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Export Diversification Effects of Aid for Trade Facilitation

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Spring 2020

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Master's Thesis in Economics, 30 hec
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Acknowledgements

We would like to sincerely thank our supervisor Elias Bengtsson for valuable input and encouragement throughout the process of writing this thesis. Whether entangled in semantic ravel or theoretical confusion your clear-sighted and pragmatic guidance made us apprehend what was the best route forward. Thank you for a much appreciated supervision and thesis experience!

We also want to extend our gratitude to Måns Söderbom, for valuable guidance on the application of system-GMM.

Abstract

Improving developing countries' export performance is a current policy priority, and the initiative Aid for Trade (AfT) has become an increasingly popular concept as a response to this. The purpose of this thesis is to contribute to the relatively scarce evidence of its impact on export diversification. The few studies that evaluate the effect of AfT on export diversification do so using aggregate categorizations of AfT, thus unable to account for heterogeneous effects of distinct aid flows. Relating to previous research on the effects of reduced trade costs on export diversification, this thesis instead applies a more disaggregated approach. We evaluate the impact of AfT facilitation, a category of AfT aimed at lowering trade costs and simplifying trade procedures, and hypothesize it increases the number of exported product categories. Using panel data in a GMM model, our results provide support for the hypothesis. We find that the impact is stronger when leaving out the bottom quarter in terms of cumulative AfT facilitation per capita over the study period, suggesting a threshold effect for AfT facilitation to become effective.

Contents

1 Introduction

International trade can be an important engine for economic growth and poverty reduction in developing countries (Winters, McCulloch & McKay, 2004). Increased trade is also a current policy priority confirmed by the 2030 Agenda for Sustainable Development, which recognizes trade as an important means to alleviate poverty and achieve economic growth (United Nations, 2015). During recent decades, comprehensive efforts have been made to improve the trade performance of developing countries (Huchet-Bourdon, Lipchitz & Rousson, 2009). Policy initiatives such as tariff preference systems and preferential market access have been implemented both multilaterally within WTO, and bilaterally between developing countries and large trade partners such as the European Union, the United States, Canada and Japan (Huchet-Bourdon et al., 2009).

Despite reduced tariffs and favourable market access, the trade performance of developing countries have not improved as anticipated. The Least Developed Countries (LDCs) is a particularly apparent example of this, as they have been enabled preferential market access into most high income markets, while at the same time seen their share of global exports decrease (Calí & te Velde, 2010). This understanding that removal of traditional trade barriers seem insufficient for developing countries to enhance their trade performance has increased the interest in other barriers to trade (Busse, Hoekstra & Königer, 2012). This is the background to the initiative Aid for Trade (AfT), which was formally launched at the 2005 WTO Hong Kong Ministerial Conference. AfT consists of development assistance targeted at supporting developing countries in improving their ability to reap the benefits from increased global trade integration (OECD & WTO, 2019). More specifically, the objective of AfT is to support developing countries to "build the supply-side capacity and trade-related infrastructure that they need to assist them to implement and benefit from WTO Agreements and more broadly expand their trade" (WTO 2005, art. 57). That is, AfT aims to assist developing countries to overcome domestic trade constraints and non-tariff barriers to trade.

Between 2006 and 2017, almost USD 410 billion was disbursed in official development assistance under the label of AfT (OECD & WTO, 2019). Considering this magnitude of the initiative and the increased emphasis put on AfT by the multilateral trade community, researchers have raised the question of whether AfT realizes its objectives. One important objective of AfT is to increase the export diversification of recipient countries, which was highlighted in the official AfT 2019 report by OECD and WTO (2019). A more diversified export can reduce economic risk and volatility in national income due to price or exchange rate shocks (Beverelli, Neumueller & Teh, 2015). This makes export diversification an especially important concern for developing countries, and in particular the LDCs, as they often rely on a narrow basket of primary commodities which makes them weakly insulated from shocks to specific markets or sectors (Beverelli et al., 2015). Export diversification has also shown to be strongly associated with higher per capita income growth (Imbs & Wacziarg, 2003). Adding to this, a survey carried out by the OECD and WTO in 2011 indicates export diversification as the most desired outcome of AfT for recipients (OECD & WTO, 2011). Out of 84 countries, 51 chose diversified exports as more important than increased export volumes, and as the overall most important outcome of AfT.

Despite this, the impact on export diversification has up until recently been overlooked in the AfT literature (Gnangnon, 2018; Kim, 2019). Moreover, the studies that do investigate the impact on export diversification do so using aggregate and broad measures of AfT (Gnangnon, 2018; Kim, 2019). However, AfT contains distinct aid flows, ranging from infrastructure support to developing trade procedures, why evaluating broad AfT flows does not illuminate potential heterogeneous effects. In this light, this thesis focuses on a narrow category of AfT, named *AfT facilitation*, and evaluates its impact on the number of exported products from recipient countries.

The overriding aim of aid flows categorized under AfT facilitation is to reduce transaction costs of international trade (Busse et al., 2012), through simplification and harmonization of international customs procedures (OECD CRS, 2020). Such trade costs can be of significant magnitude, particularly in developing countries. According to estimates by Anderson and van Wincoop (2004), the ad valorem equivalent of total trade costs for a representative industrialized country could be as high as 170 %, while direct tariff and non-tariff barriers (e.g. quotas) are below 10 %. These trade costs are also argued to be even higher in developing countries (Anderson & van Wincoop, 2004). According to Arvis et al. (2016), the ad valorem equivalent for an average developing country is estimated to 219 %. These trade costs consists of several parts, however customs formalities and trade procedures that result in delays or complexities constitute an important component of trade costs (Anderson & van Wincoop, 2004; Arvis et al., 2016; Beverelli et al., 2015).

Earlier research have found AfT facilitation to significantly reduce these trade cost, defined as the time and resources required to comply with formalities and requirements of export procedures (Busse et al., 2012; Calí & te Velde, 2010). This relates to a strand of literature indicating that such trade costs are negatively associated with the range of exported products from a country (Beverelli et al., 2015; Dennis & Shepherd, 2011; Persson, 2013). Furthermore, a negative relationship between trade transaction costs and the range of exported product types is the prediction of a growing literature on theoretical trade models with heterogeneous firms (Chaney, 2008; Helpman, Melitz & Rubinstein, 2008).

In this light, the purpose of this thesis is to contribute to the AfT literature by evaluating the impact of AfT facilitation on the number of exported products types. We do so by applying a GMM estimator to a panel of 131 AfT recipients over the period 2002-2017. Using the theoretical framework developed by Helpman et al. (2008) the hypothesis for our estimation is that AfT facilitation leads to more product types being exported, through a reduction in domestic trade costs. We test this hypothesis using detailed data on the number of exported product categories per country and year. The results provide support for our hypothesis, and show that increasing AfT facilitation disbursements by 10 % increases the number of exported product categories with 0.168 % on average. In absolute terms, this would equal one more product category exported per extra 59 000 USD of AfT facilitation at mean values. Furthermore, we find that when leaving out the bottom quarter of recipient countries in terms of cumulative AfT facilitation per capita, the impact is stronger both in terms of magnitude and significance. In this case, increasing AfT facilitation disbursements by 10 % increases the number of exported product categories with 0.295 % on average. In absolute terms, this estimation equals one more product category exported per extra 45 000 USD at mean values. This is evidence of a threshold effect for AfT facilitation to become effective.

The structure of this thesis is as follows. First, we review previous research on AfT and use it to motivate the purpose of this thesis. Second, we present the theoretical framework and formalize our hypothesis for the expected effect of AfT facilitation on export diversification. Third, we describe the sources and selections of our data. Fourth, we present the model specification and motivate our econometric strategy. Then, the results from our empirical estimations are presented followed by a discussion. Last, we sum up our findings and contributions in a concluding remark.

2 Literature Review

In this chapter we review previous research on AfT in order to motivate the purpose of this thesis. Previous research has mainly focused on the impact of aggregate AfT on export values and volumes, while the impact on export diversification is argued to be a neglected area. Furthermore, AfT consists of several different kinds of aid flows that are likely to have heterogeneous effects, necessitating a disaggregated analysis. We contribute to this literature by evaluating the impact of a narrow AfT category, *AfT facilitation*, on the diversity of exports in recipient countries.

2.1 Previous Research on Aid for Trade

Although the academic interest in the impact of AfT has increased during recent years, the quantitative evidence of its impact is still relatively scarce (Calí & te Velde, 2011; Cadot et al., 2014; Vijil & Wagner, 2012). This motivates further research, as there is insufficient understanding of whether AfT achieves its desired objectives, and which types of AfT that are effective and which are not (Calí & te Velde, 2011). In a relatively recent meta study, Cadot et al. (2014) review several studies that investigate the impact of AfT. They conclude that existing literature has generally reported a positive impact of AfT when evaluating its effect on exported values and volumes.

Nonetheless, Cadot et al. (2014) highlight that a large share of the papers studying AfT are case- and cross-sectional studies and do not provide sufficient evidence, as this imposes limitations for conclusion since they fail to circumvent possible endogeneity issues. This could for example concern the endogenous allocation of aid (Dalgaard, Hansen & Tarp, 2004). It may, for instance, be the case that a country receives AfT because it has a very poor export performance, or the opposite that a country receives AfT since its export performance is starting to improve. Both situations impose confounding influences and channels of reverse causality, which makes the possibility to draw general conclusions from these studies limited (Cadot et al., 2014). However, some more recent studies apply econometric techniques that allow them to circumvent these issues, such as panel data with fixed effects and instrumental variable estimation (Cadot et al., 2014). The results from these studies similarly report a positive impact of AfT in terms of increased export values and volumes (Calí & te Velde, 2011; Helble, Mann & Wilson, 2012; Vijil & Wagner, 2012).

2.2 Aid for Trade and Export Diversification

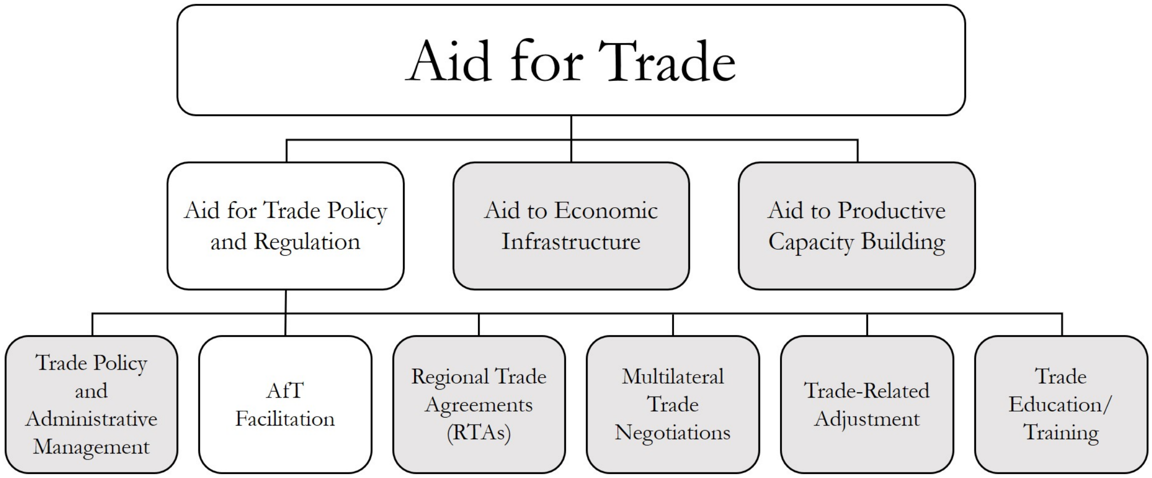
While increasing exports is indeed a central objective of AfT, several authors have recently argued that export diversification is a neglected area in research evaluating AfT (Gnangnon, 2018; Kim, 2019). At the same time, the importance of export diversification has continuously been emphasized in the literature (Imbs & Wacziarg, 2003), and has long been a policy concern for developing countries (Dennis & Shepherd, 2011). A more diversified export makes a country more insulated from shocks to specific markets or sectors and hence can reduce economic risk and volatility in national income (Beverelli et al., 2015). In addition, export diversification has shown to be strongly associated with higher per capita income growth, at least until relatively late in the development process where specialization effects become stronger (Imbs & Wacziarg, 2003). In line with this, the OECD and WTO have recently expressed an accentuated focus on export diversification as a highly prioritized goal of AfT (OECD & WTO, 2019). This further illustrates the policy relevance of addressing this gap in the empirical literature evaluating AfT.

Two recent studies that investigate the impact of AfT on export diversification is Gnangnon (2018) and Kim (2019). Gnangnon (2018) uses panel data to analyse a sample of 104 AfT recipients over the period 2002-2015 and finds that AfT has a positive impact on export diversification. The analysis is performed using aggregate AfT, and not AfT separated by category. However, AfT consists of several distinct categories that are likely to have diverse effects. This is shown by Kim (2019), who analyses the impact of total AfT on export diversification as well as of the three main categories separately. These three main categories of AfT are illustrated in Figure 1.

Results for total AfT from Kim (2019) are in line with Gnangnon (2018) and show a positive impact on export diversification. For the category *Aid to Economic Infrastructure* alone, Kim (2019) finds no significant effect. This category consists of aid aimed to support trade-related infrastructure that connects domestic markets to the global economy, such as railways and harbours (OECD CRS, 2020). *Aid to Productive Capacity Building* is found to have a positive impact, although weak in terms of significance. Aid in this category aims to support private sector development, for example through support to banking and financial services in order to improve access to finance (OECD CRS, 2020). Interestingly, the positive impact of overall AfT seems to be mainly driven by *Aid for Trade Policy and Regulation* which turns out to have a positive and significant effect on diversity of exports. This category aims at helping recipient countries to reduce non-tariff trade costs, such as transaction costs related to cross-border procedures, as well as to negotiate and implement trade agreements (OECD CRS, 2020).

This is an interesting finding as it relates to another strand of literature indicating that domestic trade costs have a strong negative impact on export diversification (Beverelli et al., 2015; Dennis & Shepherd, 2011; Persson, 2012). Such trade costs consist of the time and resources required to comply with formalities and requirements of export procedures. One of the sub-categories of AfT Policy and Regulation, namely AfT facilitation (included in Figure 1), directly aims at reducing these domestic trade costs. Busse et al. (2012) use panel data with fixed effects to study this relationship and specifically evaluate the impact of AfT facilitation on the cost of trading. They use data on the cost as well as the time required to complete all procedures to export a standardized product (Busse et al., 2012). Their results suggest no significant effect on the time of trading, measured as the number of days necessary to comply with all procedures required to export. However, AfT facilitation turns out to be highly significant in reducing the cost to export, measured as the total fees levied on a 20-foot container in USD (Busse et al., 2012). This indicates that AfT facilitation could be a driver of reduced domestic trade costs. However, no paper to our knowledge has evaluated whether it also leads to increased export diversification.

Figure 1. Main Categories of AfT and Sub-Categories of AfT Policy and Regulation



Specifically, AfT facilitation aims at "simplification and harmonization of international import and export procedures" (OECD CRS, 2020). The idea is that reducing these costs would lower barriers to export and allow new firms and products to access international markets (Beverelli et al., 2015; Dennis & Shepherd, 2011; Persson, 2012). This is also the prediction of a growing literature on theoretical trade models with heterogeneous firms (such as Chaney, 2008; Helpman, Melitz & Rubinstein, 2008), which suggest trade costs to be negatively associated with the range of products exported. Dennis and Shepherd (2011) empirically investigate this and find that trade costs have a negative impact on the number of products exported. They conclude that policy options aimed at reducing trade costs appear to have significant scope to promote export diversification.

With this paper, we aim to evaluate whether AfT facilitation could be a driver of increased export diversification and hence be such a policy option. In doing so, we contribute to the literature in several aspects. First, by using panel data over a longer time span than done before, we contribute to the relatively scarce quantitative evidence on the effects of AfT. Second, we focus on the impact of AfT on export diversification which is argued to be a neglected area in the existing AfT literature, and that is emphasized as a policy concern for developing countries. Third, we specifically target AfT facilitation, which means we can disentangle effects on a more detailed level than done before.

3 Theoretical Framework

We build on the influential contributions by Helpman, Melitz and Rubinstein (2008) in order to theoretically formalize the expected effect of AfT facilitation on export diversification. This theoretical framework is used in research closely related to ours, such as Dennis and Shepherd (2011) and Beverelli et al. (2015). A very similar theoretical framework to Helpman et al. (2008) is developed by Chaney (2008), with the main difference that Chaney incorporates elasticity of substitution, which allows to distinguish between effects on homogeneous and differentiated goods. However, potential heterogeneous effects on different kinds of products is outside the scope of this thesis, making the Helpman model a more straightforward and intuitive theoretical framework.

Helpman et al. (2008) develop a model of international trade with firms that vary in productivity and face fixed and variable costs of exporting. In order to profitably export overseas, firms must have a productivity level that enables them to cover the cost of exporting. Hence, exporters are only a subset of domestic firms. We expect AfT facilitation to reduce the fixed cost of trading. This will, theoretically, make new firms become exporters which increases the aggregate range of product types exported, making for a more diversified export bundle.

3.1 Export Diversification - Intensive and Extensive Margin Effects

In order to formalize the mechanisms behind increased export diversification it is necessary to first make the theoretical distinction between intensive and extensive margin effects of diversification. Generally speaking, a country's export bundle is located somewhere along the spectrum from specialized to diversified. Either the outbound trade flows are concentrated to one, or a few, dominating commodities, or the distribution is more even among several different types of goods. Theoretically, increased diversity of exports can occur through two different mechanisms. On the one hand, export diversification picks up the extent to which a country rely more or less heavily on a small range of products for the vast majority of their export earnings (Dennis & Shepherd, 2011). In that case, a change in the relative volume distribution between already existing export products would increase the diversification. That is, product categories with a small share of total exports grow faster than ones with a large share, which makes for a more even distribution (Dennis & Shepherd, 2011). This is referred to as an *intensive margin* effect. No new product types are introduced to the country's export bundle to make for the increased diversification (Beverelli et al., 2015). On the other hand, if new products start to be exported and hence yield an increase in the number of exported product categories, this will also result in the country's export bundle being more diverse. This increase in diversification is called an *extensive margin* effect (Beverelli et al., 2015). These two mechanisms for increased export diversification are summarized below.

- **Intensive Margin** Increased diversification occurs as a change in the relative volume distribution of exported product types. Product types at low aggregate value grow faster than product types at high aggregate value, yielding a more diversified (less concentrated) export bundle. This could be thought of as the 'old products' margin.
- **Extensive Margin** Increased diversification occurs as a result of new product types being exported that were not previously part of the country's export bundle. A higher number of product types being exported generates a more diversified export bundle. This could be thought of as the 'new products' margin.

With this distinction in mind, we now turn to introduce the theoretical framework and formulate our hypothesis.

3.2 A Heterogeneous Firm Model of International Trade

Helpman, Melitz & Rubinstein (2008) build their model on the gravity equation framework that has long dominated empirical research on international trade flows. More specifically, they extend the gravity equation developed by Anderson and van Wincoop (2003) in which the level of trade between two countries depend positively on their GDP levels and negatively on their remoteness from the multilateral trading system and their bilateral trade costs. Helpman argues that such a theoretical framework is inconsistent with empirical data in two important regards. First, it only considers countries that have positive trade flows between them, and hence fails to predict the zero trade flows that in fact is the case between many countries. In the sample of 158 countries used by Helpman, about half of the country pairs do not trade with one another. Second, the gravity equation framework imposes a symmetry of trade flows from country j to i and from i to j as well is inconsistent with data. Therefore, Helpman argues that gravity equations are not a satisfactory theoretical framework for explaining international trade flows.

Against this background, Helpman et al. (2008) generalizes the work of Anderson and van Wincoop (2003) in two ways in order to produce a framework more consistent with features of empirical data. First, Helpman introduces firm heterogeneity and fixed trade cost following Melitz (2003), which predicts an extensive margin for trade flows (Helpman et al., 2008). Low-productivity firms are relatively common and high-productivity firms are relatively uncommon, which, as stated by Dennis and Shepherd (2011), is a feature that accords well with available empirical evidence. Second, they let profitability of exports vary by destination, which accounts for asymmetries in the directions of trade flows in the model. This enables the possibility that no firm from country j finds it profitable to export to country i and hence the result of zero export volume from country j to country i. It may, however, simultaneously be the case that country i firms find it profitable to export to country j.

The model setup developed by Helpman et al. (2008) proceed as follows. In a world with J countries, indexed by $j = 1, 2, \ldots, J$, each country j has N_j number of firms that each one produce a distinct product. Hence, the number of firms and the number of products in the world economy are equal, and can be described as

$$\sum_{j=1}^{J} N_j$$

Each firm in country j produces one unit of output at a minimized cost $c_j a$, where a is the bundle of inputs used by the firm per unit of output, and c_j is the country-specific cost of this bundle. That is, c_j reflects differences in factor prices across countries, and a reflects productivity differences across firms in the same country. This varying productivity among firms captures the *firm heterogeneity* component in the model.

Given this setup, we now consider a firm's strategic decision to export or not. In the setting proposed by Helpman (2008), a country j firm that produce and sell a product in the home market bears only the production costs $c_j a$. Hence, the firm will produce and sell products in the domestic market if the output price covers the production costs. However, if the same firm instead wants to export the product and sell it abroad in country i, the firm will face additional costs. These costs, as argued by Helpman, consist of both a fixed and a variable component. The fixed cost is a one-time cost of selling in country i that is expressed as f_{ij}. The variable cost is an "iceberg" transportation cost, denoted τ_{ij}. For one unit of a product from country j to arrive in country i, τ_{ij} units of the product have to be shipped. The rest 'melts away' and hence $\tau_{ij} > 1$ for every $i \neq j$ (domestic transportation cost is zero).

Importantly, these two costs, f_{ij} and τ_{ij}, do not depend on the exporting firm's productivity level. Hence, a firm will decide whether it is profitable to export or not based on the firm's productivity level and the size of the fixed and variable cost of exporting. Apart from the domestic or 'internal' fixed cost of exporting, firms face different market entry cost depending on which country i they seek to export to. However, for the purpose of this thesis, we are interested in the impact of AfT facilitation on *domestic* trade cost and subsequent exports. Therefore, we disregard the different market entry cost that country j firms face in country i, and focus only on the domestic trade costs in country j.

Following Dennis & Shepherd (2011), the domestic export costs faced by firms can be thought of in terms of *productivity cutoffs*, as they generate a threshold level of productivity that is required to profitably export to an overseas market. This is especially the case for the fixed cost of exporting, which has a great influence on the firm's choice to export or not, but not on its export volume once the exporting decision has been made (Helpman et al., 2008). The lower this threshold level of productivity, the more firms become exporters. Due to the assumption that each firm produces a distinct product, the more firms that become exporters, the greater the aggregate number of product types exported by country j (Dennis & Shepherd, 2011).

3.3 Incorporating Aid for Trade Facilitation

As presented in the literature review in Chapter 2, AfT facilitation aims at "simplification and harmonization of international import and export procedures" (OECD CRS, 2020). It covers assistance to simplify and harmonize the formalities and requirements of a nation's customs that must be met for a firm to ship products across the border. As argued by Beverelli et al. (2015), even though these formalities and requirements must be met each time a shipment crosses the border, there is a one-time cost for a firm to acquire information on border procedures (Beverelli et al., 2015). Therefore, we argue that the number and complexity of the procedures required for export is to be considered a fixed cost in the setting proposed by Helpman. As stated by Beverelli et al. (2015), firms have a one-time cost of learning how to fill in the forms. AfT facilitation aims to decrease and simplify these documentation requirements and hence to reduce the fixed cost of exporting.

Given this, we expect AfT facilitation to country j to reduce the productivity cutoff in this country. As formalities and requirements are simplified, the fixed cost of complying with border procedures is reduced and hence the threshold level of productivity required to profitably export is lowered. The lower this threshold, the more firms become exporters in equilibrium (Dennis & Shepherd, 2011). Assuming that each firm produces a distinct product type, this leads to a greater aggregate number of products types being exported by country j. This leads to the following hypothesis:

Hypothesis: Aid for Trade facilitation leads to more product types being exported.

In other words, we expect AfT facilitation to increase export diversification through an *extensive* margin effect. As stated by Helpman et al. (2008), the fixed cost of exporting has a great influence on the firm's decision to export or not, but not on the exported volume once the exporting decision has been made. Therefore, we expect AfT facilitation to increase the diversity of exports through an extensive margin effect.

4 Data

In order to empirically test our hypothesis, we use panel data and Generalized Method of Moments (GMM) estimation. For our main specification, we have annual data for 131 AfT recipient countries covering the period 2002-2017. Our dependent variable is the annual number of exported product categories, and our main independent variable is AfT facilitation disbursements in million USD. We also include five control variables: GDP per capita, Population Size, Foreign Direct Investment (FDI), Government Effectiveness and a measure of Trade Openness. In this chapter, we describe the operationalization of our included variables, as well as the sources and selections of data. In Chapter 5, we present our model specification and motivate our chosen econometric strategy for the empirical analysis.

4.1 Export Data

Our dependent variable is the number of exported product categories every year, which is used to capture export diversification effects on the extensive or 'new products' margin. In order to operationalize this variable, we follow Kim (2019) and collect annual data from the World Integrated Trade Solution (WITS) database (2020). The WITS database contains data from UN COMTRADE on the number of product types exported at country-level every year. The product types are classified based on the Harmonized System 6-digit commodity classification (HS6), which groups trade flows into (roughly) 5300 categories. Hence, this data is very detailed and has a high precision (Kim, 2019). The time range covered by the data used is 2002-2017. The data is annual and covers 119 low- and middle-income countries, as classified by the World Bank. We have not restricted the sample and downloaded it directly from the database. This gives 1564 observations. We label this variable "HS6".

For the purpose of robustness checks, we also use two other alternative operationalizations of our dependent variable apart from the main (HS6). First, we use a dataset that is less detailed with respect to product categories, but that contains more observations. This is the dataset used by Gnangnon (2018). It is collected from the UNCTADstat database (2020) and contains data on the annual number of product categories exported at country-level every year, but according to the UN Standard International Trade Classification (SITC). The UN SITC classifies product types on a 3-digit level, which is less precise than our main dependent variable that classifies product types on a 6-digit level. The time range covered by the UN SITC data we use is 2002-2017 and it includes annual data for 130 countries. We have not restricted this sample either and downloaded it directly from UNCTAD which gives 2031 observations total. The reason we do not use this data set as our main operationalization is because it is less detailed with respect to product categorization, which risks not picking up small changes in product categories exported. However, we still apply it as a robustness check since it contains more observations than our main operationalization and since it is widely used and common in international trade data. We refer to this variable as "SITC3".

For our second robustness check, we use the Herfindahl-Hirschman concentration index applied to export concentration (HHI). It is collected from the UNCTADstat database (2020) and contains annual data on the index score for each country. The time range covered is 2002-2017 and it includes 129 countries, which gives 2031 observations. No restrictions have been made and we downloaded the data directly from UNCTAD. The HHI export concentration index measures the concentration of exports by summing the squared share of export volume per all registered products on the UN SITC 3-digit level. Values are normalized and an index-number close to 1 indicates a strong domination of a small number of products, while a value close to 0 implies a more diversified export bundle. However, a negative change in the HHI can be the result of additional introduced export product categories (extensive margin effect) or by a more even distribution among already exported goods (intensive margin effect). For example, if a country exports only two products of which one is dominant, then if the less dominant good increases relative to the dominant good, a more even distribution (less concentrated) exports would be the result. This despite that the total number of goods is kept constant. Thus, the HHI concentration index is unable to distinguish between extensive and intensive margin effects, and hence it is not an accurate measure of the number of products exported. However, we include it as a robustness check to follow up on the results from previous authors (Gnangnon, 2018; Kim, 2019). We use "HHI" to denote this variable.

4.2 Aid for Trade Facilitation Data

Our independent variable of interest is AfT facilitation. The data on AfT facilitation is collected from the OECD Creditor Reporting System (CRS, 2020) which is considered the prominent aid activity database (Busse, Hoekstra & Königer, 2012), and is the prevalent source of AfT data in the AfT literature (Busse et al., 2012; Calí & te Velde, 2011; Gnangon, 2018; Helble, Mann & Wilson, 2011; Kim, 2019; Vijil & Wagner, 2012). We use annual CRS data on AfT facilitation measured as total disbursements in current (2019) USD millions. The formal definition provided by the OECD (OECD CRS, 2020) of what aid flows this category contains is the following:

33120 - Trade facilitation: *Simplification and harmonization of international import and export procedures (e.g. customs valuation, licensing procedures, transport formalities, payments, insurance); support to customs departments; tariff reforms.*

The OECD CRS provides annual AfT data starting from 1995. Despite the AfT initiative being formally launched in 2005, aid flows had been registered and categorized since 1995. However, we only use AfT facilitation data from 2002 and onwards, since 2002 marks the start of a more consistent, detailed and extensive reporting on AfT by the OECD (Kim, 2019; OECD CRS, 2020). AfT data in the CRS database prior to 2002 may be categorized differently and cause for measurement error and inconsistent estimates (Kim, 2019). Hence, the data included in our main specification covers 131 low- and middle-income countries from 2002-2017. This gives 1289 observations.

The AfT facilitation data used is in absolute amounts. One alternative would be to use a relative measure such as disbursements in relation to GDP. Intuitively, a given amount of received disbursements can have a larger impact in a small economy compared to a larger one. However, we use absolute amounts since we want to avoid estimate being affected by unrelated fluctuations in, for example, GDP.

4.3 Control Variables

We include a total of five control variables to mitigate possible sources of endogeneity: GDP per capita, Population Size, FDI, Government Effectiveness and a measure of Trade Openness. Below we present the operationalization, source and selection of the control variables. The justification of their inclusion and their potential effects on the dependent variable and independent variable is discussed together with our model specification under Section 5.1.

Data on GDP per capita, Population Size, FDI and Government Effectiveness are all collected from the World Bank Indicators database (2020). GDP per capita is measured in thousands of USD and covers the full period 2002-2017, which gives 2016 observations. Population size is measured in millions of people and covers the period 2002-2017 which gives 2065 observations. For FDI we use the net inflows (in 100 millions of USD) for the years 2002-2017 which gives 1998 observations. The variable Government Effectiveness is a World Bank Indicator that captures perceptions of "the quality of public services, the quality of civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (World Bank, 2020). The indicator combines the views of a large number of enterprise, citizen and expert survey respondents and gives each country a score ranging from approximately -2.5 to 2.5. The data covers the full period 2002-2017 which gives 2063 observations. We have not made any restrictions for neither of the four above discussed control variables and downloaded the data directly from the World Bank.

For Trade Openness, we use the "Freedom to Trade Internationally" index developed by the Heritage Foundation. The data contains an index score for every country that is a composite measure of the absence of tariff and non-tariff barriers to trade (Heritage Foundation, 2020). This is the same index as used by Gnangnon (2018). The data is collected directly from the Heritage Foundation database (2020) and no restrictions have been made. The time range covered is 2002-2017 and this gives 1791 observations.

4.4 Descriptive Statistics

Below is a descriptive table including all our dependent variables, our independent variable as well as our control variables.

Table 1: **Descriptive Statistics for Main Sample**

Dependent Variables	**N**	**Mean**	**SD**	**Min**	**Max**	**Source**
Num. Prod. Categories Exported (HS6)	1564	1832	1303	1	4748	WITS (UNCOMTRADE)
Num. Prod. Categories Exported (SITC3)	2031	136.24	76.33	3	258	UNCTADstat
HHI Export Concentration Index	2031	0.38	0.22	0.07	0.98	UNCTADstat
Independent Variable	**N**	**Mean**	**SD**	**Min**	**Max**	**Source**
AfT facilitation, USD mil.	1289	1.82	4.54	-0.081341	49.27	OECD CRS
Control Variables	**N**	**Mean**	**SD**	**Min**	**Max**	**Source**
GDP per capita, USD thousand	2016	3038	2793	111.93	16054	World Bank WDI
Population, Total mil.	2065	42.92	160	0.009596	1386	World Bank WDI
Foreign Direct Investment, net, USD 100 mil.	1998	36.26	181.89	-101.76	2909	World Bank WDI
Government Effectiveness	2063	-0.58	0.61	-2.48	1.27	World Bank WDI
Trade Freedom Index	1791	67.50	13.71	0.00	90.00	Heritage Foundation

Period: 2002-2017

5 Econometric Strategy

5.1 Model Specification

The model specification for our main estimation is as follows:

$$ln(NumProd)_{jt} = \beta_0+\beta_1 ln(NumProd)_{jt-1}+\beta_2 ln(AfTfacilitation)_{jt-1}+\beta'\mathbf{X}_{jt-1}+\gamma_j+\gamma_t+\epsilon_{jt}$$

Pending the full motivation of our model design, we first introduce the specification briefly. Our dependent variable is the natural log of the number of products exported by country j year t. We include a one-year lag of the dependent variable due to the autoregressive nature of the number of products exported every year. This is further elaborated on below under Section 5.3. Our main independent variable is the natural log of AfT facilitation disbursements to country j year *t-1*. The one-year lag of AfT facilitation is used for two reasons. First, it is a way to avoid reverse causality: today's value of export diversification could not have affected yesterday's aid flows while the opposite direction is possible. Second, it is widely argued that there is a time lag between receiving aid and utilizing and implementing it (Cali & te Velde, 2010; Gnangnon, 2018; Kim, 2019), which further motivates the lag. This is also further elaborated on under Section 5.3. The variables γ_j and γ_t are entity and time fixed effects respectively. Finally, we use logs for all operationalizations of the dependent variable (HS6, SITC 3, HHI) and our independent variable of interest, AfT facilitation, in order to interpret percentage changes.

Following this, $\mathbf{X}_{jt-1}$ is a vector including our five control variables, GDP per capita, Population Size, FDI, Government Effectiveness and Trade Openness. GDP per capita is included to capture a country's development level and is widely regarded as a factor related to export diversification (Kim, 2019). As discussed in the literature review, Imbs and Wacziarg (2003) find that export diversification is strongly associated with higher per capita income growth, especially in the early stages of development. Thus, we assume that the diversity of developing countries exports tends to increase during their development and that GDP per capita therefore is positively related with the dependent variable. Population size is included to control for the size of the economy. Following the reasoning by Kim (2019), earlier research has indicated that larger economies may have a higher chance of export diversification, and hence we expect population size to be positively correlated with the dependent variable.

Next, we control for FDI as it has been shown to have an overall positive impact on export diversification (Osei, Morrissey & Lloyd, 2004). One possible mechanism is that a higher level of FDI inflow increases the availability of capital, which is an essential production input (Kim, 2019). Thus, we expect FDI to be positively associated with the dependent variable. Government Effectiveness is included to control for institutional quality. For example, aid effectiveness could be conditional on institutional quality, and hence Government Effectiveness could affect the impact of AfT facilitation. Furthermore, it seems feasible that better institutional quality lowers the cost and time of trading (Kim, 2019), and hence impacts the number of exported products. Therefore, we expect Government Effectiveness to be positively related to the dependent variable. Last, we include the variable Trade Openness to control for the level of trade liberalization. Although the academic debate has been inconclusive on the relationship between trade liberalization and export diversification (Gnangnon, 2018), it seems likely to affect the export structure of recipient countries (Agosin et al., 2012; Dennis & Shepherd, 2011). Therefore, we include it as a control variable.

5.2 Panel Data

The availability of panel data gives us the opportunity to control for entity and time fixed effects. With entity or, as in our case, country fixed effects we control for unobserved heterogeneity that remains constant over time within a country but varies between countries. Such examples could include geographical traits that can be assumed to remain constant in country j over time. With time fixed effects we control for unobserved heterogeneity that varies over time, but not between countries. One example could be the state of global economy or global trade patterns at time t, where all economies are affected. Utilizing these possibilities with panel data solves some of the endogeneity issues by reducing the risk of omitted variable bias. However, the suspicion that the underlying data generating process is dynamic complicates the otherwise straightforward application of fixed effects using regular

OLS estimation. This is a critical element of our analysis.

5.3 Dynamic Modelling

A dynamic process is one where the value of the dependent variable depends on past values of the explanatory variables. In the context of AfT, a lagged impact is often argued to be the case since there could be a delayed effect of aid flows, as argued by for example Calí and te Velde (2010), Gnangnon (2018) and Kim (2019). The authors argue that one should expect some time for the aid to be invested and utilized as intended, which would suggest a dynamic model. As presented in our model specification, we also use a one-year lag of our control variables. One purpose for this is to avoid reverse causality (Kim, 2019). Another related reason is the dynamics of a firm's export decision which is argued to depend on determinants from last year (Bernard & Jensen, 2004; Greenaway & Kneller, 2007). In this case, it could for example be the state and growth of a country's economy, changes in trade policy or the level of foreign investment, which all potentially could impact a firm's productivity level.

However, this dynamic feature does not solely apply to our independent variables, but also to the autocorrelation of our dependent variable. If the number of exported products at year t can be explained by its value from last year, then this may require us to include a lagged dependent variable (LDV), which we do as shown in our model specification. While Achen (2000) states that the inclusion of an LDV might bias results, several authors have since argued for the inclusion of an LDV if certain specification criteria are met (Keele & Kelly, 2006; Beck & Katz, 2011; Wilkins, 2018). They argue that the benefits in terms of reduced endogeneity is large with an LDV-model especially if the model is argued to be dynamic in nature. Indeed, this is what we contend in this study. For example, when estimating effects of aid on economic outcomes, the LDV may well be required as one should be aware of the possible endogenous allocation of aid (Dalgaard et al., 2004; Osei et al., 2004). Put more intuitively into context, it might be the case that some countries attract more, or less, AfT facilitation in the current year based on past levels of export diversification. To control for this, we include lagged regressors and lagged values of our dependent variable, in the dynamic model specification presented above.

Including lags of the dependent variable while at the same time employing fixed effects is, however, problematic. In a widely cited paper, Nickell (1981) shows that results from dynamic LDV models with OLS fixed effects tend to be downward biased, especially in cases with small T (number of time periods) and large N (number of countries). Although there is no clear definition of what constitutes “small T”, Judson and Owen (1999) find that when $T < 20$ a clear bias is present. This has to do with the LDV included in the model being correlated with the error term, which violates strict exogeneity and causes biased estimates. We provide an intuitive further elaboration on Nickell bias in Appendix Section 1. Nevertheless, Gnangnon (2018) and Kim (2019) use a Generalized Method of Moments (GMM) estimator to circumvent this issue and we follow suit.

5.4 Generalized Method of Moments (GMM)

We use the Blundell-Bond estimator (also referred to as system-GMM) that is based on the work of Arellano-Bond and Arellano-Bover/Blundell-Bond (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998). The Blundell-Bond estimator uses the GMM developed by Hansen (1982). As discussed above, we use this estimator to circumvent the Nickell bias that appears when analysing panel data with fixed effects in a dynamic model with OLS. Since the risk for this bias is especially pronounced for small T, large N panel data sets, which is the case for our data, this further justifies the choice of GMM over standard OLS fixed effects (Judson & Owen, 1999). In his prominent paper, Roodman (2009a), states that GMM is designed and suitable for panel data analysis when the process may be dynamic, when there may be fixed effects and when T is small.

In short, the Blundell-Bond, or system-GMM, estimator creates a system of two equations: the original equation and a transformed difference equation (Roodman, 2009a). In the transformed equation, first differences are taken to eliminate fixed effects. Then, deeper lags of the difference equation are used as instruments for levels so that past differences are instrumented on current values. In such way, the correlation between the LDV and the error term is broken avoiding Nickell bias. Also, this use of past values as instruments, or "internal instruments", is convenient since good external instruments is not always available. We make a brief further explanation on how the Blundell-Bond estimator accomplishes this in Appendix Section 2.

When using system-GMM there is a risk of overidentification (Roodman, 2009a). Overfitting instruments could cause bias, while at the same time potentially offer increased efficiency of the estimator ascribable to the introduction of more information (deeper lags). This trade-off between the risk of overidentification and efficiency is one that should be tested (Roodman, 2009b). We do so by altering the lag-length and compare the results of different lag-specifications and one OLS fixed effects estimation. Results from tests with different lag-length and the OLS estimation are presented in Appendix Section 3. Roodman (2009a; 2009b) also states that, for transparency purposes, one should always present the number of instruments used and a statistical test for overidentification. For the latter, we use *the Hansen Test for Overidentification*. Also, it is worth pointing out that the Hansen test tends to weaken when the instrument count becomes large (Roodman, 2009a & 2009b; Agosin et al., 2012). While we argue for the use of deeper (more) lags in our main specification, we present the Hansen p-value in our results tables. The system-GMM estimator also assumes absence of serial correlation in the error term, something that would make the estimations biased. We test for this absence by looking at the Arellano-Bond test for autocorrelation of the second order (the LDV is expected to cause serial correlation of order one). This "AR (2)" statistic is included in our result tables in the next chapter.

As a final note, when faced with a small T, fixed effects, dynamic model with LDV, turning to the system-GMM estimator is a tempting route (Judson & Owen, 1999; Bernard & Jensen, 2004; Roodman, 2009a & 2009b; Agosin, 2012; Gnangnon, 2018; Kim, 2019). However, as emphasized by Roodman (2009b & 2009b), applying the system-GMM requires much caution. The implementation is complicated and poses many specification choices. Given the theoretical complexity of both the underlying GMM as well as the Blundell-Bond estimator, we try to avoid pitfalls of misspecification by applying the concluding recommendations by Roodman (2009a; 2009b). In addition, we take inspiration from papers closely related to our thesis to support our specification choices. We follow the guidance offered by methodology-oriented papers (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998; Roodman, 2009a & 2009b) as well as practical applications (Gnangnon, 2018; Kim, 2019). For transparency we also include a brief review of our practical application of system-GMM in Appendix Section 4.

5.5 Sample Restrictions

As a further robustness check we also split our sample into different country groupings to investigate heterogeneous effects. We perform this robustness check following Busse et al. (2012) who study the impact of AfT facilitation on trade costs and find that the effect differs in magnitude and significance over different country groupings. First, we split our sample of countries in LDC and non-LDC categories. This is done for mainly two reasons. First, LDCs are said to be a prioritized group by the OECD in their latest report on AfT and export diversification (OECD & WTO, 2019), and prior research has shown that export diversification can be a driver of economic growth in the early to middle states in the development process (Imbs & Wacziarg, 2003). Second, Busse et al. (2012) find that the impact of AfT facilitation on trade cost varies between LDCs and non-LDCs in terms of significance, and we argue that there is reason to investigate this also for the number of exported products to get an accurate picture of the results.

Next, we restrict the sample with respect to cumulative AfT facilitation (in USD millions). The threshold is constructed by summing the total total AfT facilitation that a country received during the period 2002-2017, and then dividing this by the mean population in millions over the same period. For simplicity, we label this as cumulative AfT facilitation "per capita" even though it is per millions of inhabitants. The reason we adjust for population is to avoid a potential selection bias. The bias risk to occur since there is reason to believe that the level of aid disbursed include information on the economic and demographic dimension of the recipient country. Therefore, classifying countries based only on cumulative disbursements would risk bias as we expect both the size of the economy and the population to be positively related with the dependent as well as independent variable. However, adjusting for GDP per capita could, as mentioned in Chapter 4, lead to the threshold being affected by unrelated fluctuations in GDP which could skew results. This while mean population can be assumed to be less volatile over time. Therefore, we adjust the cumulative disbursements for population size.

First, we leave out the bottom 10 % and then the bottom 25 %, and then do the same for the top 10 % and top 25 % of included recipient countries. This robustness check is performed to investigate whether the results alter depending on the total amount of AfT facilitation received, as it seems reasonable to assume that the cumulative disbursements can affect the outcome. This is also in line with what Busse et al. (2012) find for the impact of AfT facilitation on trade cost, namely that the top 20 aid recipients dominate the effect on trade costs. Therefore, in order to get a complete picture of the results, we investigate any potential heterogeneous effects with respect to cumulative disbursements per capita. Below follows two descriptive statistics tables. Table 2 contains descriptive statistics for restriction variables for our main sample. Table 3 contains descriptive statistics for our sub-samples.

Table 2: **Descriptive Statistics - Restriction Variables for Main Sample**

Sample Restriction Variables	**N**	**Mean**	**SD**	**Min**	**Max**	**Source**
AfT facilitation (cum.), per capita, USD mil.	131	3.15	11.73	0.000607	129.07	OECD CRS
Least Developed Country-dummy	131	0.36	0.48	0	1	UNCTAD

LDC: UN classification (UNCTAD, 2020)

* = "*AfT facilitation (cum.) per capita, USD mil.*" is defined as total cumulative AfT facilitation received divided by mean population (in millions) for the study period 2002-2017.

Table 3: **Descriptive Statistics for Sub-Samples**

Restrictions by LDC-classification

Sample / Variable	**N**	**Mean**	**SD**	**Min**	**Max**
LDC					
Num. Prod. Categories Exported (HS6)	477	796.79	668	1	2440
AfT Facilitation, USD mil.	450	2.20	5.88	0.000171	46.69
AfT Facilitation (cum.) per capita, USD mil.	743	1.83	2.37	0.0087871	9.47
Non-LDC					
Num. Prod. Categories Exported (HS6)	1087	2286.38	1254	1	4748
AfT Facilitation, USD mil.	839	1.62	3.62	-0.081341	49.27
AfT Facilitation (cum.) per capita, USD mil.	1328	3.88	14.49	0 .0006066	129.07

Restrictions by cumulative AfT facilitation per capita

Sample / Variable	**N**	**Mean**	**SD**	**Min**	**Max**
Bottom 10% left out					
Num. Prod. Categories Exported (HS6)	1418	1791	1245	1	4686
AfT Facilitation, USD mil.	1212	1.90	4.66	-0.081341	49.27
AfT Facilitation (cum.) per capita, USD mil.	1863	3.50	12.32	0.022102	129.07
Bottom 25% left out					
Num. Prod. Categories Exported (HS6)	1208	1636	1132	1	4686
AfT Facilitation, USD mil.	1024	2.15	5.01	-0.081341	49.27
AfT Facilitation (cum.) per capita, USD mil.	1546	4.20	13.41	0.1846723	129.07
Top 10% left out					
Num. Prod. Categories Exported (HS6)	1411	1913	1308	1	4748
AfT Facilitation, USD mil.	1169	1.57	4.13	-0.000075	49.27
AfT Facilitation (cum.) per capita, USD mil.	1863	1.17	1.48	0 .0006066	6.80
Top 25% left out					
Num. Prod. Categories Exported (HS6)	1154	2028	1359	1	4748
AfT Facilitation, USD mil.	964	1.23	3.25	-0.000075	36.42
AfT Facilitation (cum.) per capita, USD mil.	1550	0.57	0.54	0 .0006066	2.28

6 Results

In this section we present our results. We begin with the results for our main specification along with our two alternative dependent variables as robustness checks, which are presented in Table 4. Then, we proceed to the results for our two sample restriction strategies, presented in Tables 5 and 6. We also end with some clarifying comments in Section 6.2.

6.1 Regression Results

Table 4 presents the results for our main specification as well as the results for the two alternative dependent variables. Table 4 column (1) contains the results for our main model specification with the number of exported products classified according to HS6 as the dependent variable. In line with our hypothesis, the empirical estimation shows a statistically significant impact of AfT facilitation on the number of exported products. According to the estimates, a 10 % increase in AfT facilitation increases the number of exported products with 0.168 % on average. Translated into absolute terms, at mean values this would equal one more product category exported per extra 59 000 USD of AfT facilitation. The result is significant on 10 % level.

The results for our first alternative operationalization, product categories classified according to SITC 3, is presented in Table 4 column (2). The estimation shows no statistically significant impact of AfT facilitation on this alternative operationalization of the dependent variable. This is in line with expectations as SITC 3 contains less detailed information on product categories and hence is less sensitive to changes. Turning to Table 4 column (3) it contains the results for HHI concentration index as dependent variable. The coefficient is negative, meaning that the outbound trade flows become less concentrated, however the result is not significant.

Table 4: **Main Results**

Column nr.	(1)	(2)	(3)
Type Dependent Variable	Num. Products	Num. Products	Export Concentration
Comment	Main specification	Robustness	Robustness
Dependent Variable	log(HS6)	log(SITC3)	log(HHI)
L.Dependent Variable	0.640***	0.800***	0.800***
	(0.173)	(0.0862)	(0.0686)
L.log(AfT Facilitation)	0.0168*	0.00568	-0.00623
	(0.00906)	(0.00600)	(0.00395)
L.GDP per capita	-1.81e-06	5.00e-06	1.80e-06
	(1.56e-05)	(6.72e-06)	(8.64e-06)
L.Population, tot	0.000365*	0.000149	-0.000122
	(0.000191)	(0.000118)	(7.90e-05)
L.FDI, net inflows	-5.60e-05	-5.47e-05	-3.79e-05
	(6.83e-05)	(4.84e-05)	(4.49e-05)
L.GovtEffectivness	0.397	0.0988*	0.00743
	(0.278)	(0.0513)	(0.0627)
L.TradeFreedomIndex	0.00231	0.000878	-0.00275*
	(0.00299)	(0.00189)	(0.00161)
Constant	2.645*	0.951**	-0.0677
	(1.366)	(0.392)	(0.157)
Instruments	85	85	85
AR(2)	0.910	0.417	0.456
Hansen	0.685	0.534	0.797
Fixed Effects	YES	YES	YES
Observations	886	1072	1,072
Period	2002-2017	2002-2017	2002-2017
Countries	105	118	118

SE in parentheses

*** p<0.01, ** p<0.05, * p<0.1

System-GMM Regression

Syntax details in Appendix

Next, we present the results with sample restrictions. For these estimations we only present the results for our main dependent variable, the number of exported products classified according to HS6. Table 5 column (1) contains the results for LDC countries only. The coefficient is now negative in contrast to our main specification from Table 4 column (1), however it is not significant. Table 5 column (2) contains the results when excluding LDC countries from the sample. This coefficient is smaller than for our main specification, however it is neither statistically significant.

Table 6 contains the results for our second sample restriction. Here, we limit the sample based on recipients cumulative AfT facilitation disbursements per capita for the whole period. In Table 6 column (1) we leave out the bottom 10 % and in column (2) the bottom 25 %. We then leave out the top 10 % and top 25 %, presented in columns (3) and (4) respectively. When excluding the top recipient countries (columns 3 and 4), the impact of AfT facilitation is not statistically significant. When leaving out the bottom 10 %, however, the coefficient is larger compared to our main specification, and it is statistically significant on 5 % level, compared to 10 % level for our main specification. When leaving out the bottom 25 % the coefficient is also larger than in our main specification, and it is also slightly larger than when leaving out only the top 10 %. This results is also statistically significant on 5 % level, compared to a 10 % significance level for our main specification. The results suggest that increasing AfT facilitation disbursements by 10 % increases the number of exported product categories with 0.295 % on average. Translated into absolute terms, at mean values this would equal one more product category exported per extra 45 000 USD of AfT facilitation.

6.2 Results Comments

The number of observations in our results tables differ from our descriptive table (Table 1). This discrepancy is due to two reasons. First, some countries lack data for one or more variables for a given year and is therefore dropped. Second, some countries have too few observations to be calculated with first differences and lags and consequently they are dropped.

This reduces both the observation count and the number of countries included.

In our data, we also have inconsistent data availability that affect the number of observations and countries included in our sample restrictions. When restricting our sample, both on based LDC-classification and cumulative AfT facilitation per capita, we see a general trend of lower income countries having less data and thus our restrictions do not provide proportional samples. That is, the number of countries left out of our sample does not always equal the percentage share specified in our restriction. We discuss this in Section 7. Last, the AR (2) values indicate no autocorrelation in any of our regressions. The Hansen-test of overidentification report high values which might be a sign of instrument overuse. However, this is the case even when restricting the number of instruments. We discuss this in Section 7, and results from specification tests are presented in Appendix Section 3.

Table 5: **Results for LDC/non-LDC sample restrictions**

Column nr.	(1)	(2)
Type Dependent Variable	Num. Products	Num. Products
Comment	LDC	Non-LDC
Dependent Variable	log(HS6)	log(HS6)
L.Dependent Variable	0.419**	0.962***
	(0.197)	(0.181)
L.log(AfT Facilitation)	-0.0188	0.00989
	(0.0444)	(0.00907)
L.GDP per capita	-0.000249	2.27e-07
	(0.000222)	(1.36e-05)
L.Population	0.0112**	1.45e-05
	(0.00548)	(0.000208)
L.FDI, net inflows	-0.00878	1.60e-05
	(0.0107)	(4.52e-05)
L.GovtEffectivness	0.427	-0.0545
	(0.406)	(0.106)
L.TradeFreedomIndex	0.00858	0.000791
	(0.0143)	(0.00437)
Constant	3.739**	0.229
	(1.520)	(1.174)
Instruments	36	36
AR(2)	0.888	0.257
Hansen	0.971	0.891
Fixed Effects	YES	YES
Observations	253	633
Period	2002-2017	2002-2017
Countries	35	70

SE in parentheses

*** p<0.01, ** p<0.05, * p<0.1

System-GMM Regression

Syntax details in Appendix

Table 6: **Results for sample restrictions based on cumulative AfT facilitation per capita**

Column nr.	(1)	(2)	(3)	(4)
Type Dependent Variable	Num. Products	Num. Products	Num. Products	Num. Products
Comment	Bottom 10 % left out	Bottom 25 % left out	Top 10 % left out	Top 25 % left out
Dependent Variable	log(HS6)	log(HS6)	log(HS6)	log(HS6)
L.Dependent Variable	0.242	0.230	0.770***	0.745***
	(0.305)	(0.262)	(0.105)	(0.174)
L.log(AfT Facilitation)	0.0228**	0.0295**	0.00418	0.00323
	(0.0105)	(0.0130)	(0.00835)	(0.00777)
L.GDP per capita	4.26e-05	2.86e-05	1.80e-05	1.46e-05
	(3.14e-05)	(4.60e-05)	(1.31e-05)	(1.39e-05)
L.Population, tot	0.00333*	0.00495*	0.000297	0.000275
	(0.00168)	(0.00264)	(0.000182)	(0.000212)
L.FDI, net inflows	9.52e-05	-0.000458	-4.96e-05	-2.89e-05
	(0.000482)	(0.00109)	(5.87e-05)	(7.00e-05)
L.GovtEffectivness	0.239	0.318	-0.00485	0.0535
	(0.344)	(0.379)	(0.126)	(0.143)
L.TradeFreedomIndex	0.00248	0.00377	0.000376	0.00294
	(0.00338)	(0.00663)	(0.00211)	(0.00236)
Constant	5.321**	5.295**	1.627**	1.671
	(2.410)	(2.082)	(0.778)	(1.276)
Instruments	64	64	64	43
AR(2)	0.814	0.563	0.390	0.636
Hansen	0.538	0.769	0.506	0.567
Fixed Effects	YES	YES	YES	YES
Observations	831	704	822	674
Period	2002-2017	2002-2017	2002-2017	2002-2017
Countries	94	81	97	78

SE in parentheses

*** p<0.01, ** p<0.05, * p<0.1

System-GMM Regression

Syntax details in Appendix

7 Discussion

7.1 Main Results

The hypothesis for our empirical analysis was that AfT facilitation leads to more product types being exported from the recipient country. The results in the previous section do provide support for this hypothesis. Our main specification suggests that increasing AfT facilitation disbursements to a country with 10 % would, on average, increase the number of exported products by 0.168 %. The result is significant on 10 % level. This would be translated into one more product category exported per extra 59 000 USD of AfT facilitation at mean values. These results results indicate that AfT facilitation could be a driver of export diversification on the extensive margin. This is an interesting finding in relation to previous research. As discussed in the literature review, AfT facilitation is a subcategory of the more aggregate category *AfT Policy and Regulations*. Kim (2019) analyses the impact of this category on the number of exported products classified according to HS6 level, and finds no significant results. In this thesis, we narrow down the analysis further and lift out only the sub-category AfT facilitation, and find that this alone is significant in increasing the number of exported products, contrary to the findings of Kim (2019). This result indicates the need of a highly disaggregated analysis when evaluating AfT. As the large aid flows categorized under AfT are distinct from each other, evaluating narrow categories separately is potentially more informative as they are likely to have diverse effects.

The reason why Kim (2019) does not find significant results for the more aggregate category is unknown, however it is an interesting topic for discussion. One possible contributing factor could be that the remaining sub-categories of *AfT Policy and Regulation* generally aim at supporting policy makers in the development of regional and multilateral trade agreements. That is, it broadly focuses on trade *liberalization* in the sense of removing traditional trade barriers, such as tariffs and quotas. This while AfT facilitation is directly aimed at reducing domestic trade cost which, as discussed briefly in the introduction, in fact often constitutes a more substantial cost than traditional trade barriers. Furthermore, previous literature has indicated that trade costs rather than traditional trade barriers have a strong negative impact on the range of exported products. In other words, it could be the case that measures aimed at trade liberalization are not effective in increasing the number of exported products. This could be one potential reason why Kim (2019) does not find significant results for the more aggregate category. However, this needs to be further investigate before drawing any conclusion.

Our results also relate to the previous finding that AfT facilitation significantly reduces domestic trade costs. The estimations presented in this thesis indicate that AfT facilitation could also lead to more product types being exported. This connects to our theoretical framework with the prediction that AfT facilitation reduces the cost of trading, and hence yields increased export diversification on the extensive margin. Although our results do not say anything about which mechanisms drive the linkage between AfT facilitation and the number of exported products, they do connect prior research. First, results from Busse et al. (2012) show that AfT facilitation significantly lowers domestic trade costs. Second, results from Dennis and Shepherd (2011) and Beverelli et al. (2015) show that domestic trade costs have a strong negative impact on export diversification. With our empirical analysis we connect these findings and provide empirical results indicating that there is a link between AfT facilitation and recipient countries export diversification.

7.2 Alternative Operationalizations and Sample Restrictions

From our alternative specifications using different dependent variables we find no significant effect for neither the more aggregate measure SITC 3 nor the HHI export concentration index. The former may be due to its aggregate nature which is less sensitive to pick up small changes in product categories exported. Indeed, this is what we suspected and the reason we did not choose the SITC 3 categorization as our main dependent variable. The latter, however, is insignificant which contradicts the results from Gnangnon (2018) and Kim (2019) who find significant effects on HHI of total AfT and *AfT Policy and Regulation* respectively. Interestingly, our results show that AfT facilitation as a standalone category does not have a significant effect on the HHI export concentration index. This could be due to several potential reasons. It could be that the extensive margin effect, i.e. the increase in the number of exported product categories, is not strong enough to be picked up by the HHI export concentration index, and therefore the result is non-significant.

Another possibility is that the extensive margin effect is offset by changes on the intensive margin. As discussed in previous sections, changes in HHI may be driven by either extensive or intensive margin effects. Therefore, for example, if the number of exported products increase while at the same time export goods at already high aggregate values grow their share of total exports, this could result in an increase in the HHI index (more concentration). If this second possibility is true, it would mean that AfT facilitation increases diversification on the extensive margin and decreases it on the intensive margin. This would contradict our prediction from the theoretical framework that AfT facilitation reduces the fixed cost of trading, which enables new firms to export, but does not affect the exported volume for already exporting firms. However, if AfT facilitation decreases the diversification on the intensive margin, it would mean that it not only allows new firms to export but also increases the export volume of already exporting firms. Nonetheless, in order to conclude anything about this possibility, it would require disentangling extensive and intensive margin effects of AfT facilitation.

Turning to our sample restrictions, they show a few interesting results worth pointing out. For our main specification, the results seem to be mainly driven by countries that receive relatively larger amount of cumulative AfT facilitation disbursements per capita over the studied period. When leaving out the top 10 % as well as the top 25 % from our sample, the impact of AfT facilitation on the number of exported products become insignificant. This is in line with the results from Busse et al. (2012) who find that the impact of AfT facilitation on domestic trade cost is mainly driven by the top 20 recipients in terms of cumulative disbursements over the studied period. When we leave out the bottom 10 %, the coefficient and statistical significance increases compared to our main specification. Furthermore, when leaving out the bottom 25 %, the coefficient becomes slightly larger again. In this case, increasing AfT facilitation disbursements by 10 % increases the number of exported product categories with 0.295 % on average. Translated into products per extra USD, this estimation equals one more product category exported per extra 45 000 USD at mean values. This is evidence that the impact is driven by countries receiving above-average aid.

This also appears in line with Busse et al. (2012) who argues there might be a "threshold" level for AfT facilitation to become effective. That is, it could be the case that it is required for a country to receive a certain level of disbursements for AfT facilitation to have a significant impact on trade cost and diversity of exports. This is an important result for the purpose of efficient aid allocation. If it is the case that AfT facilitation becomes effective only after a certain threshold, then this is important information when deciding the levels of disbursements and how the aid should be allocated. For our sample restrictions with respect to LDCs, we find that leaving out the LDCs from the sample makes the estimations insignificant. Likewise, when analyzing only LDCs, we find no significance. Hence, according to our results, a country being categorized as an LDC does not seem to be a determinant of the impact of AfT facilitation on the number of products exported.

7.3 Limitations

As mentioned briefly in our results section, there is an inconsistent data availability that tends to provide more observations for higher income countries. This is an endogeneity concern and possibly threatens the validity of our study as it might cause selection bias. It also raises a concern of the potentially present measurement error caused by over- or under reporting. If this is systematic, for example if the measurement error is more severe for lower income countries, then it could generate biased results. This potential threat of endogeneity is important to keep in mind. However, for all our respective variables, the databases used in this thesis are the most consistent and updated to our knowledge.

Another limitation of our study is the restricted time periods analysed as we only have 16 years of observations. It might be that the results would be different if longer panels were available. Even though we estimate a significant impact of AfT facilitation in our empirical analysis, it seems reasonable that it requires a significant amount of time for a country to achieve a more diverse export bundle. This also relates to the non-significant results when using the SITC 3 classification as dependent variable. With SITC 3, export categories are categorized on a more aggregate level than in our main dependent variable (HS6). This could be a sign that the changes in the diversity of exports following AfT facilitation are 'accessory' rather than structural. That is, our results could be the consequence of new firms exporting but from within similar sectors as already exporting firms, leaving other industries behind. To enable these industries to profitably export, more structural changes of a country's economy might be required. However, it could also be the case that AfT facilitation does enable firms from non-exporting sectors to start to profitably export, but that this requires longer time. With longer panels, it would for example be interesting to investigate whether the impact on SITC 3 changes.

Last, as for our application of system-GMM we want to underline a few points. It is important to note that the significance of the results are sensitive to different specification options of system-GMM, such as choice of instrument lag length. However, while significance changes, the coefficient is relatively stable when altering the lag-limit which point towards an efficiency gain when using deeper lags. Also worth pointing out is our generally high p-values from the included Hansen test for overidentification. Even if the Hansen-test tends to become weaker when the instrument count is high, our Hansen-statistics could be a sign of overidentification and the overuse of instruments (Roodman 2009a & 2009b; Agosin et al., 2012; Kim, 2019). Specification choices were nonetheless made with statistical testing and the guidance of econometric papers (Judson & Owen, 1999; Roodman 2009a & 2009b) as well as practical applications in closely related papers (Agosin et al., 2012; Gnangnon, 2018; Kim, 2019). For transparency, we include a brief review of results from our specification testing and application of system-GMM in Appendix Sections 3 and 4.

8 Conclusion

This thesis studies whether Aid for Trade facilitation could be a driver of increased export diversification in recipient countries. The results support our hypothesis that AfT facilitation increases the range of exported product types from recipient countries. In our main specification without any sample restrictions, we find that a 10 % increase in AfT facilitation would, on average, increase the number of exported product categories from the recipient country by 0.168 %. In absolute terms, this would equal one more product category per extra 59 000 USD of AfT facilitation at mean values. Furthermore, sample restrictions suggest that the impact is driven by countries above a certain threshold in terms of cumulative aid disbursements per capita over the studied period 2002-2017. When leaving out the bottom 25 % of recipients, a 10 % increase in AfT facilitation would, on average, increase the number of exported product categories by 0.295 %. In absolute terms, this would, at mean values, equal one more product category exported per extra 45 000 USD at mean values.

Our results contribute to the literature by showing that AfT facilitation does not only lead to reduced domestic trade costs, as shown in previous research, but can also lead to increased export diversification. Hence, we show that AfT facilitation is one potential policy option to promote export diversification in developing countries. Furthermore, our results highlight the heterogeneous effects of different kinds of AfT flows. In previous research, no significant impact of the more aggregate AfT category which AfT facilitation contains in was found on the number of exported products. This highlights the need for a highly disaggregated approach when analyzing the impact of AfT.

In addition, our results contribute to existing research by adding to scarce quantitative evidence with the use of panel data in a dynamic GMM model. We use system-GMM to avoid common problems of endogeneity present in dynamic models with small T and fixed effects in OLS. For future research, we suggest continued elaboration of proper applications of system-GMM in order to test how our results compares to those from longer panels and further developed specifications.

Furthermore, we suggest for future research to also disentangle the impact of AfT facilitation on the extensive and intensive margins of diversification. This in light of of our results showing a significant impact on the extensive margin, while at the same time generating no significant effect on the HHI export concentration index. Another suggestion for future research is to further elaborate on the levels of aid disbursements required for AfT facilitation to be effective, as our results support a suggested threshold effect. This in order to avoid ineffective use and continue the pursuit of enabling recipient countries' trade capacity. Finally, we suggest for future research to evaluate and compare the impact of other narrow subcategories of AfT. For example, it would be interesting to compare the impact of AfT facilitation with other subcategories of *AfT Policy and Regulation*. This to provide understanding of which AfT flows that are effective and which are not.

9 References

Achen, C.H. (2000). Why Lagged Dependent Variables can Suppress the Explanatory Power of other Independent Variables. *(Paper Presented at the Annual Meeting of the Political Methodology Section of the American Political Science Association, Los Angeles, July 20-22, 2000).*

Agosin, M.R., Alvarez, R. & Bravo-Ortega, C. (2012). Determinants of Export Diversification Around the World: 1962-2000. *World Economy, 35*(3), 295-315.

Anderson, J.E. & van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review, 93*(1), 170-192.

Anderson, J.E. & van Wincoop, E. (2004). Trade Costs. *Journal of Economic Literature, 42*(3), 691-751.

Anderson, T.W. & Hsiao, C. (1981). Estimation of Dynamic Models with Error Components. *Journal of the American Statistical Association, 76*(375), 598-606.

Arellano, M. & Bond, S. (1991). Some Tests of Specification for Panel Data - Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies, 58*(2), 277-297.

Arellano, M. & Bover, O. (1995). Another Look at the Instrumental Variable Estimation of Error-Components Models. *Journal of Econometrics, 68*(1), 29-51.

Arvis, J., Duval, Y., Shepherd, D., Utoktham, C. & Raj, A. (2016). Trade Costs in the Developing World: 1996-2010. *World Trade Review, 15*(3), 451-474.

Beck, N. & Katz, J.N. (2011) Modeling Dynamics in Time-Series-Cross-Sectional Political Economy Data. *Annual Review of Political Science, 14*(1), 331-352.

Bernard, A. & Bradford Jensen, J. (2004). Why Some Firms Export. *Review of Economics and Statistics, 86*(2), 561-569.

Beverelli, C., Neumueller, S. & Teh, R. (2015). Export Diversification Effects of the WTO Trade Facilitation Agreement. *World Development, 76*(18), 293-310.

Blundell, R. & Bond, S. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics, 87*(1), 115-143.

Busse, M., Hoekstra, R. & Königer, J. (2012). The Impact of Aid for Trade Facilitation on the Cost of Trading. *Kyklos, 65*(2), 143-163.

Cadot, O., Fernandes, A., Gourdon, J., Mattoo, A. & Melo, J. (2014). Evaluating Aid for Trade: A Survey of Recent Studies. *World Economy, 37*(4), 516-529.

Calí, M. & te Velde, D.W. (2011). Does Aid for Trade Really Improve Trade Performance? *World Development, 39*(5), 725-740.

Chaney, T. (2008). Distorted Gravity: the Intensive and Extensive Margins of International Trade. *American Economic Review, 98*(4), 1707-1721.

Creditor Reporting System (CRS). (2020). *OECD.Stat.* Accessed 2020-03-01 from https://stats.oecd.org/Index.aspx

Dalgaard, C.J., Hansen, H. & Tarp, F. (2004). On the Empirics of Foreign Aid and Growth. *Economic Journal, 114*(496), 191-216.

Dennis, A. & Shepherd, B. (2011). Trade Facilitation and Export Diversification. *World Economy, 34*(1), 101-122.

Gnangnon, S.K. (2018). Aid for Trade and Export Diversification in Recipient-Countries. *World Economy, 42*(2), 396-418.

Greenaway, D. & Kneller, R. (2007). Firm Heterogeneity, Exporting and Foreign Direct Investment. *Economic Journal, 117*(517), 134-161.

Hansen, L. (1982). Large Sample Properties of Generalized Method of Moments Estimators. *Econometrica, 50*(4), 1029-1053.

Helble, M., Mann, C.L. & Wilson, J.S. (2012). Aid for Trade Facilitation. *Review of World Economics, 148*(2), 357-376.

Helpman, E., Melitz, M. & Rubinstein, Y. (2008). Estimating Trade Flows: Trading Partners and Trading Volumes. *Quarterly Journal of Economics, 123*(2), 441-447.

Heritage Foundation. (2020). *2020 Index Data.* Accessed 2020-04-27 from https://www.heritage.org/index/explore

Huchet-Bourdon, M., Lipchitz, A. & Rousson, A. (2009). Aid for Trade in Developing Countries: Complex Linkages for Real Effectiveness. *African Development Review, 21*(2), 243-290.

Imbs, J. & Wacziarg, R. (2003). Stages of Diversification. *American Economic Review, 93*(1), 63-86.

Judson, R.A. & Owen, A.L. (1999). Estimating Dynamic Panel Data Models: a Guide for Macroeconomists. *Economics Letters, 65*(1), 9-15.

Keele, L. & Kelly, N.J. (2006). Dynamic Models for Dynamic Theories: The Ins and Outs of Lagged Dependent Variables. *Political Analysis, 14*(2), 186-205.

Kim, Y.R. (2019). Does Aid for Trade Diversify the Export Structure of Recipient Countries? *World Economy, 42*(9), 2684-2722.

Melitz, M.J. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica, 71*(69), 1695-1725.

Nickell, S. (1981). Biases in Dynamic Models with Fixed Effects. *Econometrica, 49*(6), 1417-1426.

OECD CRS. (2020). Aid-for-Trade Statistical Queries. Accessed 2020-02-20 from https://www.oecd.org/dac/aft/aid-for-tradestatisticalqueries.htm

OECD & WTO. (2011). Aid for Trade at a Glance 2011: Showing Results. Accessed 2020-01-30 from https://www.wto.org/english/res_e/publications_e/aid4trade11_e.pdf

OECD & WTO. (2019). Aid for Trade at a Glance 2019: Economic Diversification and Empowerment. Accessed 2020-01-08 from https://www.wto.org/english/res_e/booksp_e/aid4trade19_e.pdf

Osei, R., Morrissey, O. & Lloyd, T. (2004). The Nature of Aid for Trade Relationship. *The European Journal of Development Research, 16*(2), 354-374.

Roodman, D. (2009a). How to do xtabond2: an Introduction to Difference and System GMM in Stata. *Stata Journal, 9*(1), 86-136.

Roodman, D. (2009b). A Note on the Theme of Too Many Instruments. *Oxfors Bulletin of Economics and Statistics, 71*(1), 135-158.

Persson, M. (2013). Trade Facilitation and the Extensive Margin. *Journal of International Trade and Economic Development, 22*(5), 658-693.

Tadesse, B. & Shukralla, E.K. (2011). The Impact of Foreign Direct Investment on Horizontal Export Diversification: Empirical Evidence. *Applied Economics, 45*(2), 141-159.

UNCTAD. (2020). *Data Center*. Accessed 2020-03-10 from https://unctadstat.unctad.org/wds/ReportFolders /reportFolders.aspx?sCS_ChosenLang=en

United Nations. (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. Accessed 2020-03-02 from https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

Vijil, M. & Wagner, L. (2012). Does Aid for Trade Enhance Export Performance? Investigating the Infrastructure Channel. *World Economy, 35*(7), 838-868.

Wilkins, A.S. (2018). To Lag or not to Lag? Re-Evaluating the Use of Lagged Dependent Variable in Regression Analysis. *Political Science Research and Methods, 6*(2), 393-411.

Winters, A., McCulloch, N. & McKay, A. (2004). Trade Liberalization and Poverty: The Evidence So Far. *Journal of Economic Literature, 42*(1), 72-115.

World Bank. (2020) *World Development Indicators.* Accessed 2020-02-25 from https://databank.worldbank.org/source/world-development-indicators

World Integrated Trade Solutions. (2020). *Indicators.* Accessed 2020-02-26 from https://wits.worldbank.org/country-indicator.aspx?lang=en

WTO. (2005). Ministerial Declaration. Accessed 2020-03-02 from https://www.wto.org/english/thewto_e/minist_e/min05_e/final_text_e.pdf

A Appendix

1. Nickell-bias

Nickell bias occurs when using an OLS fixed effects estimator for a dynamic LDV-model with data characterised by small T. Taking inspiration from an example given by Roodman (2009a) we can put this in an intuitive context.

Suppose we have data on the number of exported product categories for country i over ten years. The number of exported product categories year t is our dependent variable ($Y_{i,t}$); included controls are represented in vector ($X_{i,t}$); entity fixed effect is included in (u_i); the idiosyncratic error term is ($\epsilon_{i,t}$). The model also includes a constant (β_0) and a LDV ($Y_{i,t-1}$), and can be written as follows:

$$Y_{i,t} = \beta_0 + \alpha Y_{i,t-1} + \beta' X_{i,t} + u_i + \epsilon_{i,t} \tag{1}$$

We control for entity fixed effects by subtracting the mean (ten year average) from the above equation (1). β_0 and u_i are constants and disappears with the fixed effects transformation, giving us the following equation:

$$Y^*_{i,t} = \alpha Y^*_{i,t-1} + \beta' X^*_{i,t} + \epsilon^*_{i,t} \tag{2}$$

Now imagine a negative shock to exported products took place in the fourth year and that this shock is not modelled. This will lower the ten year average (entity fixed effect) and the estimate of the LDV-coefficient in year five. This since the LDV-coefficient α will now be attributed effects that actually belongs to the entity fixed effect. This bias is what is referred to as *Nickell-bias* (Nickell, 1981). Obviously, this is not mitigated for by increasing N but has to be solved by increasing T for the OLS estimator.

2. System-GMM

Another solution to Nickell-bias, that we turn to in this thesis, is to use a different estimator, namely the Blundell-Bond estimator (system-GMM). The Blundell-Bond estimator uses GMM developed by Hansen (1982). The use of so called moment conditions and deep mechanics of GMM is beyond the scope of this appendix, but interested readers are referred to relevant textbooks or papers (see for example Hansen, 1982; Arellano & Bond, 1991; Arellano & Bover 1995; Blundell & Bond 1998; Roodman, 2009a). However, the basic idea of our application is as follows:

Again suppose we have an autoregressive LDV-model (now in a GMM-framework):

$$Y_{i,t} = \beta_0 + \alpha Y_{i,t-1} + \beta' X_{i,t} + u_i + \epsilon_{i,t} \tag{3}$$

If we take first differences and rid the model of fixed effects we end up with equation (4).

$$\Delta Y_{i,t} = Y_{i,t} - Y_{i,t-1} = \alpha \Delta Y_{i,t-1} + \beta' \Delta X_{i,t} + \Delta \epsilon_{i,t} \tag{4}$$

In this stage we are still left with endogeneity. The term $Y_{i,t-1}$ is mathematically related to $\Delta\epsilon_{i,t}$ since both terms include $\epsilon_{i,t-1}$ and thus violates the strict exogeneity assumption as shown in the following equation (5):

$$cov(\Delta\epsilon_{i,t}, \Delta Y_{i,t-1}) = cov(\epsilon_{i,t} - \epsilon_{i,t-1}, Y_{i,t-1} - Y_{i,t-2}) \neq 0 \tag{5}$$

To solve this, deeper lagged differences of the dependent variables are used as instruments. Since $\Delta Y_{i,t-2}$ is not related to $\Delta\epsilon_{i,t}$, the correlation is broken.

This IV-approach was introduced by Anderson & Hsiao (1981), then applied with higher efficiency within GMM by Arellano-Bond (1991) and further improved by Blundell-Bond (1998). The Arellano-Bond estimator is often referred to as "difference-GMM" while the Blundell-Bond estimator is called "system-GMM". The difference between these estimators is that system-GMM uses both the difference and level-equations when instrumenting, allowing for more moment conditions to be utilized and consequently more efficient results (Blundell-Bond, 1998; Roodman, 2009a & 2009b). The Blundell-Bond estimator instruments levels with differences.

We want to stress that this is a very simple and crude description of system-GMM and by no means an attempt to provide the reader with more than just a basic and intuitive understanding.

3. Test of lag sensitivity and overidentification

Below in Table 7 we present results for different specifications with respect to lag-length. We also include results from an OLS fixed effect estimator for comparison.

From results in column (2), (3) and (4) we can see that our coefficient is relatively constant even when the lags are restricted and that increasing the number of instruments does not skew results towards the OLS estimate in any major way. Instead we argue that the reduced standard errors (increased efficiency) is a result of the additional instruments yielding more precise estimates. The estimate from the included OLS fixed effects estimator, presented in column (1), is much smaller in magnitude which is in line with our discussion on Nickell-bias for this type of estimator in a LDV and small T setting. We also note that the Hansen p-values are high in all three system-GMM specifications with the lowest value for our chosen main specification.

Table 7: **Results for OLS fixed Effects and system-GMM with lag restrictions**

Column nr.	(1)	(2)	(3)	(4)
Type Dependent Variable	Num. Products	Num. Products	Num. Products	Num. Products
Estimator	OLS Fixed Effects	GMM; lag(3 1)	GMM; lag(6 1)	GMM; lag(9 1)
Comment				*Main specification*
Dependent Variable	log(HS6)	log(HS6)	log(HS6)	log(HS6)
L.Dependent Variable	0.501***	0.530**	0.519***	0.640***
	(0.173)	(0.229)	(0.171)	(0.173)
L.log(AfT Facilitation)	0.00117	0.0186	0.0181	0.0168*
	(0.00663)	(0.0116)	(0.0114)	(0.00906)
L.GDP per capita	-1.22e-05	1.41e-05	2.14e-05	-1.81e-06
	(1.01e-05)	(3.16e-05)	(1.82e-05)	(1.56e-05)
L.Population, tot	5.65e-05	-9.27e-05	-0.000127	-5.60e-05
	(5.66e-05)	(0.000156)	(9.84e-05)	(6.83e-05)
L.FDI, net inflows	-0.00116*	0.000585	0.000573**	0.000365*
	(0.000644)	(0.000425)	(0.000273)	(0.000191)
L.GovtEffectivness	0.110	0.358	0.325	0.397
	(0.0900)	(0.266)	(0.313)	(0.278)
L.TradeFreedomIndex	-0.000365	0.00240	-0.000837	0.00231
	(0.000862)	(0.00457)	(0.00342)	(0.00299)
Constant	3.846***	3.389**	3.690**	2.645*
	(1.337)	(1.672)	(1.439)	(1.366)
Instruments	-	43	64	85
AR(2)	-	0.904	0.825	0.910
Hansen	-	0.693	0.889	0.685
Fixed Effects	YES	YES	YES	YES
Observations	886	886	886	886
Period	2002-2017	2002-2017	2002-2017	2002-2017
Countries	105	105	105	105

SE in parentheses

*** p<0.01, ** p<0.05, * p<0.1

System-GMM Regression

4. System-GMM Stata syntax: xtabond2

We use the Stata program xtabond2 to run system-GMM. The program is written by David Roodman (2009a) which is also the author of a prominent paper covering the practical applications of difference- and system-GMM in Stata. Roodman (2009a & 2009b) urges, for purposes of transparency, that one should disclose how system-GMM is applied. In this spirit we provide a list of the command specifications and options used.

- We set country as *entity*- and year as *time*-variables to control for fixed effects
- "*GMM-style*"-instruments: year dummies
- "*IV-style*"-instruments: lagged dependent variable, main regressor and all controls
- IV-equation is set to *level*
- We use *laglimit(a b)* and *collapse*-option to reduce the number of instruments
- Further options are *twostep* and *robust*

5. List of included countries

Below in Table 8 follows a list of all included countries in our empirical estimation. The numbers to the right of the country name indicates total number of observations over the number of years with registered AfT facilitation. LDC status is indicated by *.

Table 8: **List of Included Countries**

Total observations listed over years with registered AfT facilitation.
LDC indicated by *

Afghanistan*	17/15	Grenada	17/8	Sao Tome & Princ.*	17/5
Albania	17/11	Guatemala	17/15	Senegal*	17/14
Algeria	17/13	Guinea*	17/8	Serbia	17/15
Angola*	17/8	Guinea Bissau*	17/7	Sierra Leone*	17/10
Argentina	17/11	Guyana	17/1	Solomon Islands*	17/10
Armenia	17/12	Haiti*	17/11	Somalia*	17/2
Azerbaijan	17/12	Honduras	17/15	South Africa	17/16
Bangladesh*	17/16	India	17/16	South Sudan*	8/6
Belarus	14/6	Indonesia	17/15	Sri Lanka	17/14
Belize	17/6	Iran	17/8	St. Lucia	17/2
Benin*	17/14	Iraq	17/10	St.Vincent & Gren.	17/3
Bhutan*	17/11	Jamaica	17/9	Sudan*	17/11
Bolivia	17/14	Jordan	17/13	Suriname	17/2
Bosnia-Herzegovina	17/13	Kazakhstan	17/14	Syria	17/2
Botswana	17/14	Kenya	17/12	Tajikistan	17/13
Brazil	17/14	Kiribati*	17/9	Tanzania*	17/14
Burkina Faso*	17/13	Kosovo	10/9	Thailand	17/16
Burundi*	17/9	Kyrgyz Republic	17/13	Timor-Leste*	17/14
Cabo Verde	17/2	Lao PDR*	17/12	Togo*	17/12
Cambodia*	17/15	Lebanon	17/10	Tonga	17/12
Cameroon	17/11	Lesotho*	17/12	Tunisia	17/12
CAR*	17/11	Liberia*	17/9	Turkey	17/12
Chad*	17/10	Libya	14/8	Turkmenistan	17/10
China	17/15	Madagascar*	17/15	Tuvalu*	17/4
Colombia	17/15	Malawi*	17/14	Uganda*	17/13
Comoros*	17/5	Malaysia	17/15	Ukraine	14/13
Congo Dem.Rep.*	17/14	Maldives	17/4	Uzbekistan	17/12
Congo Rep.	17/1	Mali*	17/13	Vanuatu*	17/11
CostaRica	17/16	Marshall Islands	17/2	Venezuela	17/6
Cote d Ivoire	17/12	Mauritania*	17/9	Viet Nam	17/17
Cuba	17/5	Mauritius	17/12	Yemen*	17/10
Djibouti*	17/2	Mexico	17/16	Zambia*	17/14
Dominican Rep.	17/12	Micronesia	17/2	Zimbabwe	17/11
Ecuador	17/12	Moldova	17/13	Nigeria	17/10
Egypt	17/15	Mongolia	17/12	North Korea	17/2
El Salvador	17/13	Montenegro	17/10	North Macedonia	17/12
Eritrea*	17/4	Morocco	17/16	Pakistan	17/13
Eswatini	17/10	Mozambique*	17/15	Papua New Guinea	17/14
Ethiopia*	17/11	Myanmar*	17/12	Paraguay	17/8
Fiji	17/11	Namibia	17/13	Peru	17/17
Gabon	17/8	Nauru	17/5	Philippines	17/15
Gambia*	17/2	Nepal*	17/12	Rwanda*	17/12
Georgia	17/12	Nicaragua	17/15	Samoa	17/9
Ghana	17/13	Niger*	17/9		