | (3.128) | (17.681) | (13.105) |
| ln(GDP growth) | -58.371** | -51.238** | -20.176 | -101.633 | -39.405 |
| | (26.437) | (19.752) | (15.492) | (83.350) | (47.185) |
| Government | -1.930 | -1.032 | -0.347 | -8.545 | 11.749*** |
| | (1.497) | (1.090) | (0.656) | (5.685) | (2.017) |
| ln(CPI) | -0.754 | -0.413 | -0.373 | -2.170 | 0.587 |
| | (1.081) | (0.868) | (0.482) | (3.406) | (1.256) |
| Observations | 62 | 62 | 62 | 62 | 62 |
| R-sq. (within) | 0.163 | 0.169 | 0.117 | 0.096 | 0.409 |

*Note*s: This table presents the estimated coefficients of the effect of aid to trade education on firm-level outcomes in developing countries. Robust standard errors are given in parentheses. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

These significant and positive coefficients contrast with aggregate-level results, where the relationship between trade education and export levels is negative and statistically insignificant. This may be attributed to aggregate export data hiding micro-level dynamics and benefits experienced by firms. With respect to SMEs, Table 11 shows that nearly all coefficients are positive but insignificant and quite modest, except for the percentage of foreign input used and the percentage of constrained firms. For instance, a 100% increase in aid to SMEs may be associated with an increase of firms exporting by 0.4% and firms exporting directly by 0.6%, approximately. These results are in line with the previous aggregate level results, remaining particularly unexpected given that aid to SMEs is designed to provide a more targeted support to businesses.

Table 11. Small and Medium Enterprises (SMEs)

| | (1) Export firms | (2) Direct export firms | (3) Direct export sales | (4) Foreign input | (5) Constrained firms |
|---|---|---|---|---|---|
| $\ln(A_{SMEs})_{it}$ | 0.450 | 0.604 | 0.657 | -3.950 | -1.381 |
| | (0.900) | (0.653) | (0.524) | (2.488) | (1.238) |
| ln(GDP growth) | -59.943** | -52.594** | -21.225 | -97.050 | -38.361 |
| | (27.632) | (19.873) | (15.000) | (85.147) | (49.518) |
| Government | -1.820 | -0.930 | -0.262 | -8.952* | -11.857*** |
| | (1.528) | (0.124) | (0.694) | (5.317) | (1.918) |
| ln(CPI) | -0.593 | -0.258 | -0.238 | -2.837 | -0.775 |
| | (1.050) | (0.886) | (0.511) | (3.610) | (1.310) |
| Observations | 62 | 62 | 62 | 62 | 62 |
| R-sq. (within) | 0.135 | 0.146 | 0.102 | 0.106 | 0.420 |

*Note*s: This table presents the estimated coefficients of the effect of aid to SMEs on firm-level outcomes in developing countries. Robust standard errors given in parentheses. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

The impact of aid to business policy on the same variables is presented in Table 12. While the coefficients for the percentage of exporting firms are positive and statistically non-significant, the correlation is significant for direct export sales, with a 0.4% increase when business policy support is raised by 100%. The coefficient for foreign input usage is negative and significant, indicating that increased aid of this type may reduce firms' dependence on foreign inputs by 6%, possibly by facilitating the creation of local supply chains.

Table 12. Business policy

| | (1) Export firms | (2) Direct export firms | (3) Direct export sales | (4) Foreign input | (5) Constrained firms |
|---|---|---|---|---|---|
| $\ln(A_{BUSINESS})_{it}$ | 0.923 | 1.166 | **0.434*** | **-6.106*** | -0.890 |
| | (0.855) | (0.713) | (0.728) | (3.132) | (1.072) |
| ln(GDP growth) | -55.954** | -47.550** | -18.056 | -123.502 | -42.270 |
| | (27.380) | (18.828) | (15.500) | (86.078) | (46.032) |
| Government | -1.937 | -1.080 | -0.366 | -8.136 | -11.708*** |
| | (1.564) | (1.191) | (0.700) | (4.875) | (1.936) |
| ln(CPI) | -0.565 | -0.226 | -0.241 | -2.942 | -0.726 |
| | (0.942) | (0.748) | (0.430) | (3.695) | (1.270) |
| Observations | 62 | 62 | 62 | 62 | 62 |
| R-sq. (within) | 0.152 | 0.185 | 0.115 | 0.154 | 0.411 |

*Notes*: This table presents the estimated coefficients of the effect of aid business policy on firm-level outcomes in developing countries. Robust standard errors given in parentheses. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

It is important to note that across the three tables, the coefficients for GDP growth and government effectiveness consistently show unexpected negative signs, occasionally turning significant, which suggests potential bias. Furthermore, this cross-sectional study suffers from certain limitations. In particular, the low number of observations may reduce the statistical power, increasing the risk of missing true effects and producing unstable estimates. Without adequate temporal sequencing, the study cannot establish causal relationships or control for time-dependent confounders. Thus, the reliability and generalizability of these findings are intrinsically constrained. Nonetheless, the results are noteworthy as they imply that trade education may increase the percentage of (direct) exporting firms and that the majority of AfT categories – aid to economic infrastructure, productive capacity, trade facilitation, trade policy and business policy – could contribute to reducing dependence on foreign inputs.

## 6. Methodological imitations and bias

The results should be interpreted carefully due to several limitations that prevent the establishment of causal relationships. One major concern is potential selection bias resulting from the non-random allocation of aid, as discussed in section 4.1. For instance, AfT may be preferentially directed to countries with better economic performance or may be affected due to strategic trade relations, thus influencing the outcome. This means that any observed positive results could be attributed to aid, when in fact it may be due to these pre-existing advantages. While controlling for GDP and the WDIs may partly address these issues, there remains a potential risk of overestimation.

Moreover, there are other important, yet hard-to-measure factors that may affect aid allocation and trade performance. The exclusion of historical ties, colonial relationships, specific strategic interests of donors, cultural affinities, and geopolitical considerations may introduce the possibility of biased estimates due to omitted variable bias. Another critical issue is simultaneity bias. Countries may receive aid based on both observable and unobservable attributes that also contribute to their export success, leading to an ambiguous direction of causality. It remains unclear whether aid improves trade performance or whether countries with a higher level of exports attract more aid.

The internal validity of the study is further affected by the presence of multicollinearity among the independent variables. In this context, the observed positive correlation between trade and GDP growth rates can be attributed to the large contribution of exports and imports in GDP calculations. This correlation may increase the standard errors of the coefficients and reduce the precision of the estimates. Finally, the study is subject to measurement errors despite the detailed nature of the OECD dataset. Reliance on voluntary reporting by the DAC countries (Development Assistance Committee) may introduce potential inconsistencies and inaccuracies in the data. These errors may be due to variations in reporting regulations across countries or differences in data collection methods. Overall, addressing these methodological concerns is essential to strengthen the reliability of the results, thus, future research could benefit from instrumental variables approaches to mitigate the influence of endogeneity bias.

## 7. Conclusion

Aid for trade, designed to enhance trade performance in developing countries, offers considerable potential for integrating these countries into the global trading system, thereby promoting economic growth and alleviating poverty. In theory, this initiative provides support by improving infrastructure, strengthening firms to diversify their products, reducing the costs associated with trade liberalization, formulating effective trade strategies and facilitating the implementation of trade agreements. However, empirical evidence on the effectiveness of AfT remains inconclusive and lacks clarity on which particular categories of aid provide the largest improvements in trade performance.

Therefore, this study analyzes the effectiveness of different categories of AfT on export performance utilizing a detailed dataset from the OECD Creditor Reporting System (CRS), which includes a large sample of developing countries. The findings indicate that while aid directed towards trade facilitation is positively and significantly associated with an increase in exports, the remaining categories - aid for economic infrastructure, productive capacity, and trade policy and regulations - do not show a statistically significant correlation with export levels. These results partially align with the existing literature. Sector-specific analysis suggests that support for monetary institutions, port infrastructure and general education and training are positively correlated with export performance, implying that reducing transaction costs, increasing supply chain efficiency and developing a skilled labour force may create favorable conditions for trade.

An additional cross-sectional analysis at the firm-level based on the UN Enterprise Surveys suggests that aid for trade policies and regulations, business policy and trade education can be positively associated with the percentage of firms engaged in export activities and their direct export sales. Meanwhile, total AfT and several subcategories may contribute to reduce the percentage of constrained firms and the dependence on foreign inputs. While improvements in trade facilitation may increase the level of aggregate exports, more targeted support to improve firms' productivity seems essential to encourage their participation in international trade, which is consistent with the literature. Nevertheless, aid to SMEs appears to have no impact at either the aggregate or the firm-level.

These results cannot be interpreted as a causal relationship due to several methodological limitations. Particularly, the potential for selection bias, omitted variable bias and simultaneity bias are likely to influence the results. However, this study contributes

considerably to the existing literature by disaggregating AfT by sector, allowing for a better assessment of the potential effectiveness across different and more specific dimensions. The findings raise important policy implications. Programs with limited impact may need to be re-evaluated and possibly restructured to ensure a more targeted and effective allocation of resources. Furthermore, the impact of AfT is heterogeneous across countries due to differing needs. For instance, the least developed countries may require more aid for infrastructure development, while other middle-income countries may benefit more from aid aimed at strengthening institutions or improving trade education. Therefore, future research should consider cross-country variations and potentially employ instrumental variables (IV) to mitigate biases and provide a clearer picture of the causal impact of AfT.

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# Appendix

Table A1. List of countries and data

| | | |
|---|---|---|
| Afghanistan * | Ghana *** | Nigeria * |
| Algeria * | Guatemala | Pakistan * |
| Angola * | Guinea * | Panama |
| Argentina | Guinea-Bissau *** | Paraguay |
| Bangladesh * | Guyana *** | Peru *** |
| Belize | Honduras * | Philipines *** |
| Benin | India *** | Rwanda |
| Bolivia | Indonesia | Sao Tome and Principe |
| Botswana | Iran * | Senegal |
| Brazil | Jordan | Seychelles * |
| Burkina Faso | Kazakhstan | South Africa |
| Burundi | Kenya * | Sri Lanka * |
| Cabo Verde * | Kyrgyzstan *** | Sudan * |
| Cambodia | Laos *** | Suriname |
| Cameroon *** | Lebanon *** | Tanzania *** |
| Central African Republic | Lesotho *** | Thailand *** |
| Chile | Liberia * | Togo * |
| China | Madagascar ** | Tunisia |
| Colombia | Malawi * | Uganda * |
| Comoros | Malasia | Uruguay |
| Congo * | Mali * | Venezuela * |
| Costa Rica | Mauritania * | Vietnam *** |
| Côte d'Ivoire *** | Mauritius | Palestine * |
| Ecuador | Mexico | Yemen * |
| Egypt *** | Mongolia *** | Zambia |
| El Salvador | Morocco | Zimbabwe |
| Equatorial Guinea * | Mozambique | |
| Eswatini | Namibia | |
| Ethiopia | Nepal * | |
| Gabon *** | Nicaragua | |
| Gambia | Niger *** | |

*Note*s: *refers to incomplete export data, ** refers to incomplete total aid data. *** refers to incomplete data on controls. No sign refers to complete aid data

Table A2. Effect of main types of aid for trade on imports

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| $\ln(A_{INF})_{It-1}$ | -0.056 | -0.070 | | | | | | | -0.062 | -0.077 |
| | (0.040) | (0.047) | | | | | | | (0.045) | (0.051) |
| $\ln(A_{TF})_{It-1}$ | | | 0.016 | 0.030 | | | | | 0.064 | 0.060 |
| | | | (0.027) | (0.034) | | | | | (0.041) | (0.044) |
| $\ln(A_{PC})_{It-1}$ | | | | | 0.004 | -0.020 | | | 0.037 | 0.037 |
| | | | | | (0.060) | (0.054) | | | (0.063) | (0.081) |
| $\ln(A_{POL})_{it-1}$ | | | | | | | -0.036 | -0.026 | -0.071 | -0.055 |
| | | | | | | | (0.040) | (0.053) | (0.043) | (0.052) |
| ln(GDP growth) | 0.975** | 0.717** | 0.954** | 0.709* | 0.952* | 0.743* | 0.873** | 0.612* | 0.880** | 0.588* |
| | (0.383) | (0.460) | (0.405) | (0.383) | (0.406) | (0.400) | (0.401) | (0.341) | (0.380) | (0.302) |
| Government | 0.441* | 0.487* | 0.426* | 0.471* | 0.428* | 0.496* | 0.506* | 0.533* | 0.512** | 0.543* |
| | (0.243) | (0.282) | (0.238) | (0.278) | (0.240) | (0.287) | (0.244) | (0.293) | (0.250) | (0.293) |
| ln(CPI) | | -0.008 | | -0.009 | | -0.009 | | -0.001 | | 0.003* |
| | | (0.037) | | (0.037) | | (0.037) | | (0.036) | | (0.035) |
| Observations | 1201 | 972 | 1202 | 973 | 1202 | 963 | 1104 | 898 | 1103 | 897 |
| Countries | 76 | 74 | 76 | 74 | 76 | 74 | 76 | 74 | 76 | 74 |
| R-sq. (within) | 0.229 | 0.153 | 0.223 | 0.145 | 0.222 | 0.144 | 0.230 | 0.153 | 0.240 | 0.166 |

*Notes*: This table presents the estimated coefficients of the effect of the main types of aid on the level of imports. The dependent variable is the value of total aggregate imports in US$. $A_{INF}$, $A_{TF}$, $A_{PC}$, and $A_{POL}$ are lagged by one period. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.

Table A3 Financial/Monetary institutions, and SMEs on imports

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $\ln(A_{FORMAL})_{it}$ | -0.006 | | | | -0.003 |
| | (0.026) | | | | (0.025) |
| $\ln(A_{INFORMAL})_{it}$ | | -0.066 | | | -0.064 |
| | | (0.048) | | | (0.045) |
| $\ln(A_{MONETARY})_{it}$ | | | **0.008***** | | **0.112***** |
| | | | (0.056) | | (0.003) |
| $\ln(A_{SMEs})_{it}$ | | | | -0.048 | -0.050 |
| | | | | (0.077) | (0.075) |
| ln(GDP growth) | 0.708 | 0.634 | 0.710* | 0.726* | 0.645 |
| | (0.380) | (0.421) | (0.381) | (0.381) | (0.415) |
| Government | 0.470* | 0.459* | 0.474* | 0.478* | 0.466* |
| | (0.279) | (0.272) | (0.274) | (0.282) | (0.275) |
| ln(CPI) | -0.008 | -0.007 | -0.009 | -0.007* | -0.004 |
| | (0.038) | (0.037) | (0.037) | (0.037) | (0.037) |
| Observations | 972 | 973 | 971 | 973 | 972 |
| Countries | 74 | 74 | 74 | 74 | 74 |
| R-sq. (within) | 0.143 | 0.147 | 0.150 | 0.146 | 0.145 |

*Notes*: This table presents the estimated coefficients of the effect of aid directed to financial institutions and SMEs on imports in the recipient countries. The dependent variable is the value of total aggregate imports in US$. Robust standard errors are given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Table A4. Economic infrastructure on exports: Transport on imports

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $\ln(A_{WATER})_{it}$ | 0.013 | | | | 0.015 |
| | (0.024) | | | | (0.024) |
| $\ln(A_{ROAD})_{it}$ | | -0.021 | | | -0.021 |
| | | (0.038) | | | (0.038) |
| $\ln(A_{AIR})_{it}$ | | | -0.009 | | -0.002 |
| | | | (0.023) | | (0.022) |
| $\ln(A_{RAIL})_{it}$ | | | | -0.014 | -0.015 |
| | | | | (0.021) | (0.020) |
| ln(GDP growth) | 0.702* | 0.718* | 0.712* | 0.724* | 0.724* |
| | (0.340) | (0.376) | (0.385) | (0.374) | (0.382) |
| Government | 0.471* | 0.466* | 0.472* | 0.473** | 0.465 |
| | (0.280) | (0.278) | (0.280) | (0.280) | (0.280) |
| ln(CPI) | -0.009 | -0.008 | -0.009 | -0.009 | -0.008 |
| | (0.037) | (0.037) | (0.037) | (0.037) | (0.037) |
| Observations | 973 | 973 | 973 | 973 | 973 |
| Countries | 74 | 74 | 74 | 74 | 74 |
| R-sq. (within) | 0.144 | 0.145 | 0.143 | 0.144 | 0.145 |

*Notes*: This table presents the estimated coefficients of the effect of aid to transport on imports in the recipient countries in all columns. The dependent variable is the value of total aggregate imports in US$. The independent variable values are logarithm and not lagged. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Table A5. Education on imports

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $\ln(A_{TRADE\ EDUCATION})_{it}$ | -0.258 | | | | 0.248 |
| | (0.308) | | | | (0.287) |
| $\ln(A_{EDUCATION\ TRAINING})_{it}$ | | -0.017 | | | -0.010 |
| | | (0.094) | | | (0.106) |
| $\ln(A_{AGRI\ EDUCATION})_{it}$ | | | -0.056 | | -0.047 |
| | | | (0.163) | | (0.155) |
| $\ln(A_{ENERGY\ EDUCATION})_{it}$ | | | | -0.035 | -0.036 |
| | | | | (0.078) | (0.090) |
| ln(GDP growth) | 0. 745* | 0.709* | 0.708* | 0.729* | 0.758** |
| | (0.382) | (0.386) | (0.380) | (0.373) | (0.372) |
| Government | 0.465* | 0.472* | 0.470* | 0.470** | 0.461* |
| | (0.277) | (0.277) | (0.280) | (0.275) | (0.272) |
| ln(CPI) | -0.010 | -0.009 | -0.007 | -0.008 | -0.008 |
| | (0.037) | (0.037) | (0.037) | (0.037) | (0.037) |
| Observations | 973 | 973 | 973 | 973 | 973 |
| Countries | 74 | 74 | 74 | 74 | 74 |
| R-sq. (within) | 0.146 | 0.145 | 0.144 | 0.144 | 0.147 |

*Note*s: This table presents the estimated coefficients of the effect of aid to education to different sectors on imports in the recipient countries in all columns. The dependent variable is the value of total aggregate imports in US$. The independent variable values are logarithm and not lagged. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗ ∗p<0.05; ∗∗∗p<0.01

Table A6. Policies on imports

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| $\ln(A_{TRANSPORT})_{it}$ | 0.088 | | | | | 0.078 |
| | (0.021) | | | | | (0.211) |
| $\ln(A_{FINANCIAL})_{it}$ | | -0.024 | | | | -0.027 |
| | | (0.023) | | | | (0.025) |
| $\ln(A_{BUSINESS})_{it}$ | | | 0.046 | | | 0.050 |
| | | | (0.090) | | | (0.087) |
| $\ln(A_{ENERGY})_{it}$ | | | | 0.012 | | 0.014 |
| | | | | (0.024) | | (0.020) |
| $\ln(A_{TRADE})_{it}$ | | | | | -0.041 | -0.046 |
| | | | | | (0.050) | (0.046) |
| ln(GDP growth) | 0.715* | 0.736* | 0.724* | 0.700* | 0.736* | 0.800* |
| | (0.377) | (0.378) | (0.385) | (0.385) | (0.371) | (0.404) |
| Government | 0.481* | 0.473* | 0.481* | 0.472* | 0.464* | 0.483* |
| | (0.276) | (0.280) | (0.286) | (0.278) | (0.278) | (0.281) |
| ln(CPI) | -0.070 | -0.007 | -0.014 | -0.009 | -0.008 | -0.067 |
| | (0.153) | (0.037) | (0.038) | (0.037) | (0.375) | (0.156) |
| Observations | 973 | 973 | 972 | 973 | 973 | 972 |
| Countries | 74 | 74 | 74 | 74 | 74 | 74 |
| R-sq. (within) | 0.144 | 0.144 | 0.147 | 0.144 | 0.145 | 0.148 |

*Note*s: This table presents the estimated coefficients of the effect of aid to policies to different sectors on imports in the recipient countries in all columns. The dependent variable is the value of total aggregate imports in US$. The independent variable values are logarithm and not lagged. Robust standard errors are clustered and given in parentheses. All regressions include country and year-fixed effects. ∗p<0.1; ∗ ∗p<0.05; ∗∗∗p<0.01

Table A7. Total AfT

| | (1) Export firms | (2) Direct export firms | (3) Direct export sales | (4) Foreign input | (5) Constrained firms |
|---|---|---|---|---|---|
| $\ln(AfT)_i$ | -0.582 | -0.306 | 0.078 | -5.333*** | -1.522* |
| | (0.470) | (0.323) | (0.240) | (1.522) | (0.770) |
| ln(GDP growth) | -58.082* | -51.591** | -21.427 | -80.553 | -33.667 |
| | (30.968) | (23.296) | (18.386) | (1.952) | (44.755) |
| Government | -1.547 | -0.801 | -0.326 | -6.158 | -11.050*** |
| | (1.371) | (1.017) | (0.630) | (4.986) | (1.757) |
| ln(CPI) | -0.710 | -0.350 | -0.280 | -3.261 | 0.876 |
| | (1.083) | (0.900) | (0.505) | (3.200) | (1.145) |
| Observations | 62 | 62 | 62 | 62 | 62 |
| R-sq. (within) | 0.152 | 0.142 | 0.063 | 0.229 | 0.457 |

*Notes*: This table presents the estimated coefficients of the effect of total AfT on firm-level outcomes in developing countries. The independent variable is in logarithm form, but the dependent variables are not. Robust standard errors are given in parentheses. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Table A8. Economic infrastructure

| | (1) Export firms | (2) Direct export firms | (3) Direct export sales | (4) Foreign input | (5) Constrained firms |
|---|---|---|---|---|---|
| $\ln(A_{INF})_i$ | -0.401 | -0.236 | 0.033 | -4.111*** | -1.124* |
| | (0.350) | (0.251) | (0.208) | (1.212) | (0.637) |
| ln(GDP growth) | -59.652* | -3.973 | -21.203 | -94.640 | -37.722 |
| | (30.305) | (22.883) | (18.340) | (70.340) | (43.984) |
| Government | -1.514 | -0.763 | -0.313 | -5.509 | -10.904*** |
| | (1.379) | (1.018) | (0.602) | (5.204) | (1.828) |
| ln(CPI) | -0.671 | -0.332 | -0.288 | -2.948 | -0.781 |
| | (1.073) | (0.896) | (0.506) | (3.178) | (1.145) |
| Observations | 62 | 62 | 62 | 62 | 62 |
| R-sq. (within) | 0.147 | 0.142 | 0.062 | 0.222 | 0.451 |

*Notes*: This table presents the estimated coefficients of the effect of aid to economic infrastructure on firm-level outcomes in developing countries. The independent variable is in logarithm form, but the dependent variables are not. Robust standard errors are given in parentheses. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Table A9. Trade facilitation

| | (1) Export firms | (2) Direct export firms | (3) Direct export sales | (4) Foreign input | (5) Constrained firms |
|---|---|---|---|---|---|
| $\ln(A_{TF})_i$ | 0.157 | 1.300 | 0.306 | -8.602* | -2.861 |
| | (1.093) | (1.125) | (0.662) | (4.858) | (1.729) |
| ln(GDP growth) | -59.382* | -52.033** | -21.052 | -100.955 | -39.664 |
| | (29.944) | (22.716) | (18.444) | (74.977) | (43.841) |
| Government | -1.729 | -0.847 | -0.260 | -9.543* | -12.051*** |
| | (1.547) | (1.117) | (0.682) | (5.403) | (1.946) |

| | | | | | |
|---|---|---|---|---|---|
| ln(CPI) | -0.600 | 0.270 | -0.282 | -2.775 | -0.750 |
| | (1.009) | (0.846) | (0.496) | (3.446) | (1.237) |
| Observations | 62 | 62 | 62 | 62 | 62 |
| R-sq. (within) | 0.141 | 0.149 | 0.064 | 0.118 | 0.425 |

*Notes*: This table presents the estimated coefficients of the effect of aid to trade facilitation on firm-level outcomes in developing countries. The independent variable is in logarithm form, but the dependent variables are not. Robust standard errors are given in parentheses. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.0

Table A10. Productive capacity

| | (1) Export firms | (2) Direct export firms | (3) Direct export sales | (4) Foreign input | (5) Constrained firms |
|---|---|---|---|---|---|
| $\ln(A_{PC})_i$ | -0.736 | 0.423 | 0.056 | -4.573** | -1.446* |
| | (0.578) | (0.394) | (0.320) | (1.710) | (0.831) |
| ln(GDP growth) | -55.496* | -50.013** | -21.518 | -69.880 | -29.776 |
| | (32.985) | (24.671) | (18.947) | (76.946) | (48.327) |
| Government | -2.013 | -1.055 | -0.273 | -9.903** | -12.153*** |
| | (1.421) | (1.036) | (0.700) | (4.636) | (1.814) |
| ln(CPI) | -0.715 | -0.357 | 0.285 | -3.055 | -0.833 |
| | (1.076) | (0.900) | (0.507) | (3.508) | (1.236) |
| Observations | 62 | 62 | 62 | 62 | 62 |
| R-sq. (within) | 0.158 | 0.147 | 0.062 | 0.165 | 0.442 |

*Notes*: This table presents the estimated coefficients of the effect of aid to productive capacity on firm-level outcomes in developing countries. The independent variable is in logarithm form, but the dependent variables are not. Robust standard errors are given in parentheses. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Table A11. Trade policies and regulations

| | (1) Export firms | (2) Direct export firms | (3) Direct export sales | (4) Foreign input | (5) Constrained firms |
|---|---|---|---|---|---|
| $\ln(A_{PR})_i$ | 1.523* | 1.132 | 0.426 | -8.097** | -2.310** |
| | (0.904) | (0.828) | (0.447) | (3.048) | (1.100) |
| lnGDP growth | -60.228** | -54.662** | -23.699 | -77.273 | -35.832 |
| | (29.257) | (22.228) | (18.346) | (72.677) | (45.250) |
| Government | -0.913 | -0.4155 | -0.294 | -5.608 | -11.454*** |
| | (1.254) | (1.020) | (0.709) | (5.048) | (2.045) |
| lnCPI | -0.467 | 0.237 | -0.316 | -2.411 | 0.738 |
| | (0.964) | (0.839) | (0.494) | (3.347) | (1.217) |
| Observations | 60 | 60 | 60 | 60 | 60 |
| R-sq. (within) | 0.160 | 0.110 | 0.086 | 0.138 | 0.410 |

*Notes*: This table presents the estimated coefficients of the effect of aid to trade policies and regulations on firm-level outcomes in developing countries. The independent variable is in logarithm form, but the dependent variables are not. Robust standard errors are given in parentheses. ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01