The effect of free trade agreements on international trade: an empirical analysis for developed and developing countries

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Abstract

This paper examines how free trade agreements (FTAs) affect bilateral trade flows and if this effect differs between developed and developing countries. To conduct the empirical analysis, a panel dataset is used that contains 31 developed and 31 developing countries over the 1995-2014 period. The regression models are based on the gravity equation and are estimated using the ordinary least squares (OLS) estimation technique with time and bilateral country fixed effects, where the latter addresses the issue of endogeneity of FTAs. The results show a 6 percent increase in trade due to the presence of a FTA between countries. Furthermore, concerning the difference between developed and developing countries, the results shows that the effect of FTAs on trade flows increase, the more developed the two countries involved become. Furthermore, if the exporting country has a higher development status than the importing country, trade will increase. On the other hand, if the exporting country has a lower development status relative to the importing country, this may negatively affect trade if this difference is sufficiently large, while it could be positive when this difference is small. Robustness checks on the difference between the two groups of countries showed relatively similar result, increasing the robustness of the conclusions.

1. Introduction

One of the more frequent campaign promises made by Donald Trump was the elimination of the North American Free Trade Agreement (NAFTA). Calling it "one of the worst deals ever", he held it responsible for the unemployment of many U.S. citizens (Welker, 2017). The statement has been one of many regarding Trump's plan to put "America first". His plans on protection include the renegotiations or elimination of free trade agreements (FTAs), increasing import tariffs and the "Buy American-Hire American" statements. However, especially Trump's stance on FTAs has been criticized by many economists, as it seems that there is no bigger gap between economists and politicians than on the subject of free trade (Lowenstein, 2017).

Regarding the FTAs, Trump is going down a path which could have large consequences for the United States, but also to the related countries in the free trade agreements. On the 23rd of January 2017, the U.S. pulled out of the Trans-Pacific Partnership (TPP), which CNN dubbed as "the largest proposed free trade deal in history" (Riley, 2017). By the U.S. pulling out, the agreement cannot be ratified due to pre-arranged conditions on ratification. With the participating countries, consisting of developed and developing countries, having a combined Gross Domestic Product (GDP) of 27.4 trillion US dollars, this trade agreement could have huge consequences for the international trade of the participating countries.

The question however is how much this effect of entering into FTAs really is and if this effect differs between the developed and developing countries involved. Particularly knowing the potential difference between developed and developing countries could give useful insights into the consequences of such a decision made by Trump to restrict free trade, since these consequences may differ depending on development status. Therefore, the central question in this paper is: how do FTAs affect bilateral trade flows and does this effect differ between developed and developing countries? This analysis will be conducted using bilateral data in a panel dataset of 31 developed and 31 developing countries over the 1995-2014 period. The econometric analysis will be based on the gravity equation and will be estimated using the OLS-estimation technique with time and bilateral country fixed effects.

The results show a 6 percent increase in trade due to the presence of a FTA between countries. Furthermore, concerning the difference between developed and developing countries, the results shows that the effect of FTAs on trade flows increase, the more developed the two countries involved become. Generally, similar developed countries thus trade more with

each other relative to similar developing countries as a result of a FTA. Furthermore, trade will increase if the exporting country's development status is higher than that of the importing country. On the other hand, trade will either increase or decrease if the exporting country has a lower development status relative to the importing country.

The remainder of this paper is structured as follows. In the next section, some theoretical concepts regarding FTAs, free trade and trade related characteristics of developed and developing countries are discussed. In addition, relevant literature will be analysed. The third section will give an overview of the equations used for this research, the data and the methodological framework. The fourth section will contain the presentation and analysis of the results, as well as the robustness checks. Finally, the last section will present an overview of the conclusions, limitations and the recommendations for further research, based on this paper.

2. Theoretical Framework

2.1. Free Trade Agreements

Since this research revolves around free trade agreements, it is important to discuss its definition and implications. The European Commission defines FTAs as agreements that eliminate or cut customs duties, remove quotas and reduce the amount of other trade restrictions for commerce in goods and services between two (bilateral) or more (multilateral) participating countries (European Commission, 2017). Overall, the main goal of concluding such an agreement is to strengthen the domestic economy and to create employment due to the increase in trade flows between the participating countries. The increase in trade flows is a result of the reduction in trade barriers, which works in two ways; it allows a country to compete more efficiently and increase exports to other countries, and it also allows for better access to intermediate products and other necessary products from all over the globe (European Commission, 2017).

Countries are however not free in their decision to set up a trade agreement with another party. World Trade Organization (WTO) members, which consists of nearly every country as of today, have to comply to a set of rules put forward by the WTO in an attempt to mitigate any potential negative effects global trade. Roughly said, the main rules state that the agreement should encompass substantially all trade and have positive effects on the trade flows between participating countries, without creating trade barriers towards non-participating countries (WTO, sd). The latter rule is derived from one of the core principles of the WTO, the non-discrimination principle, which states that members should not wrongfully discriminate

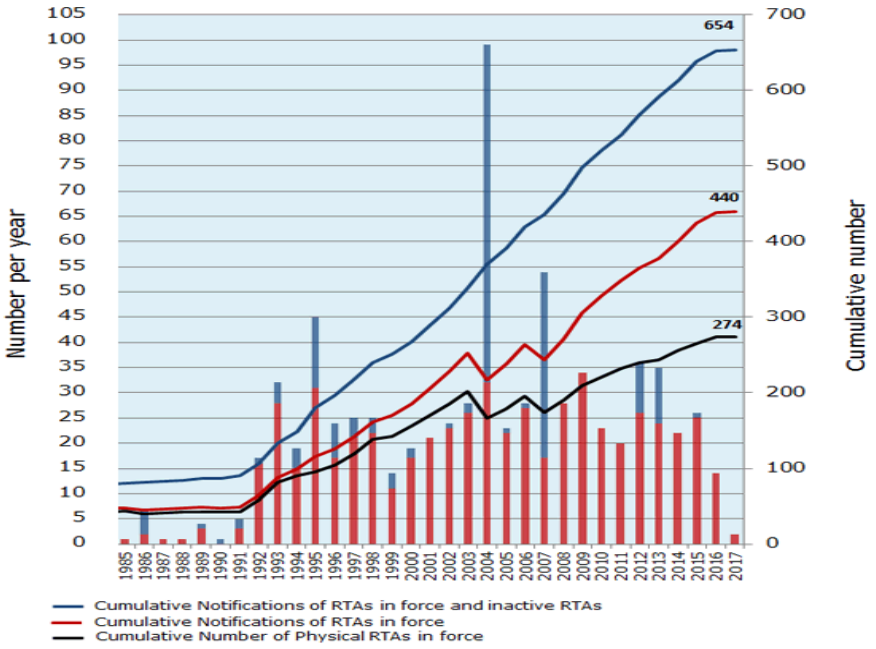
between trading partners. Despite FTAs being discriminatory by definition, since only participating countries reap the benefits, the WTO recognizes its genuine role in international trade and thus tries to monitor the process. As of December 2006, WTO-members have to notify the WTO in advance when there are plans to enter into a FTA, as well as providing data and information regarding the FTA. Using this information the WTO can assess what the impact will be on the participating countries and if it complies to the regulations (WTO, sd). When the verdict is positive, the WTO will give the green light for the ratification of the agreement.

For the trade agreements discussed above, the WTO uses the term Regional Trade Agreements (RTAs), which is a collective name for multiple types of trade agreements. The WTO uses this broad definition of trade agreements, since free trade can be realized on a variety of levels, with the free trade area being the first stage of economic integration where there effectively is free trade. Members of the free trade area agree to reduce or eliminate tariffs and other trade restrictions on goods. The second stage of integration is the customs union, where, in addition to the requirements of a free trade area, the participating countries maintain a common external tariff towards non-participating countries. If, in addition to the free trade area, not only trade barriers regarding the movement of tangible goods are eliminated, but also for other economic resources, the group of countries form a common market. In this stage of economic integration, labour, capital, goods and services are allowed to move freely amongst participating countries. The next stage is the economic union, where countries form a common market and maintain a common external tariff, which can become an economic and monetary union, with the most prominent example being the euro area, if in addition a single common currency is adopted as well as a common monetary policy. Last is the stage of complete economic integration. In this case all policies, as discussed above, are completely harmonized and the group of countries will effectively act as one. Free trade can thus be realized in multiple ways, with the intensity altering between stages of integration.

2.2.1. The pros and cons of free trade: background

The wording by the European Commission in the first paragraph of the previous section seems to support the idea that free trade is beneficial for all countries involved. Many governments seem to follow this viewpoint, which is shown by the amount of notifications for RTAs the WTO received depicted in figure 1.

Figure 1: Evolution of Trade Agreements.



Note: notifications of RTAs in force: goods, services and accession to an RTA are counted separately, for physical RTAs in force they are counted together.

Source: WTO secretariat

The figure shows the cumulative number of RTAs, represented by the coloured lines, as well as the amount of RTAs per year, which is depicted by the bar diagram. Focusing on the coloured lines, it can be inferred that starting from 1991 there has been a substantial increase in the amount of RTAs. It has thus been a trend for governments in the last few decades to enter into free trade agreements, since, although free trade has been a widely debated topic in economics, the general consensus among leading economists is that it indeed increases economic welfare, productivity and employment (IGM, 2012).

In order to see if free trade is indeed beneficial, the next section will present an overview of the benefits and costs of free trade. However, before this is done, a quick look at economic history is required. The argument for free trade starts with the pioneers in this area: Adam Smith and David Ricardo. In one of the most important works in the field of economics, "The Wealth Of Nations" in short, Smith laid the foundation for the free trade theory that is known today. In his book he designated the flaws of the mercantilist system, which centres around the idea that governments should regulate foreign trade in such a way that the balance of trade displays a positive value (Smith, 1776). He argued that an unregulated marked would be more beneficial, since this would enable countries to trade the goods they produce most cost-effectively, leading to the theory of absolute advantage. Furthermore, Smits's invisible hand theory marked a starting point for free markets, stating that unregulated markets would lead people to act in their

self-interest, which ultimately results in a greater benefit to society than in a situation of stringent regulations.

The work by Adam Smith was expanded upon by David Ricardo, who introduced the theory of comparative advantage. This theory is perceived to be the main argument for the benefits of free trade (The Economist, 1998). The comparative advantage theory introduced new insights to economic theory on international trade, since it shows that even if a country is superior in producing all products, i.e. having an absolute advantage with every product, it is still beneficial to trade due to relative differences between countries. Simply said, if the opportunity costs of producing a good is lower for country A than for country B, country A has a comparative advantage regarding the good. With the opportunity costs being the amount of other goods that need to be foregone to be able to produce the good. Due to these relative differences, countries can reallocate resources to the areas in which they are most productive, ultimately benefiting both countries. The theory shows that it is possible for every country to trade, as even the least efficient country in the world will have a comparative advantage in some area. The comparative advantage theory is an important pillar in the establishment of the free trade argument and was supported by empirical evidence at the time (Beattie, 2016).

2.2.2. The pros and cons of free trade

The improvements on Smith's work by David Ricardo showed that free trade leads to higher economic welfare due to specialization in the area in which the country has a comparative advantage. This theory serves as the basis of the argument for free trade, since it shows that generally every country is able to trade more as a result of to trade liberalization. The following arguments are all, to some extent, derived from the theory as they are mostly consequences of the increase in trade. The first of those arguments is the increase in competition and innovation. In the absence of free trade companies may have had sufficient market power that gave them the opportunity to maintain prices that were significantly higher than marginal costs. For the companies in the domestic market, the increase in competition from abroad will lead to a reduction of their market power. Furthermore, competition should incentivize the domestic companies to innovate, since the company with the highest cost advantage could capture the entire market (Amadeo, 2017). In an attempt to reduce costs due to fiercer competition, productivity will need to increase. Trefler shows that this indeed is the case, since the Canada-U.S. FTA indeed resulted in higher labour productivity in the United States (Trefler, 1993).

Trade liberalization also enables firms to benefit from economies of scale, since the potential market size for domestic exporting firms significantly increases due to the possibility to export to more foreign markets. Reducing the average costs as output rises, economies of scale are especially advantageous for industries subject to high fixed costs and will lead to lower prices for consumers. Furthermore, trade liberalization combined with economies of scale will increase the amount of product varieties (The Economist, 1998), which will increase welfare according to Krugman (paper Krugman new trade theory).

Another benefit of free trade is trade creation, resulting in an increase in consumer welfare. In the case of a reduction or elimination of barriers to trade, prices will go down. Together with the aforementioned increase in competition, prices in the domestic economy will be kept low, causing the consumer surplus to increase as well as total welfare. According to economic theory total welfare will increase, since the increase in consumer surplus will more than offset the reduction in producer surplus due to the lower price and the government loss of tax revenue. The latter is mitigated by the potential reduction in government subsidies resulting from trade liberalization.

In addition, free trade enables companies to transfer technologies and expertise to generally smaller companies. The introduction of foreign companies into domestic markets and vice versa gives local businesses access, voluntary or not, to new technologies and knowledge, which in the long run increases the efficiency of companies worldwide. This is especially beneficial for developing countries as it may exponentially increase their rate of development. Lastly, as a combination of the benefits discussed so far, free trade will increase economic growth. It is estimated that NAFTA led to a 0.5 percent/year increase in U.S. economic growth (Amadeo, 2017).

However, trade liberalization has some negative aspects as well. The first one being the amount of job losses in the liberalizing domestic country, which is the other side of the coin regarding trade creation. Competition from foreign companies leads to a fall in domestic prices, making it increasingly difficult for domestic companies to keep their businesses afloat. Due to this chain of events it may be necessary to cut down their workforce. NAFTA caused mainly manufacturing companies cut down the workforce or outsource jobs to Mexico (Amadeo, 2017). Even though the benefits of trade creation outweigh the costs, the worker layoffs may be more visible to the public eye than the increase in consumer surplus, eventually leading to discontent among the people.

Another cost of free trade is the problems it may cause in developing countries. With the judicial system in some developing countries being relatively undeveloped, the introduction of free trade could have negative consequences, such as the theft of intellectual property due to undeveloped patent laws, giving an advantage to foreign companies. Another example could be multinational companies relocating jobs to developing countries without a developed labour protection system, leading to people working in bad conditions for little money. Third, the environmental protection system could also be lacking, which causes the depletion of natural resources in developing countries. Lastly, native cultures could disappear due to the rapid development and the direct contact with the developed society. However, these negative effects can be refuted to some extent by the fact that many FTAs between developed and developing countries also include agreements on the provision of aid regarding the judicial system and labour protection systems. Besides this aid being beneficial to the developing country, developed countries gains as well as it is more profitable to trade in a stable economic environment.

2.3 Previous empirical literature and the gravity equation

Judging by the benefits and costs of free trade combined with the general consensus among leading economists and the growing number of FTAs signed by countries and areas from all over the world, it can be concluded that free trade is generally beneficial for total welfare. Empirical evidence supports the fact that increasing the amount of trade has a positive effect on welfare, as shown by multiple examples (Augier & Gasiorek, 2003; Bond, Riezman, & Syropoulos, 2004; Hertel, Hummels, Ivanic, & Keeney, 2007)

Overall it is thus beneficial for countries to liberalize trade, which can be accomplished by engaging in free trade agreements. However, the arguments discussed so far generally assume that trade between countries increases due to free trade, but does a FTA actually lead to more trade? This question has been extensively researched using different estimation techniques. The gravity equation has played a central role in examining the ex post effects of FTAs on trade flows over the past 40 years (Baier & Bergstrand, 2007). Since the gravity model has been a dominant factor in research on this subject, this section will focus on previous empirical literature based on this model. In short, the gravity model is utilized to explain variation in bilateral trade flows based on both countries' GDP, similar borders, distance between the pair and the existence of a FTA. A more profound description of the specifications of the gravity model in this research will be given in the methodology section. The first researcher who made use of the gravity model was Jan Tinbergen (Tinbergen, 1962). One of

the findings in his research was an insignificant effect of FTAs on bilateral trade. In the following years the gravity model was improved upon most notably by Linnemann, and Aitken (Linnemann, 1966; Aitken, 1973). However, these early studies were criticised for their informal theoretical foundations (Baier & Bergstrand, 2007). New economic theory on international trade developed in subsequent years by Anderson, Bergstrand and Helpman and Krugman provided theoretical justifications for the gravity model (Anderson, 1979; Helpman & Krugman, 1985; Bergstrand, 1985). An additional contribution was made by Bergstrand in 1989 by introducing the GDP per capita of both countries to correct for demand sophistication (Bergstrand, 1989), however its use in gravity models is still subject to debate.

The conclusions obtained by the use of the gravity model to assess the impact of FTAs on trade flows are mixed. Researches with the European Community (EC) as a subject by Aitken, Abrams, and Brada and Mendez found a positive and significant effect of FTAs on trade flows (Aitken, 1973; Abrams, 1980; Brada & Mendez, 1985), while Bergstrand and Frank, Stein and Wei did not find any significant effects (Bergstrand, 1985; Frankel, Stein, & Wei, 1995). Furthermore, Frankel's results in 1997 showed negative effects from EC-membership on trade flows (Frankel, 1997). Baier and Bergstrand attribute this inconsistency in the estimated to the endogeneity of the FTA dummy, which was first highlighted by Trefler (Trefler, 1993). It is likely that the mechanism in which countries enter into FTAs is endogenous, possibly due to factors unobservable to researchers (Baier & Bergstrand, 2007). Another possibility is the simultaneity bias for FTA; it could be that countries who trade more with each other are more likely to enter into a free trade agreement. The researches discussed above assume this variable to be exogenous, leading to over-or under-estimation of the effects of FTAs on trade flows explaining the inconsistent results.

In 2002, Baier and Bergstrand were the first in attempting to resolve the issue of endogeneity by using an instrumental variable estimation method (Baier & Bergstrand, 2002). The instruments used in this research were related to political factors. However, this provided the researchers with unreliable results due to the correlation with trade flows which was already established in previous empirical work. Magee expanded upon this research by using instruments related to trade characteristics of the observed countries (Magee, 2003). Again, the results were inconclusive most likely due to correlation of the instruments with trade flows. Following their previous research, Baier and Bergstrand, using an extensive dataset and multiple estimation techniques with different instruments, demonstrated that instrument

variable analyses on the average treatment effect of FTAs are unstable and provide a varying range of results (Baier & Bergstrand, 2004).

The three tudies attempting to control for the endogeneity issue discussed so far used a cross-sectional dataset, which according to another follow-up-research by Baier and Bergstrand is the reason for the unstable results (Baier & Bergstrand, 2007). In the paper they argue that one can obtain robust and reliable results when using panel data for the gravity equation. This is largely attributed to the fact that panel data allows the researcher to correct for unobserved time-invariant heterogeneity using fixed effects (Wooldridge, 2000). The time-invariant heterogeneity is, according to the authors, the source for the endogeneity of the FTA-dummy. Their results support this theory, since the coefficient of FTA in their fixed effects-regression is more than five times higher compared to their results without fixed effects. Overall, the findings imply that after ten years, the trade flows among members of a FTA are doubled. The research shows the importance of correcting for endogeneity in order to obtain reliable results. Using a similar method, Caporale et al. find a smaller, but significant effect of FTAs on trade flows between the European union and Central and Eastern European countries (Caporale, Rault, Sova, & Sova, 2009).

2.4 Potential differences in the effects for developed and developing countries

Until now research has mostly focused on ensuring the robustness of the gravity model and using these improvements for analysing trade flows among a group of countries, however it is difficult to find, if it even exists, empirical work that focuses on the differences between the effects on trade flows of a FTA for developed and developing countries. As stated in the introduction, analysing this difference could give useful insights into the mechanism of international trade for countries with a different development status, displaying the consequences of protectionist measures such as the ones imposed by Trump, or, conversely, the consequences of maintaining the trend of liberalizing trade that could be observed in figure 1. The empirical research in this paper will mainly focus on this aspect of free trade agreements.

There are various factors that may lead to a potential difference between the effects for developed or developing countries. For example, it is interesting to focus on the factors behind the effects on developing countries. One factor could be the relatively weak bargaining position the developing countries have when it comes to the negotiation of FTAs. From the creation of the General Agreement on Tariffs and Trade in 1948, which is the predecessor of the WTO, to the beginning of the new millennium, nearly 60 percent of total exports originating from

developing countries had a developed country as a destination (United Nations, 2015). Combined with the fact that the developed countries only exported around 25 percent to developing countries, it shows the relative dependency of developing countries on developed countries, especially in the second half of the 20th century. This negatively influenced the bargaining position of developing countries and subsequently their gains from liberalizing trade (Balassa, 1985). Recently, this dependency of developing on developed countries is reducing, since the share of developing country-exports to developed countries is decreasing. Furthermore, partly due to rapid industrialization in some countries, their share in world exports increases to more than 30 percent (United Nations, 2015). However, negotiating countries face the nearly impossible challenge to find an optimal solution, which often results in developed countries still drawing the longest straw (Page, 2002). This is partly shown by the recent negotiations in the Doha-round.

Another factor could be the relatively bad state of infrastructure and the level of technology in developing countries (Worldbank, 2008). This hampers these type of countries in immediately benefitting from a FTA, since it takes time to adapt to the possible higher demand or supply of products.

On the other hand, the benefits of free trade discussed in the theoretical section could have an exponential effect on growth in developing countries due to their generally lower, relative to market size, amount of trade flows relative to developed countries. The increase in the level technology and overall welfare could be vital for the development of the less developed countries.

There could also be a variety of factors at play for developed countries. The increase in market size and the already developed nature, in terms of infrastructure and technology, of the developed country and its businesses would generally lead to more trade. This could result in a more immediate benefit from signing a FTA, as the country is prepared for sudden increases in demand or supply. However, the benefit could be endangered, for example, by the relatively high union power in developed countries. The relatively well organized labour unions in developed countries can exert pressure on the government if a FTA harms their incomes, with the agricultural subsidies as a prominent example.

3. Data and methodology

3.1. Equations

The empirical analysis will be conducted using two equations that are based on the gravity equation. In the first part of the empirical analysis an analysis will be made of the global effect of free trade agreements on trade flows. In this baseline specification, no distinction will be made between developed and developing countries. For this analysis, the gravity model is based on the model first suggested by Anderson and Van Wincoop (Anderson & Van Wincoop, 2003). The baseline specification looks as follows:

$$ln\ Trade_{ijt} = \beta_0 + \beta_1\ FTA_{ijt} + \beta_2\ ln\ GDP_{it} + \beta_3\ ln\ GDP_{jt} + \beta_4\ ln\ Dist_{ij} + \beta_5\ Adj_{ij} + \beta_6\ Langt_{ij} + \alpha_{ij} + \gamma_t + \varepsilon_{ijt} \quad \textbf{(1)}$$

Here, "Trade" represent the trade flows from exporting country i to importing country j, "FTA" is the dummy for the existence of a FTA between country i and j in year t and takes the value "1" if it exist and "0" otherwise, GDP is the gross domestic product and is included for both countries for year t, "Dist" represents the distance between country i and j where the reference point is based on the population distribution, "Adj" is a dummy that takes the value "1" if country i and j are neighbouring states and "0" otherwise, "Lang" is a dummy that takes the value "1" if country i and j speak the same language and "0" otherwise. The α_{ij}, γ_t and $\varepsilon_{i,t}$ represent the bilateral country fixed effects, time fixed effects and the error term respectively. The bilateral country fixed effects account for time-invariant heterogeneity between country pairs and time fixed effects control for certain events or shocks in a particular year not captured by the regressors.

After the effect of FTAs on trade flows is established, a dissection will be made of this result by examining the effects for developed and developing countries separately, which is the main focus of this research. The Human Development Index (HDI) is the variable used to indicate the development status of the countries. The specification for this second estimation is as follows:

$$ln\ Trade_{ijt} = \beta_0 + \beta_1\ FTA_{ijt}*HDI_{it} + \beta_2\ FTA_{ijt}*HDI_{jt} + \beta_3\ FTA_{ijt} + \beta_4\ \ HDI_{it} + \beta_5\ HDI_{jt} + \beta_6\ ln\ GDP_{it} + \beta_7\ ln\ GDP_{jt} + \beta_8\ ln\ Dist_{ij} + \beta_9\ Adj_{ij} + \beta_{10}\ ln\ Langt_{ij} + \alpha_{ij} + \gamma_t + \varepsilon_{ijt} \quad \textbf{(2)}$$

The only variable added to the first model is the HDI index. This is done for both the exporting country and the importing country, by including HDI_{it} and HDI_{jt} respectively.

Subsequently, HDI is interacted with the FTA dummy, making it possible to analyse how the researched effect of FTAs differs between countries with a relatively low and countries with a relatively high level of development. The use of bilateral data makes it possible to not only dissect the effects of FTAs on trade between developing countries and developed countries, but also within the import and export sector of these two groups of countries. The interaction terms for exporting and importing countries are FTA_{ijt}*HDI_{it} and FTA_{ijt}*HDI_{jt} respectively.

3.2. Data

The data used to estimate the equations is described in this section. Most of the data used in this research is obtained from the French institute CEPII. The database contains most important variables that are central in estimating the gravity equation and is an extension of the dataset made by Head, Mayer and Ries (Head, Mayer, & Ries, 2010). Variables included in the dataset are, amongst others, distance between the countries, common languages, GDP and the existence of a FTA, where FTA includes free trade agreements from all stages of economic integration. For the bilateral trade flows another database on the CEPII website needed to be utilized. Since the resulting merged dataset was extensive, some modification was needed in order to obtain a dataset that was suitable for this research, including the creation of dummy variables, removing zero values and eliminating superfluous countries. Different sources were consulted for data on the development status. For the Human Development Index, which is an development index based on life expectancy indicators, educational attainment indicators and gross national income (GNI) per capita, data is retrieved from the website of the United Nations Development Programme (UNDP, 2017). Data on life expectancy and the internet users as a percentage of total population were found on the World Bank database. The end result is a panel dataset spanning from 1995 to 2014 and contains variables on 62 countries (country list in the appendix) equally divided between developed and developing countries and not tied to a specific geographic area.

Table 1 includes the descriptive statistics of the most important variables used in this research. It can be seen that the values of trade, GDP and internet users are widely spread, which is expected due to the large dataset of many different types of countries used for this research. Another thing to note is the reduction in observations for some variables, but overall still an extensive dataset remains.

All variables expressing monetary values are denoted in U.S. dollars, with GDP not being inflated in accordance to trade flows. Distance is measured in kilometres and is measured

by the distance between reference points based on the population distribution. The HDI is defined as a value between 0 and 1, but is modified by multiplying it by 100 for interpretation purposes. Internet users is expressed as a percentage of total population and life expectancy is expressed in years.

Table 1 – Descriptive statistics.

Variable	Mean	Std. Dev.	Maximum	Minimum	Observations
Trade (million $)	1389	7103	280,400	0.61 (in 1$)	66539
FTA (dummy)	0.26	0.437	1	0	70800
GDP (billion $)	740	1875	17400	3.12	70682
Distance	7494	4840	19648	160.9	70800
Adjacent (dummy)	0.103	0.304	1	0	70800
Language (dummy)	0.039	0.194	1	0	70800
HDI	76.155	13.129	94.8	37.2	66139
Life expectancy	73.606	7.462	83.980	46.608	70799
Internet Users	0.344	29.521	0.963	0	66965

Dataset covers the 1995-2014 period for 62 countries.

3.3. Methodology

As stated before, to identify how free trade agreements affect trade flows, equations 1 and 2 are based on the gravity equation. The first section of the empirical analysis concerns the global effect of free trade agreements on trade flows and is estimated using equation 1. The gravity model used in this research accounts for the important contributions made to the model by various authors, especially concerning the issue of endogeneity of FTA, which was explained in section 2.3. In short, Baier and Bergstrand showed that time-invariant heterogeneity is the source for the endogeneity of the FTA variable (Baier & Bergstrand, 2007). The use of bilateral country fixed effects in panel data resolves this issue, since this controls for this type of heterogeneity, giving more robust and reliable results. The Hausman test also rejects the null hypothesis, confirming that the fixed effects estimation is correct. Furthermore, in an earlier paper they argue that, despite previous attempts by various researchers, an instrumental variable estimation is not reliable, since it is nearly impossible to find instruments that are not correlated with trade flows (Baier & Bergstrand, 2004). Thus, based on the two papers by Baier and Bergstrand, the fixed effects estimation will be conducted in this research using time and bilateral country fixed effects.

After the effect of FTAs on trade flows is established, a dissection will be made of this result by examining the effects for developed and developing countries separately, which is the main focus of this research. To estimate this, equation 2 is used, where HDI is added as the indicator for development status. The HDI index is used since it is a rather complete measure of the level of development of a country. The HDI variable is interacted with the FTA dummy,

as the interaction shows how the effect of FTAs differs between developed and developing countries. Since the dataset consists of bilateral trade data, in addition to estimating the difference between developed and developing countries, both the effects for the exporting sector and the importing sector of a country can be estimated, deepening the analysis.

To check for the robustness of the results, other measures representing a country's development status are used to see if the results are relatively similar. These alternative measure replace the HDI variable in equation 2. First, life expectancy is used, which is a measure frequently used in empirical analyses as a development indicator (WHO, 2014). As a second alternative measure, internet users as a percentage of total population is used, which is an interesting proxy since it includes several key factors that need to be accounted for in order to become an internet user. One could think of the general wealth of a population, the quality of infrastructure in that specific country, the degree of technological advancement in a country, which are all higher the more developed a country is.

Both equations will be estimated using the OLS-estimation technique, which will be divided into four stages; the first stage estimates the model without fixed effects, the second stage includes only time fixed effects, the third stage includes only bilateral country fixed effects and the last stage includes both time and bilateral country fixed effects. This way it is possible to distinguish the different effects on the results due to the inclusion of a certain type of fixed effect. For the robustness checks only the model without fixed effects and the model including both fixed effects will be presented, since this provides all useful information.

4. Empirical analysis

This section presents the results of the several regression analyses that have been performed on the basis of the aforementioned data and methodology. In the first part the baseline model (equation 1) will be analysed, which is the effect of FTAs on trade flows. Thereafter, in the second part, an analysis of the results obtained from equation 2 will follow, which concerns the different effects of FTAs on trade for developed and developing countries. The third part of the results checks the robustness of the results obtained from estimating equation 2 by using different proxies for development status.

4.1 The effects of FTAs on trade flows

The empirical results obtained from estimating equation 1 are depicted in table 2. Each column represents an alternative specification of the model regarding the inclusion of fixed effects, with the most reliable results depicted in column 4 where time and bilateral fixed effects are added.

Table 2: Results of estimation of equation 1.

Variables	No fixed effects (1)	Time fixed effects (2)	Bilateral fixed effects (3)	Time and bilateral fixed effects (4)
FTA	0.188 (0.017)***	0.381 (0.017)***	0.049 (0.018)***	0.059 (0.018)***
lnGDP_x	1.060 (0.004)***	1.112 (0.004)***	0.498 (0.012)***	0.632 (0.017)***
lnGDP_i	0.970 (0.004)***	1.022 (0.004)***	0.801 (0.012)***	0.935 (0.017)***
lnDistance	-0.992 (0.009)***	-0.930 (0.009)***		
Adjacency	0.683 (0.028)***	0.650 (0.027)***		
Language	0.868 (0.019)***	0.871 (0.019)***		
Adj. R^2	0.752	0.767		
Within R^2			0.327	0.335
Observations	66,428	66,428	66,428	66,428

Significant at * = 10%, ** = 5%, * = 1%. Robust standard errors in parentheses. Dataset covers the 1995-2014 period for 62 countries.**

The results in column 1 are obtained by estimating the baseline gravity equation without fixed effects. The coefficients for exporter and importer GDP are close to unity, adjacency and common language shows coefficients of 0.68 and 0.87 respectively and the coefficient for distance takes on the traditional gravity equation value of -1. All variables are statistically significant at the one percent level, with coefficients that are relatively typical for gravity equation estimations with similar variables (Chaney, 2011). The main variable, the dummy for FTA, has a significant coefficient of 0.187, which is consistent with cross-sectional findings of previous empirical literature on this subject (Baier & Bergstrand, 2007).

The first step in increasing the robustness of the results is to include year fixed effects, for which the results are displayed in column 2. It can be seen that the coefficients and significance of the controls variables are relatively similar. The important result here is the increase of the FTA coefficient to 0.38, showing that in the model without time fixed effects the estimates are biased downwards due to time-specific events or shocks, e.g. wars or recessions, in the 1995-2014 period that are not captured in the controls. The time fixed effects account for these shocks, however, as argued before, excluding bilateral fixed effects from the

estimation gives rise to endogeneity problems of FTAs, so no definitive conclusions can be drawn from these estimates.

To resolve the issue of endogeneity, bilateral country fixed effects are introduced in the model displayed in column 3. With this specification accounting for time-invariant heterogeneity, the distance variable and the dummies for common language and adjacency drop out, since these controls do not vary over time. The remaining variables are still significant at the one percent level. The major thing to note here is the quite substantial decrease of the FTA coefficient to 0.049, which is the result of accounting for the endogeneity of FTAs. The fact that the FTA coefficient decreases implies that, on average, the unobserved time-invariant heterogeneity in the determinants of bilateral trade result in an upward bias in a model without bilateral fixed effects. An explanation for the upward bias could be the reverse causality between trade flows and FTAs; the more two countries trade with each other, the more likely it becomes that the countries will establish a FTA. The positive reverse causality will result in an upward bias for the effect of FTAs on trade flows. In addition, there could be time-invariant unobservable policy-related factors that limit the amount of trade between two countries, which are also negatively correlated with the decision to sign a FTA. One could think of a long lasting dispute between two countries. This factor has a negative impact on trade between the countries and has a negative impact on the creation of a FTA as well. This will also result in an upward bias.

Column 4 provides the results of the most complete model, which includes year and bilateral country fixed effects. Again, all variables are statistically significant at the one percent level. The coefficient of FTA has increased due to the inclusion of the time fixed effects relative to the results of column 3. The coefficient is 0.059, which translates into a 6 percent ($e^{0.059}$) increase in trade due to the presence of a FTA between countries.

4.2 The effects of FTAs on trade for developed and developing countries

The results for the effects of FTAs on bilateral trade obtained in the previous section will now be dissected by examining the effects for developed and developing countries separately. Table 3 reports the results obtained from estimating equation 2 with, as in the case of equation 1, each column containing none, a different type, or both fixed effects. The model specification of the last column, which includes time and bilateral country fixed effects, is the most reliable of all. The variable FTA*HDI_(x/i) represents the interaction term between the

FTA dummy and HDI that captures the different effects of the imposition of a FTA for both the export (x) and import sector (i) of developed and developing countries.

Table 3: Results of estimation of equation 2.

Variables	No fixed effects (1)	Time fixed effects (2)	Bilateral fixed effects (3)	Time and bilateral fixed effects (4)
FTA	4.142 (0.151)***	4.070 (0.150)***	0.518 (0.162)***	-0.0767 (0.163)
FTA*HDI_x	-0.017 (0.001)***	-0.015 (0.001)***	0.003 (0.001)**	0.007 (0.001)***
FTA*HDI_i	-0.033 (0.001)***	-0.032 (0.001)***	-0.009 (0.001)***	-0.005 (0.001)***
HDI_x	0.013 (0.001)***	0.015 (0.001)***	0.067 (0.003)***	0.088 (0.003)***
HDI_i	0.004 (0.001)***	0.006 (0.001)***	-0.003 (0.003)	0.018 (0.003)***
lnGDP_x	1.026 (0.004)***	1.069 (0.004)***	0.190 (0.017)***	0.330 (0.020)***
lnGDP_i	0.979 (0.004)***	1.024 (0.004)***	0.738 (0.017)***	0.877 (0.020)***
lnDistance	-1.030 (0.009)***	-0.962 (0.009)***		
Adjacency	0.639 (0.026)***	0.624 (0.027)***		
Language	0.839 (0.019)***	0.851 (0.019)***		
Adj. R^2	0.756	0.771		
Within R^2			0.331	0.341
Observations	63,162	63,162	63,162	63,162

Significant at * = 10%, ** = 5%, * = 1%. Robust standard errors in parentheses. Dataset covers the 1995-2014 period for 62 countries.**

Column 1 depicts the results of estimating equation 2 without any fixed effects. Similar to the result of equation 1 and previous cross-sectional empirical literature, exporter and importer GDP are close to unity, distance is equal to -1 and the coefficients of common language and adjacency are relatively typical, showing that the interaction terms fit well into the model. Furthermore, it can be seen that all coefficients are significant at the one percent level. The coefficients of the main variables of interest, the interaction terms, are negative for both the export sector and the import sector of a country. From this it can be derived that, since an increase in HDI means an increase in the level of development of a country, the effect of FTAs on trade flows decrease in the level of development for both the import and the export sector. One thing to note is that the negative sign of the interaction term for the importing country is larger, implying that a higher development status has a relatively larger effect on the importing country.

In order to increase the robustness of the OLS regression, time fixed effects are introduced into the model, which is displayed in column 2. The coefficients of the variables do not change much relative to the model without time fixed effects, again showing negative signs for both interaction terms and high statistical significance.

However, the two results of equation 2 discussed so far still include the endogeneity of FTA. As with equation 1, this is solved by including bilateral country fixed effects for which the results are reported in column 3. Taking out the unobserved time-invariant heterogeneity has a large impact on the results, with, most notably, the sign of FTA*HDI_x changing sign. This implies that the endogeneity of FTA has a downward bias on the interaction term between FTA and the exporting country's development status. The importer HDI variable is insignificant, which means that when the FTA dummy is equal to zero, the importer HDI does not have a significant effect on bilateral trade. However, time fixed effects is excluded from this model, thus this may negatively affect the reliability of this result.

In order to draw definitive conclusions from the results, column 4 needs to be consulted, where time fixed effects are added to the model of column 3 to obtain the most complete model. The first thing to note is that all variables are highly significant, most notably the interaction terms, except the FTA dummy. This can be explained by the fact that, due to the inclusion of the interaction term, the interpretation of the FTA dummy changes. With an interaction term, the interpretation of the FTA dummy is the effect of FTAs on trade flows if both exporter and importer HDI are equal to zero, which is impossible, thus explaining the statistical insignificance. The reason the FTA dummy did not show the insignificance in previous estimations of equation 2 might be due to the inclusion of both time and bilateral fixed effects in this model.

Overall, the main finding from the results is that the effect of FTAs on trade flows becomes larger, the higher the development status of the exporting country, while it becomes lower, the higher the development status of the importing country. This could be explained by the fact the developed countries have better infrastructure and a higher level of technology in order to immediately benefit from the FTA, thus exporting more, while on the other hand, due to the better living standards, developed countries already have access to a large variety of products, thus decreasing the need to import. For developing countries the opposite is true; due to relatively bad infrastructure and low levels of technology, they are not able to immediately benefit from the FTA, while the need to import products is high, since the variety of products on offer is generally lower than for developed countries. Another contributing factor to this

explanation could be the bargaining position of developed countries. This could give them leverage in the negotiations, resulting in favourable export conditions for developed countries, making developing countries more dependent on imports.

Following this explanation, when the exporting country's HDI increases by 1 this would increase exports, while if the importing country's HDI increases by 1 this would decrease exports. This is consistent with the obtained results. It can be seen that if the HDI of both countries increase with 1, the positive effect dominates since 0.006948 is larger than 0.005297, implying that trade increases the more developed both trading partners become. Furthermore, if the exporting country has a higher development status than the importing country, trade will increase. On the other hand if the exporting country has a lower development status relative to the importing country, this may negatively affect trade if this difference is sufficiently large, while it could be positive when this difference is relatively small. These conclusions can also be explained by the reasoning put forward in the last paragraph.

In the case of trade between two "average" countries, the outcome is almost similar to the result of section 5.1. This can be seen by inserting the average HDI from the summary statistics into the total effect of FTA. This effect, assuming FTA = 1, is as follows: -0.0766*FTA + 0.006948*76.155 - 0.005297*76.155. This gives 0.049, which differs only 0.01 from the coefficient for FTA in section 5.1.

4.3. Robustness checks

In this section alternative measures of the development status, life expectancy and internet users as a percentage of total population, are used to establish the robustness of the FTAresults of equation 2 by examining if the alternative measures would yield similar results. The alternative measures replace the Human Development Index in equation 2. The results for the estimations using both alternative measures, denoted by "alternative", are reported in table 4.

Table 4: Results of estimation of robustness checks.

Variables	Life expectancy No fixed effects (1)	Life expectancy Both fixed effect (2)	Internet users No fixed effects (3)	Internet users Both fixed effects (4)
FTA	7.063 (0.243)***	0.280 (0.233)	0.556 (0.024)***	-0.032 (0.024)
FTA*alternative_x	-0.039 (0.002)***	0.006 (0.002)***	-0.001 (.0005)*	0.003 (.0004)***
FTA*alternative_i	-0.053 (0.002)***	-0.001 (0.002)	-0.006 (0.001)***	-0.000008 (.0004)
Alternative_x	0.016 (0.001)***	0.075 (0.004)***	-0.002 (.0003)***	-0.002 (.0004)***
Alternative_i	0.011 (0.001)***	-0.030 (0.004)***	-0.006 (.0003)***	-0.006 (.0004)***
lnGDP_x	1.046 (0.004)***	0.595 (0.017)***	1.085 (0.004)***	0.603 (0.017)***
lnGDP_i	0.970 (0.004)***	0.953 (0.017)***	1.022 (0.004)***	0.927 (0.017)***
lnDistance	-1.038 (0.009)***		-0.991 (0.009)***	
Adjacency	0.609 (0.026)***		0.596 (0.027)***	
Language	0.859 (0.019)***		0.838 (0.019)***	
Adj. R^2	0.756		0.758	
Within R^2		0.340		0.338
Observations	66,426	66,426	66,426	66,426

Significant at * = 10%, ** = 5%, * = 1%. Robust standard errors in parentheses. Dataset covers the 1995-2014 period for 62 countries.**

Table 4 shows the results of the simple OLS regression and the fixed effects regression, where the latter includes both time and bilateral country fixed effects to correct for the heterogeneity of FTA. The fixed effects specification is the most complete, however the simple OLS estimation is included in the table as this gives an overview of the changes caused by including fixed effects. Columns 1 and 2 contain life expectancy as the alternative measure, while columns 3 and 4 report the results of the estimation using internet users.

As in the previous sections, the simple regressions of columns 1 and 3 show coefficients for GDP, distance, adjacency and common language that are relatively typical for cross-sectional estimations of the gravity equation. However, in order to check the robustness of the results, the fixed effects estimation needs to be consulted. From these results, reported in column 2 and 4, it can be concluded that the results are relatively similar to the results obtained by estimation equation 2 with HDI as the measure for development status. The signs of both interaction terms are similar across all 3 estimations, with the dummy for FTA being insignificant due to the inclusion of the interaction term as explained in the previous section.

The robustness checks both differ in one aspect from the estimation of equation 2, which is the insignificance of the interaction term of FTA with the importer's value for internet

users/life expectancy. A possible explanation for this result could be the fact that HDI is a complete measure that incorporates various factors in constructing it's index, while the percentage of internet users and lifetime expectancy, which are both interesting proxies for development status, do not capture the full extent of the impact of the importer's development status on the effect of FTAs on trade.

The results of estimating equation 2 combined with the relatively similar results of the robustness checks indicate that the effect of FTAs on trade flows is larger the more developed the two countries become. This generally means that a FTA results in more bilateral trade between two similar developed countries relative to two similar developing countries. Furthermore, if the exporting country's development status is higher than that of the importing country, trade will increase. On the other hand if the exporting country has a lower development status relative to the importing country, trade will either increase or decrease dependent of the relative difference of the development status between the two countries.

5. Conclusions, limitations and recommendations

5.1. Conclusions

This paper examined the impact of FTAs on bilateral trade flows and how this effect differs for developed and developing countries. The analysis was executed using bilateral data in a panel dataset of 31 developed and 31 developing countries over the 1995-2014 period. The analysis is based on the gravity equation, which is a widely used model in the field of international economics concerning bilateral trade flows.

The theoretical section gives an overview of the important concepts used in this paper, mainly focusing on the concept of free trade. Judging by the benefits and costs of free trade combined with the general consensus among leading economists and the growing number of FTAs signed by countries and areas from all over the world, it can be concluded that free trade is generally beneficial for total welfare due to the increase in trade. However, it is generally assumed that a FTA increases trade, but this may not necessarily be true. The assumption has been researched by many economists, mostly using the gravity equation. Results in the late 1900s were mixed, but as the estimation of the gravity equation became more robust due to refinements of the model, the estimates indeed showed a positive effect of FTAs on trade flows. However, not much research has been done on the difference of this effect between developed and developing countries, which could give useful insights into the mechanism of the effects of FTAs.

As a starting point for the analysis no distinction was made between developed and developing countries to give the overall effect of FTAs on trade flows. This was examined using the gravity equation with time and bilateral country fixed effects, with the latter addressing the endogeneity of the FTA variable, which has been a large issue concerning previous cross-sectional empirical estimates using the gravity equation. The results show a 6 percent increase in trade due to the presence of a FTA between countries.

Next, the result was dissected into the separate effects for developed and developing countries. The HDI index was used as a proxy for development status. The use of bilateral data made it possible to not only look at differences between developed and developing countries, but also within the import and export sector of these two groups of countries. Similar to the previous regression, fixed effects were used to account for the heterogeneity. The results shows that the effect of FTAs on trade flows increase, the more developed the two countries involved become. Generally, similar developed countries thus trade more with each other relative to similar developing countries as a result of a FTA. Furthermore, trade will increase if the exporting country's development status is higher than that of the importing country. On the other hand, trade will either increase or decrease if the exporting country has a lower development status relative to the importing country, which depends on the relative difference of the development status between the two countries.

To check for the robustness of the latter results, alternative measures for the development status were used, internet users as a percentage of total population and life expectancy. These estimations gave relatively similar results, increasing the robustness of the conclusions given in the last paragraph.

5.2. Limitations and recommendations

Some caveats to this research are in order. The first one is the fact that every FTA is different. The content of a FTA can theoretically range from an agreement on one single industry to an agreement including nearly every industry. This can have a large impact on the extent to which such an agreement affects trade flows. Second, the HDI index is a complete measure of the development status of a country, making it difficult to proxy HDI for the robustness checks. The proxies used in this research as alternative measures do exhibit the same pattern, but due to the completeness of the HDI variable there are still some areas that the proxies do not capture.

For further research it would be interesting to incorporate the different ranges of the FTAs content into the equation. This would give more robust results, since there may be a lot of variation due to various factors, such as the relative bargaining position, that influence the amount to which both countries gain from the agreement. Furthermore, in this paper, possible theoretical explanations are given for the differences of the effect of FTAs on trade between developed and developing countries. For further research it may give useful insights to empirically analyse these theoretical explanations to see whether they are true, or whether other factors play a role. These results could subsequently be used to construct strong policy recommendations for governments signing FTAs.

Data appendix

Provided below is a list of the countries used in the empirical analysis. Development status is based on the IMF World Economic Outlook Report 2016.

Developed countries	Developing countries
Australia	Argentina
Austria	Brazil
Belgium	Bulgaria
Canada	Cambodia
Czech Republic	Cameroon
Denmark	Chile
Estonia	China
Finland	Colombia
France	Croatia
Germany	Ecuador
Hong Kong	Egypt
Hungary	Honduras
Ireland	India
Israel	Indonesia
Italy	Iran
Japan	Ivory Coast
Latvia	Kazakhstan
Luxembourg	Malaysia
Netherlands	Mexico
New Zealand	Peru
Norway	Paraguay
Poland	Romania
Portugal	Russia
Puerto Rico	Senegal
Slovakia	Serbia
Slovenia	South Africa
Spain	Tunisia
Sweden	Turkey
Switzerland	Uruguay
United Kingdom	Venezuela
United States	Vietnam

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