MASTER THESIS

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„The role of free trade agreements and agricultural share of GDP in external agricultural trade of the EU "

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English Abstract

This thesis deals with the question which role free trade agreements (FTAs) and agricultural share of GDP (VAagri) play in determining EU external agricultural trade. A gravity model of trade is estimated using the OLS technique and the software R. For this, a dataset had to be constructed based on the International Trade and Production Database (ITPD-E), which includes bilateral trade flows of 26 agricultural sectors, VAagri of the importer and exporter and an FTA dummy for 243 countries from 2000 to 2016. The estimation shows that more of the EU's external trade in grains and fruits is with exporting countries which have a higher VAagri and that it is not significantly larger for most agricultural sectors if there exists an FTA between the trading partners. Possible explanations for these findings are discussed and range from colonial history, climatic conditions, differences in standards to specific elements of EU trade policy.

German Abstract

Diese Masterarbeit beschäftigt sich mit der Frage, welche Rolle Freihandelsabkommen (FTAs) und der Anteil der Landwirtschaft am BIP (VAagri) bei der Bestimmung des EU-Außenhandels mit Agrarprodukten haben. Ein Gravity-Handelsmodell wird mit Hilfe der OLS-Technik und der Software R geschätzt. Dazu musste ein Datensatz auf Basis der International Trade and Production Database (ITPD-E) erstellt werden, der die bilateralen Handelsströme von 26 Agrarsektoren, den VAagri des Importeurs und Exporteurs sowie einen FTA-Dummy für 243 Länder von 2000 bis 2016 enthält. Die Schätzung zeigt, dass ein größerer Teil des EU-Außenhandels mit Getreide und Obst mit Exportländern abgewickelt wird, die einen höheren VAagri haben, und dass dieser Handel für die meisten landwirtschaftlichen Sektoren nicht signifikant größer ist, wenn es ein Freihandelsabkommen zwischen den Handelspartnern gibt. Mögliche Erklärungen für diese Ergebnisse werden erörtert und reichen von der Kolonialgeschichte über klimatische Bedingungen und unterschiedliche Standards bis hin zu spezifischen Elementen der EU-Handelspolitik.

Pledge of Honesty

"On my honour as a student of the Diplomatic Academy of Vienna, I submit this work in good faith and pledge that I have neither given nor received unauthorized assistance on it."

Lydia Maria Lienhart

Contents

List of Abbreviations

CCP Common Commercial Policy

CES Constant Elasticity of Substitution

CETA Comprehensive Economic and Trade Agreement of the European Union with Canada

CGE Computable General Equilibrium Model

DGD Dynamic Gravity Dataset

e.g. exempli gratia (Latin) – for example

EUJEPA EU and Japan's Economic Partnership Agreement

EUMAA EU-Mercosur Association Agreement

EUVFTA EU-Vietnam Free Trade Agreement

FAOSTAT Food and Agriculture Organization Statistics Division

FTA Free Trade Agreement

GSP Generalized Scheme of Preferences

i.e. id est (Latin) – that is

ITPD – E International Trade and Production Database for Estimation

LDCs Least Developed Countries

Mercosur Southern Common Market (Mercado Común del Sur)

MFN Most Favoured Nation Tariffs

MRTs Multilateral Resistance Terms

MS Member State of the European Union

NAFTA North American Free Trade Agreement

OLS Ordinary Least Squared

pp Percentage Point

TFEU Treaty on the Functioning of the European Union

VAagri Value added of the agricultural sector as percentage of a country's GDP

WTO World Trade Organization

1 Introduction

Today, fact-based trade policy analysis is more necessary than ever. Trade openings have become increasingly contentious, because the concerns of policy makers and civil society have become more complex: As opposed to the second half of the 20th century, where welfare creation was the main goal of liberalizing trade, today issues like climate change, social rights, sustainability, equality and rule of law are considered as at least as important. The literature provides abundant evidence that there exists a positive causation of income and GDP growth through trade[1]. Nonetheless, in the European Union (EU), each potential new free trade agreement (FTA) causes grave concern of stakeholders and the general public, the focus frequently being on the agricultural sector.

This thesis will investigate the role FTAs play in the EU's external agricultural trade in particular for various reasons: On the one hand, agriculture is and has historically always been the most protected sector worldwide. Up until today, WTO law provides only for agri-food products a range of protectionist measures exempted from its general rulebook. This is not without reason: This sector is one of the most vulnerable to international competition, as its structure is subject to regional climatic and social conditions. Yet, secure food supply is the most basic condition for countries' prosperity. This is why specialization in competitive products and importing those products which a country cannot produce cheaply is not an option. This would make a country's bare survival subject to the functioning of global supply chains. Regional agricultural production is also inextricably linked to the state of the environment and ultimately, people's wellbeing. Agricultural trade does not account for a large share in the EU's total external trade (8.1% in 2021, Eurostat (2022a)). However, the role this sector plays in EU policy making, surpasses this number, as public attention regarding new trade agreements is frequently focused on this sector. This might be because every single person is consuming food and whishes for affordable, yet healthy and sustainable products. While a deterioration in standards could affect any sector, its effects are never so immediate, clear and easy-to-understand as in the food producing sector. Therefore, people simply worry about the effects of free trade on agriculture more than on other sectors. Lastly, many authors have found that agriculture is much more affected by FTAs than manufaturing or services, see for instance Borchert et al. (2020a) or Grant and Lambert (2008).

This thesis will use a gravity model of trade. The model will have as a dependent variable the bilateral trade flows of agricultural products. The existence of an FTA between two countries will be included as one explanatory variable. Another interesting explanatory variable is the agricultural share of GDP of countries. Being a key indicator in development economics, it can provide insights into the nature of the trade relationship and the structure of the agricultural sectors of the trading partners. Furthermore, the interaction between these two variables will be investigated, as they might be mutually reinforcing. All throughout the thesis, the focus will be on the EU's external agricultural trade. However, the estimation will be performed for global agricultural trade in order to be able to compare and contrast the results of both sample

[1] See, for instance, Wacziarg and Welch (2008) or Bernhofen and Brown (2005) for more general evidence, and Costinot and Dave Donaldson (2016) for evidence in US agriculture.

sets. No gravity analysis of the EU's external agricultural trade on the sectoral level has been performed so far. This is why this thesis aims at closing this research gap and answering the question which role free trade agreements and agricultural share of GDP play in determining EU external agricultural trade flows. A secondary goal of this thesis is constructing a dataset which includes recent data on all the necessary variables, as such a dataset does not exist so far.

The more quantitative part of the thesis is complemented by a chapter on the economic and political context of the estimation results, which will also provide a more interdisciplinary assessment of the research question and highlight issues which need further research.

This thesis prospectus is structured as follows: Following this introduction, the second section will provide an extensive literature review. In the third section, the theoretical framework shall be explained. In the section on the empirical application, the data used, the estimation method and the results obtained will be presented. Lastly, these will be put into their economic and political context in section 5. The final section will conclude.

2 Literature review

The literature on the effects of trade policy on countries' economies is vast. For recent examples using the gravity framework, see for instance Head and Mayer (2021) and Oberhofer and Pfaffermayr (2021), who estimated the effect of European integration and the potential effects of Brexit, respectively; or Caliendo and Parro (2014), whose gravity-compatible model inquired into the welfare effects of NAFTA; or Heid et al. (2021), who analyzed the impact of non-discriminatory trade policies such as Most Favoured Nation (MFN) tariffs.

Yet, there is much fewer literature which focuses on the effects of trade liberalization on the agricultural sector. Such analyses on the sectoral level either demand sectoral data, which is not as easily available as aggregate data. Alternatively, aggregate data may be used and inferences for the farming sector drawn through the use of sector-specific trade and consumption elasticities. This constraint was accepted by the authors of the literature which will be reviewed in the following. They can be grouped by their methodology used: In the past two decades, Computable General Equilibrium (CGE) models dominated, while gravity models have only recently gained popularity in the field of agricultural economics. Arita et al. (2017) are an example of the former, inquiring into the role of non-tariff measures (NTM) on transatlantic agricultural trade. And Aichele et al. (2014) or Costinot and Dave Donaldson (2016) use the latter for analyses focused on the United States. Martin (2018) clearly advocates for the gravity approach, arguing that the impact of FTAs on the sector is a yet poorly understood area in the field of agricultural economics.

When it comes to the specific question of how the European agricultural sector is affected by free trade agreements with third countries, the literature is scarce. No gravity model analyses of the agricultural sector are available for CETA[2], the EU and Japan's Economic Partnership Agreement (EUJEPA), the EU-Singapore Free Trade Agreement (EUSFTA) or the EU-Vietnam Free Trade Agreement (EUVFTA). While University of Manchester (2009) or Burrell et al. (2011) provide extensive assessments of what today is the EU-Mercosur Association Agreement (EUMAA) using the CGE model, they did so based on the status quo of the negotiations at that point in time. Since the negotiations of FTAs can take decades, such research can quickly become outdated as the treaty test might be altered substantially over the years. This was the case for the EUMAA, leading to the fact that there are so far only a handful of published papers which analyse the potential effects of the text agreed upon in 2019. These more recent studies can again be split into those focusing on the effects of EUMAA on agriculture in Mercosur-countries on the one hand (see, for instance, Cabrera et al. (2021)) and in EU member countries on the other hand. London School of Economics Consulting (2020), Breuss (2020), Carrico et al. (2020) and Ngavozafy et al. (2021)[3] all apply a CGE model for estimating potential effects of the EUMAA on the EU or its MS. While not each of them specifically focuses on farming, they all provide some estimations on how certain agricultural sectors would be affected by liberalizing trade between the EU and Mercosur. To date, only three studies have applied the gravity framework in this context, two out of which are published papers (Sinabell et al. (2020) and

[2]the EU-Canada Comprehensive Economics and Trade Agreement

[3]Ngavozafy et al. (2021) is an unpublished conference paper.

Timini and Viani (2020)) and one is a conference paper (Calil and Ribera, 2020). Out of these papers, only Calil and Ribera (2020) report results on the sectoral level and disaggregated for EU MS. Yet, they did not use sectoral data but rather aggregated data from which they infered results for the agricultural sector. Furthermore, being a conference paper, many estimation details and results are not published yet, and only a few country- and sector results were picked to be presented. Ngavozafy et al. (2021) aim to fill this gap, but have similarly not published any results yet. This thesis aims to fill this gap in the literature on the effect of the EU's FTAs with third countries on agricultural trade by doing a sectoral gravity estimation, the theoretical foundations of which will be explained in the next section.

While there is some literature on the role of the agriculture share of GDP of countries and their economic development (see Bein and Ciftcioglu (2017) or Olowu et al. (2019)), at the time of writing there were no publications on the relation between this indicator and international trade.

3 Theoretical framework

3.1 The gravity model: Introduction

The gravity model is widely used and was established as an analogy to Newton's Law of Universal Gravitation: "[...] the gravity model of trade predicts that international trade (gravitational force) between two countries (objects) is directly proportional to the product of their sizes (masses) and inversely proportional to the trade frictions (the square of distance) between them." This quote is from Yotov et al. (2016, 5), the point of departure for most modern-day gravity trade policy analysis.

Out of a host of potential theoretical frameworks for this thesis, the gravity model has proven to be the most suited one. This is because it is intuitive, has a sound theoretical footing, uses a realistic general equilibrium market view and has a flexible structure. Moreover, it takes into account the market-clearing conditions for goods and services (Yotov et al., 2016, 69). This means it can be complemented by other general equilibrium models, for instance dealing with the labor market or the environment (Yotov et al., 2016, 5). This last feature would allow for analyzing the effects of an FTA on indicators like GDP, employment rate or trade balances. Yet, doing so would go beyond the scope of this thesis, despite the fact that this would proof an insightful addition.

The gravity model's first applications in economics date back to Ravenstein (1885) analysing migration and Tinbergen (1963) applying it to trade. A milestone in improving its theoretical foundations was adding multilateral resistance terms (MRTs) to the equation in order to account for the structural characteristics of countries (Anderson and Van Wincoop, 2003). Today, the model is the workhorse of many quantitative analyses on international trade. This popularity has to do with its compatibility with different microeconomic trade theories: Anderson and Van Wincoop (2003) and Calil and Ribera (2020) use monopolistic competition models, while Caliendo and Parro (2014) apply it to a sectorial Ricardian model, and Feenstra et al. (2001) elaborated on a host of further possible applications. Many theoretical contributions helped increase it's versatility. A detailed analysis of the history and development of the gravity framework as well as of the arguments for its empirical validity can be found in Head and Mayer (2014). They offer evidence that is has a model fit of 60% to 90% for when aggregate or sectoral data is used.

Coming to its specification, I will follow Yotov et al. (2016) in using the following equation as a point of departure:

$$X_{ij} = T_{ij} \frac{Y_i E_j}{\prod_i \Psi_j} \tag{1}$$

X_{ij} stands for the bilateral trade flow of country i to country j. T_{ij} are the trade frictions between country i and country j, stemming from a variety of factors such as geographical distance or whether these countries share a trade agreement, language or cultural ties. Y_i is the total production of country i, while E_j is the expenditure of country j. $\prod_i$ and Ψ_j denote the outward and inward multilateral resistance terms (MRT), capturing trade-relevant structural characteristics of a country. In the estimation, they are represented by the so-called importer- and exporter-time fixed effects. This means that a matrix of variables built of combinations of years and country names will be added as explanatory variables. Including these does not only account for the structural characteristics of countries but also addresses endogeneity issues: For instance, when inquiring into the relation between FTAs and trade, potential reverse causality or omitted variable bias can lead to biased estimates. Luckstead (2021, 2) elaborates how importer- and exporter-time fixed effects constitute a remedy for this problem.

3.2 The gravity model: Assumptions

Each specific application of the gravity framework for trade policy analysis will use its own set of assumptions. Those commonly used and also applied in this thesis will be explained in the following.

For the underlying aggregate demand and supply functions, Constant Elasticity of Substitution (CES) is assumed. This has mathematical reasons and implies that the ratio between shifts in relative prices and relative quantities is constant for the production and utility functions. Furthermore, "iceberg"-type bilateral trade frictions are assumed. This means that a larger quantity of goods is sent from one country than is being received in the other countries, and the differences are the costs for trading. One can compare this with an iceberg floating from one country to the other and melting a little en route. This also implies that the larger the distance between two trading partners, the larger the trade costs will be. Therefore, assuming these types of trade frictions ensures consistency with the gravity framework (see, for instance, (Yotov et al., 2016, 14) or Calil and Ribera (2020, 8)). Another assumption is the market clearing condition, which is used in any general equilibrium framework. It implies that factory-gate prices in a specific country will change when a change in global trade costs ocurrs (Yotov et al., 2016, 69, 83). As was first proposed by Anderson (1979) and as is practiced in most gravity modelling, I assume product differentiation by place of origin, meaning that otherwise similar products of different origins will both be on the market. This can be considered a realistic assumption rooted in consumers' preference for diversity.

These assumptions are needed in order to be able to model trade policy. Their transparent communication is of utmost importance for the interpretation and real-life applicability of the research findings, which does not only hold for gravity models, but for scientific research generally.

3.3 Including structural characteristics of countries

Generally, as described above, structural characteristics of countries enter the equation indirectly through MRTs. Yet, including a specific structural characteristic as an explanatory variable can be especially insightful in analysing how trade relates to them. For instance Heid et al. (2021, 376) include MFN tariffs and export subsidies, and Beverelli et al. (2018) inquire into the relation between institutional quality and trade.

Structural characteristics of countries may be a host of indicators, ranging from GDP to average working age and investment structures. In the agricultural sector this can be the share of agriculture of the overall GDP of a country, the average farm size, average employees per farm, input factor relations (e.g. capital per worker), the trade openness and many further indicators. For the empirical application, the agricultural share of GDP was chosen to be used for two reasons: First, the data for this measure is easily obtained and, compared to other measures, available for all the countries and years included in the model. So while other measures would certainly also prove insightful to include as an explanatory variable, the data availability for some countries for some time periods poses a significant challenge. Second, out of all potential measures to be used which fulfilled the data-requirements, agricultural share of GDP provided to most significant results in the estimation.

3.4 Sector-level analysis

Public scrutiny of trade agreements frequently concerns specific sectors, most notably in agriculture. Therefore, research which disaggregates effects on the sectoral level is especially important. As mentioned in the literature review, sector-level analysis of trade policy can either be performed using a gravity model or a more general CGE-framework. In practice, one can either use data on the sector level as input data, or use aggregate data and in a later stage infer repercussions for specific sectors from the aggregate results. Moreover it is possible to do quantitative estimations on the aggregate level and then discuss the effects on the sector level using a qualitative analysis, like London School of Economics Consulting (2020). In the past, most gravity models used aggregate data, as sector- or even product-level data was not easily available (Yotov et al., 2016, 32). However, the availability of sector-level data has risen in the past decade. Therefore it was possible for sector-level data to be used in the gravity estimation of this thesis, which will be elaborated in detail in the following section.

4 Empirical application

4.1 Data

In order to perform a theoretically consistent and economentrically sound estimation which is also feasible with the computing power available within the software R, the data used has to fulfill a number of criteria: First of all, a panel data set is needed which reports yearly values for all bilateral trade flows in agricultural sectors, the standard gravity variables distance and GDP, a dummy variable for the existence of an FTA between bilateral trading partners, as well as the GDP share of agriculture for all the countries globally. While a higher data frequency (for instance quarterly or monthly) would yield a higher sample size and thus better asymptotic qualities, it would render the data too challenging to process within the software. Using 3-year or 4-year intervals would reduce computational time and is suggested by Mauricio Vargas (2021) and practiced by many authors (see for instance Sun and Reed (2010) or Luckstead (2021)). Yet, it has been found to potentially produce biased estimates (Egger et al., 2022). Therefore, it was decided to use yearly values in this dataset. Now coming to the measurement of the trade flows, one could use data denoted in trade volume or data denoted in current US dollars. The latter is easier to obtain and easier to interpret, and is therefore used for this estimation. One of the accomplishments of this thesis constitutes the construction of a dataset which includes all the above-mentioned data and fulfills the requirements. This construction will be elaborated in the following.

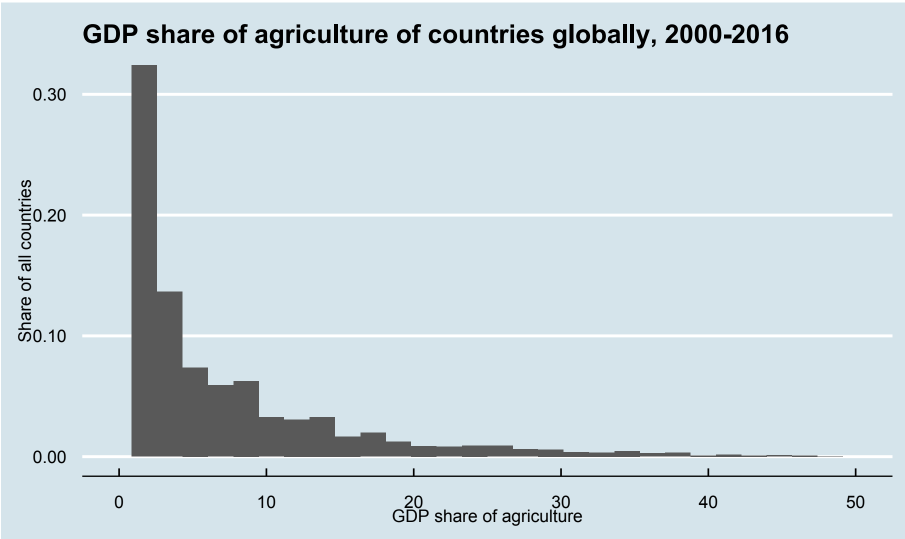
Bilateral trade flows can be obtained from various sources, and many authors have found the CEPII Gravity data base[4] to be the best suited. Yet, only one database reports global bilateral trading data for agricultural sectors: The International Trade and Production Database for Estimation (ITPD-E) of Borchert et al. (2020b), which is at the same time the first comprehensive sector-level gravity database (Borchert et al., 2020a, 7). This dataset reports trade for 26 agricultural sectors for 243 countries over the span of 16 years (2000-2016). This data is based on the reported import flows obtained from the Food and Agriculture Organization Statistics Division (FAOSTAT). Using reported import flows as opposed to reported export flows is considered as more reliable (Sinabell et al., 2020, 20). Missing values have been imputed using mirror export flows of the respective trading partner (Borchert et al., 2020a, 6). As Borchert et al. (2020b, 22ff) argue, the ITPD-E is suited to be applied in a sectoral gravity estimation for a variety of reasons. One of them is that it is based solely on reported administrative data, as opposed to other datasets, which often also include calculated data. This means that the ITPD-E is apt for statistical inference. A downside of the ITPD-E is that its sectoral coverage is far from perfect. For instance, trade in milk and milk products (which is a key export sector for many EU countries) is not captured within the section "Agricultural Commodities" but rather in the processed food industry. And while the "Other meats, livestock products, and live animals" category includes exotic elements such as rodents or coarse goat hair, it misses beef and pork. Furthermore, some of the categories are highly aggregated, while some categories include a single product, such as the "Wheat" category. The sectors and their included product groups

[4] http://www.cepii.fr

can be found in the appendix.

Departing from the ITPD-E, the gravity variables had to be added. As the Dynamic Gravity Dataset (DGD) matches the IDPD-E (US COMTRADE, 2022), and has some advantages over the CEPII (Tamara Gurevich and Peter Herman, 2018, 4), it proved to be the best choice for this step. Lastly, the GDP share of countries' agricultural sector was added to the first two datasets by using data from The World Bank (2022). While the World Bank also offers further indicators of the role of countries' agricultural sectors, such as the share of total land that is used for agriculture, the GDP share of agriculture turned out to yield the most significant estimation results. The GDP share of agriculture in the sample ranges from 0.03% (Singapore in 2018) to 79.04% (Liberia in 2002). Figure 1 shows the distribution of countries by this measure, which corresponds to the ISIC[5] divisions 1-3. This means it includes "forestry, hunting, and fishing, as well as cultivation of crops and livestock production"(The World Bank, 2022)[6].

Figure 1: GDP share of agriculture 2000-2016



Own graph. Data from The World Bank (2022)

The World Bank data also covers the years 2000-2016, just as the ITPD-E, and therefore matches seamlessly. Another advantage of using this span of years is that for EU countries, all trade values are already reported in euro. The second and the third datasets were joined with the ITPD-E in a way to match the bilateral trading pairs. This means that for each trade flow in the ITPD-E, the other variables had to be added twice: Once for the importing country, once for the exporting country. All datasets were merged via their ISO 3-letter country code. Some adjustments had to be made for Romania, as the historically-accurate code for this country for 2000-2001 (ROM) is used by the DGD, while the ITPD-E uses ROU.

The constructed dataset was subsequently extended by adding importer-time and exporter-time fixed effects. These were computed following Mauricio Vargas (2021).

[5]International Standard Industrial Classification

[6]"Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources."(The World Bank, 2022)

Despite the best efforts, there are several limitations to the final dataset constructed by the author: First of all, as with any quantitative analysis of agricultural indicators, the large share of the unreported and informal economy as compared to other sectors poses problems. Especially (but not exclusively) in developing countries much of the production of the farming sector is directly consumed, exchanged for other goods, or exchanged on informal markets. Therefore, agricultural production often has to be estimated via other indicators, such as inputs, or area under cultivation. Yet, even the best estimations cannot always take into account climatic realities or farming practices. Another limitation is that while the DGD dataset offers a large variety of different types of trade agreements (e.g.: partial scope agreements, economic integration agreements, preferential trade agreements), for simplicity reasons, only free trade agreements (FTAs) were included in the analysis. Ideally, one would use separate variables for all types of trade agreements. Yet, this would have come at the cost of the estimation and interpretation being much more complex. Furthermore, the final dataset does not include intra-national trade flows. The ITPD-E is the first dataset to report them on the sectoral level. But including them would have posed collinearity problems with the other explanatory variables that proved too time-intensive to overcome. This does not lower the quality of the estimation significantly, as Borchert et al. (2020a, 3) prove: They estimated two gravity models with the ITPD-E, one including and one excluding domestic trade, finding that the estimates were nearly identical.

4.2 Estimation method

The above-described data was used to estimate a gravity model using the statistical software R[7]. Wölwer et al. (2018) provide an R package for estimating gravity models using cross-sectional data. They explain advantages and disadvantages of different estimation methods, and add that "As Head and Mayer (2014) or Martinez-Zarzoso (2013) point out there is no best estimation method for gravity models." (Wölwer et al., 2018, 35) The Ordinary Least Squared (OLS) estimation proved most suitable for this dataset. It is least demanding on the gravity data due to its simplicity but still has sound econometric footing. For the estimation the following gravity specification was used:

$$\begin{aligned} X_{ijt} = \beta_0 + \beta_1 lnDIS_{ij} + \beta_2 lnGDP_{it} + \beta_3 lnGDP_{jt} + \beta_3 VAagri_{it} + \beta_4 VAagri_{jt} \\ + \beta_5 FTA_{ijt} + \beta_6 (VAagri_{it} \cdot FTA_{ijt}) + \beta_7 (VAagri_{jt} \cdot FTA_{ijt}) + \beta_8 \prod_{it} + \beta_9 P_{jt} \end{aligned} \tag{2}$$

where X_{ij} stands for the agricultural exports of country i to country j at time t. DIS_{ij} is the distance between the trading partners. GDP_{it} and GDP_{jt} represent the Gross Domestic Product at time t of the exporter and importer, respectively. $VAagri_{it}$ and $VAagri_{jt}$ express the agricultural share of GDP of countries i and j. FTA_{ij} is a dummy variable which takes the value 1 if the trading partners share an FTA and 0 otherwise. $VAagri_i \cdot FTA_{ij}$ and $VAagri_j \cdot FTA_{ij}$ are the two interaction terms between country i's and country j's VAagri and the FTA dummy. $\prod_i$ and P_j are the Outward Multilateral Resistance of the exporter and the Inward

[7] https://www.r-project.org

Table 1: Independent variables used in the estimation

Independent Variable	Description	Expected Sign
DIS_{ij}	Distance between country i and j (weighted by population and location of large cities)	-
GDP_i	Gross Domestic Product of exporter i (today-dollar value from Penn World Tables)	+
GDP_j	Gross Domestic Product of importer j (today-dollar value from Penn World Tables)	+
$VAagri_i$	Agriculture, forestry, and fishing, value added of exporter (% of GDP)	+
$VAagri_j$	Agriculture, forestry, and fishing, value added of importer (% of GDP)	-
FTA_{ij}	Dummy variable for existance of FTA	+
$VAagri_i \cdot FTA_{ij}$	Interaction term	+
$VAagri_j \cdot FTA_{ij}$	Interaction term	+
$\prod_i$	Outward Multilateral Resistance of exporter	-
P_j	Inward Multilateral Resistance of importer	-

Multilateral Resistance of the importer, respectively. An overview of the independent variables, their descriptions, measurements and expected signs is given in Table 1.

All instances where trade, distance, GDP or VAagri displayed NA or zero values where removed from the dataset before the estimation. This was in order to make an OLS estimation possible (Wölwer et al., 2018, 20). This left a dataset with 898.839 observations. Bilateral trade flows, distance and importer and exporter GDP are specified in logarithmic transformation. Including an interaction term between the value added of the agricultural sector and the FTA-dummy as an explanatory variable does not only allow for capturing their joint effect, but also increased the significance of other variables in most of the sectors. Yet, including it means that the FTA dummy cannot be interpreted on its own without the assumption that VAagri of the importer and exporter is 0%. As this would be unpractical, it was decided to use two different estimation specifications in this thesis. Specification A which includes the interaction term and Specification B which does not. Specification A will be used to interpret the effect of VAagri on trade, as including the interaction term leads to higher significance of VAagri. It is furthermore easily interpreted in conjunction with the interaction term: If there is no FTA in place between two trading partners, the interaction term is 0. If there is one, then the value of the interaction term is added to the value of the VAagri variable and consequently interpreted. Specification B will be used to interpret the effect of FTAs on agricultural trade. This is because excluding the interaction term allows the interpretation of the FTA dummy directly.

Additional explanatory variables were importer-time and exporter-time fixed effects, following the recommendations elaborated in Anderson and Van Wincoop (2003). The population of the exporter or importer was not significant for most of the sectors when included as an explanatory variable, which is why it was left out for all of the sectors in order to have consistent estimations and interpretations as well as a model which is as complex as it needs to be but as simple as possible.

Two different sets of estimations were compared: In the first one, all countries of the dataset were included. In the second one, only bilateral trade flows between countries where one partner was an EU member and the other was not were used[8]. This means that the second set includes all EU external trade, with EU MS either as exporters or importers, but does not include neither EU internal trade nor trade between non-EU countries. This is to compare the insights for EU external trade with general world trade. For both sets of estimations, out of the 26 agricultural sectors included in the ITPD-E dataset, 20 were included in the analysis. The sector of "Other agricultural products, nec" was left out, as the included products were too diverse to be interpreted, as well as five sectors which had less than 11,000 observations in the global set and less than 4,000 in the EU external trade set. The the number of observed trade flows per sector in the world trade set ranges from 74,358 trade flows ("Fresh Fruit") to 1,968 ("Raw and refined sugar and sugar crops"). The number of observed trade flows in the EU external trade set ranges from 28,771 trade flows ("Fresh Fruit") to 436 ("Raw and refined sugar and sugar crops)". The five sectors left out because they had too few observations were "Live Cattle", "Live Swine", "Cereal products", "Prepared vegetables" and "Raw and refined sugar and sugar crops".

So overall, the empirical part of this thesis has a 2 by 2 architecture: Two different specifications (A and B) are estimated on two different datasets (EU external trade and global trade). With this setup, the estimation was performed for each sector separately, the results of which are discussed in the next chapter.

4.3 Results and analysis

This chapter first briefly analyses the results of the main gravity variables and then discusses the ones of the VAagri variable and the FTA dummy in detail. For the analysis of all variables apart from the FTA dummy, the focus will mainly be on the model Specification A, as it has a larger number of significant variables. The results of Specification A for the global trade estimation and the EU external trade estimation can be found in Table 2 and Table 3, respectively. The coefficient for DIS_{ij} is highly significant for all sectors on the 0.1% level in the world trade set. The same can be observed in the EU external trade set, with the exception of "Rice(raw)", this coefficient is significant on the 1% level. In the literature, a gravity model estimation and the corresponding data set are often justified by highly significant coefficients for distance and GDP, as these are the main gravity variables. However, exporter and importer GDP is not significant for most of the sectoral observations in both estimation sets. This might be due to the fact that while the gravity equation always holds for aggregated trade flows, this does not have to be the case for every single disaggregated trade flow. Especially when it comes to agricultural goods, there are a host of reasons why the importer's or exporter's GDP as a measure of size might not be significant in the estimation. Cultural reasons or dietary preferences are such examples, as they greatly affect the range and value of the imported products. For instance, the dataset

[8]For the whole analysis, 28 EU countries where used, i.e., including the United Kingdom. This is because the time period covers the years 2000-2016 during which it had been still a EU MS. While it would be historically more accurate to change the definition of EU countries from year to year to account for the enlargements which took place during this time period, this was not feasible for the estimation.

shows that countries with a population which is mostly Muslim or Jewish import less "Live Swine" than secular or Christian-majority countries. Or countries with a high GDP per capita import more animal feed ingredients than countries with a lower GDP per capita - and GDP per capita is not always correlated with the overall size of the economy. Moreover, some imported goods (e.g. tobacco) might be related to social norms and legal restrictions of the countries. These are just a few possible explanations why the trade flows of specific agricultural sectors might not always be related to a country's total GDP. Interestingly, distance remains highly significant regardless.

Before turning to a separate analysis of the VAagri variable and the FTA dummy, their joint effect which was captured via the interaction term in Specification A is to be mentioned. While it was significant for a majority of the sectors in the dataset, it was always very close to zero. Therefore, its relevance for policy making can be questioned. Yet, as mentioned in section 4, including it lead to higher significance of other variables in Specification A compared to Specification B. When analysing the effect of VAagri in the following, the few instances where the existence of an FTA had a slight effect will be mentioned.

As can be observed in Table 2 and Table 3, the role of agricultural share of GDP (VAagri) for trade is very different from sector to sector. Both tables show significant results for some sectors, yet not for all.

The most significant role of VAagri in EU external trade can be found for trade in grains and fruits: The largest effect is to be observed in fresh fruit trade, which is 63.07%[9] higher if the exporter has a one percentage point (pp) higher VAagri. For soybean-trade, one can see that one more pp VAagri of the exporter is associated with an increase in traded soybeans of 9.28%. This effect is not larger or smaller if an FTA exists between the trading partners. For wheat, +1pp of VAagri of the exporter is associated with an increase in wheat trade of 4.98%. This effect is slightly smaller (+4.87%) if there is an FTA in place between the trading countries. Also for oilseeds, a 1 pp increase in the VAagri of the exporter is associated with a 5.93% higher EU external trade. This effect is slightly stronger if there is an FTA (6.05%). For trade in other cereals, a one more pp higher VAagri of the exporter leads to 2.24% more trade (2.38% if there is an FTA). Therefore, one can say that more of the EU's external trade in grains and fruits is with exporting countries which have a higher VAagri. So overall, in 5 sectors there is a large, significant and positive correlation between exporter VAagri and trade. Further three sectors (beverages, meats, tobacco) show a significant positive correlation which is very small (+ 0.92%, +0.43% and + 0.68%, respectively). And only one sector shows a significant negative correlation, which is close to zero ("Other sweeteners": -0.41%). The remaining 11 sectors show no significant estimate for the VAagri of the exporter.

[9] This semi-elasiticity and the following semi-elasticities are calculated in order to be able to interpret the coefficients. As the VAagri variable enters the estimation in a log-level model, the coefficient needs to be transformed in the following way: $\%\Delta y = 100 * (e^{\beta 1} - 1)$.

Table 2: Results for the OLS estimation with interaction term for the EU external trade set (Specification A)

	Wheat		Fresh vegetables		Other cereals		Soybeans		Fresh fruit		Animal feed ingredients		Other oilseeds	
Intercept	213.40	.	98.76		5.00		-99.16		-148.30		-35.13		-85.76	
Distance (log)	-1.61	***	-1.97	***	-1.85	***	-2.04	***	-2.50	***	-2.07	***	-1.56	***
Importer GDP (log)	-18.66	.	-7.24		-1.24		6.47		7.46		2.74		4.10	
Exporter GDP (log)	2.03	*	0.16		1.33	*	2.19	***	5.28	***	1.18	.	3.01	***
Importer VAagri	2.21		0.08		2.16		0.63		-1.10		-0.74		-0.63	
Exporter VAagri	1.79	*	0.26		1.17	.	2.33	***	4.16	***	1.11		1.94	*
FTA dummy	-0.63		0.50	*	-0.05		-0.55		0.39	.	-2.53	***	-1.18	***
FTA dummy x Importer VAagri	0.13	*	0.05	*	-0.09		0.25	*	-0.02		0.21	***	0.07	**
FTA dummy x Exporter Vaagri	-0.12	*	-0.03		0.13	***	-0.07		-0.02		0.08	.	0.11	***
Num. obs.	7,223		24,805		9,106		4,372		28,771		9,274		20,895	

	Meat		Prepared fruits & fruit juices		Corn		Nuts		Cocoa and cocoa products		Eggs		Tobacco	
Intercept	70.91		-3.87		3588.00		843.69		-10.18		-635.10		23.36	
Distance (log)	-2.44	***	-1.42	***	-1.41	***	-1.49	***	-0.81	*	-1.67	***	-0.61	***
Importer GDP (log)	-2.90		-3.93		-300.40		12.19		0.76		51.20		1.09	
Exporter GDP (log)	-2.43		3.64		1.86	.	-67.81		0.00		2.34	*	-2.68	**
Importer VAagri	0.65		0.39		69.21		-5.85		0.12		-12.01		0.06	
Exporter VAagri	0.36	.	-0.07		0.88		-62.42		0.34		1.33		0.52	***
FTA dummy	-0.12		-0.18		0.45		0.52	.	-5.71	.	-2.28	*	-0.05	
FTA dummy x Importer VAagri	-0.01		-0.08		-0.11	**	-0.05	.	0.59	**	0.02		0.12	**
FTA dummy x Exporter Vaagri	0.06	**	0.02		0.02		-0.04		-0.12		0.32	***	-0.11	***
Num. obs.	26,254		13,635		8,263		16,268		5,007		5,687		13,939	

	Spices		Other sweeteners		Beverages		Cotton		Rice		Pulses and legumes	
Intercept	54.06		-9.58		102.20		-22.89		-153.20		-44.05	
Distance (log)	-1.37	***	-1.21	***	-2.22	***	-1.61	***	-0.75	**	-1.31	***
Importer GDP (log)	-9.13		4.92		-7.45		-3.44		21.95		10.78	
Exporter GDP (log)	2.01		-2.23	*	-2.27	.	4.29		-1.85		-3.16	
Importer VAagri	2.18		-1.31		1.57		0.96		-5.43		-2.54	
Exporter VAagri	0.12		-0.53	.	0.65	***	3.86		-1.65		0.38	
FTA dummy	-0.10		0.58	*	-0.65	***	-0.70	***	-1.20	.	-0.35	**
FTA dummy x Importer VAagri	0.12	***	-0.18	***	-0.08	**	0.12		0.18		0.17	***
FTA dummy x Exporter Vaagri	-0.02		-0.05		0.11	***	-0.21	**	-0.05		-0.07	
Num. obs.	26,097		9,847		27,584		11,051		4,187		16,651	

Note: Importer- and exporter-time fixed effects were estimated as well (as elaborated in the chapter on the estimation), but this table depicts the focal variables only. The "Meat" category also includes livestock products & live animals. Significance is depicted using stars an dots: . means p <0.1, * means p <0.05, ** means p <0.01, *** means p <0.001.

Table 3: Results for the OLS estimation with interaction term for the global trade set (Specification A)

	Wheat	Fresh vegetables	Other cereals	Soybeans	Fresh fruit	Animal feed ingredients	Other oilseeds
Intercept	74.73	-37.60	-165.60	217.20	-20.85	-489.50	132.10
Distance (log)	-1.60 ***	-1.64 ***	-1.57 ***	-1.32 ***	-1.50 ***	-1.48 ***	-1.29 ***
Importer GDP (log)	-1.95	4.83	22.02	-26.92	3.68	66.02	-17.59
Exporter GDP (log)	-6.03 *	0.42	-0.62	1.26	-1.07	-3.59	1.41
Importer VAagri	1.62	-1.51	-5.20	7.24	-0.54	-17.00	4.91
Exporter VAagri	0.57	0.27 *	-0.29	-0.37	0.56 **	-0.60	0.02
FTA dummy	0.44 ***	0.89 ***	0.21 ***	-0.39 ***	0.74 ***	-0.02	0.22 ***
FTA dummy x Importer VAagri	-0.03 *	-0.05 ***	0.04 ***	-0.00	0.03 ***	-0.02 .	-0.03 ***
FTA dummy x Exporter Vaagri	-0.02 .	0.03 ***	-0.04 ***	-0.02 .	-0.02 ***	-0.04 ***	0.02 ***
Num. obs.	22393.00	60142.00	25775.00	15387.00	74358.00	23436.00	55592.00

	Meat	Prepared fruits & fruit juices	Corn	Nuts	Cocoa and cocoa products	Eggs	Tobacco
Intercept	116.60	646.20 **	89.11	108.50	25.44	-97.14	79.71
Distance (log)	-1.38 ***	-1.10 ***	-1.52 ***	-1.31 ***	-0.59 ***	-1.59 ***	-0.43 ***
Importer GDP (log)	-14.16	-84.73 **	-1.52	-0.06	-5.67 .	12.64	-8.73
Exporter GDP (log)	0.29	7.24	-0.70	-8.09 *	1.47 .	0.18	-1.12 *
Importer VAagri	3.91	18.48 **	0.38	-1.06	0.72	-3.10	2.65
Exporter VAagri	0.17	-1.57 *	-2.18 .	-1.28 ***	1.73	-0.06	0.44 ***
FTA dummy	0.21 ***	0.31 ***	0.19 ***	0.20 ***	0.51 ***	0.22 **	0.01
FTA dummy x Importer VAagri	0.01	0.01	0.00	0.00	0.09 ***	0.02 ***	0.02 **
FTA dummy x Exporter Vaagri	-0.03 ***	0.00	0.03 ***	-0.01	-0.03 .	0.02	0.01
Num. obs.	57478.00	35618.00	26690.00	43092.00	11644.00	17671.00	34665.00

	Spices	Other sweeteners	Beverages	Cotton	Rice	Pulses and legumes
Intercept	34.29	3.29	6.40	113.60	-174.50	35.37
Distance (log)	-1.01 ***	-0.79 ***	-1.01 ***	-0.74 ***	-1.37 ***	-1.14 ***
Importer GDP (log)	-4.04	-8.97	1.51	-13.24	22.06	-5.97
Exporter GDP (log)	-0.57	7.05	-2.12 *	0.04	-1.58	1.78
Importer VAagri	1.36	1.32	-0.17	3.14	-4.70	1.68
Exporter VAagri	0.48 *	0.36	0.48 **	0.05	0.62	-0.19
FTA dummy	0.23 ***	0.24 ***	0.02	0.22 ***	0.31 **	0.16 ***
FTA dummy x Importer VAagri	0.03 ***	-0.03 ***	0.03 ***	-0.00	0.02	-0.04 ***
FTA dummy x Exporter Vaagri	-0.02 ***	0.01	-0.02 ***	-0.00	0.00	0.05 ***
Num. obs.	67797.00	24978.00	68340.00	29275.00	14208.00	45837.00

Note: Importer- and exporter-time fixed effects were estimated as well (as elaborated in the chapter on the estimation), but this table depicts the focal variables only. The "Meat" category also includes livestock products & live animals. Significance is depicted using stars an dots: . means p <0.1, * means p <0.05, ** means p <0.01, *** means p <0.001.

Overall, the effect of VAagri of both importer and exporter is by far less pronounced for global trade than for EU external trade. This might be due to a variety of factors, one of them could be that since global trade includes the whole range of importers and exporters in terms of their agricultural value added in percent of GDP (from 0.03% of GDP (Singapore in 2018) to 79.04% of GDP (Liberia in 2002)), the diversity of trade flows and the aggregation evens out the role of this variable. Still, some slight trends can be observed: Globally, the trade in fresh fruit is 0.75% higher if the exporter has a 1pp higher VAagri, so +7.76% if the exporter has a 10pp higher VAagri. For fresh vegetables, a 1pp increase in VAagri is associated with 0.31% more trade, so +3.14% for a 10pp increase. The corn and nuts sectors are the only sectors in the sample with a significant negative effect of VAagri of the exporter in the global trade set: A 1pp increase in VAagri of the exporter leads to -0.89% for corn and -0.72% for nuts. This means, that for these sectors, the common insight that there are more agricultural trade flows if the exporter has a higher VAagri does not apply.[10]

To summarize, the results of the role of the GDP share of agriculture of countries show that for some sectors, and much more pronounced for EU external trade, a higher VAagri is associated with more trade. This means that in said sectors, the EU imports more from countries, where agriculture plays a larger role in the economy[11]. Which interesting economic and political insights this yields will be elaborated in section 5.

Next is an analysis of the second interesting explanatory variable of the gravity equation: The FTA dummy. For this, Specification B of the estimation was used as elaborated in section 4, the results of which can be found in Table 4 and Table 5 for the EU external trade data set and the global data set, respectively.

When looking at the estimation results for EU external trade, displayed in Table 4, one can see that out of the 20 analysed sectors, 9 show a positive relation between the existence of a free trade agreement and bilateral trade flows, 3 of them are significant at the 10% level: Sweeteners excluding sugar (+57.76%), fresh vegetables (+32.63%) and oilseeds excluding peanuts (+24.64%) [12]. On the other hand, 11 sectors show a negative relation with 4 being significant at the 10% level: Cotton (-50.78%), beverages, including coffee and tea (-40.67%), pulses and legumes (-23.93%) and prepared fruits and fruit juices (- 20.76%). For the other sectors not mentioned explicitly, the effect of the FTA is not significant. This means overall, out of 20 analysed sectors, only 3 show a positive, significant correlation between the existence of an FTA and trade flows, while 17 were either insignificant or showed a negative correlation.

[10]The coefficient for the VAagri of the importer in the sector "Prepared fruits and fruit juices" could not be interpreted, as it produced an impossibly high value. The reason for this could not be determined, but is most probably related to some influential outliers.

[11]It also means that more of the EU's agricultural exports come from MS with a higher VAagri. Yet, the variation among EU countries' VAagri is insignificantly small compared to the global variation.

[12]While cocoa- and cocoa-products also had a positive and significant coefficient, it was impossibly high (+ 1308.34%), which implies estimation issues with this sector. It was therefore decided not to include it in the interpretation.

Table 4: OLS estimation results for the EU external trade set (Specification B)

	Wheat		Fresh vegetables		Other cereals		Soybeans		Fresh fruit		Animal feed ingredients		Other oilseeds	
Intercept	298.40	.	-39.88		3.03		18.37		-41.82		-107.20		79.35	
Distance (log)	-1.71	***	-1.95	***	-1.80	***	-1.97	***	-2.34	***	-2.03	***	-1.63	***
Importer GDP (log)	35.97	.	5.31		-1.01		-2.69	.	17.92		11.19		-16.63	
Exporter GDP (log)	1.03		0.53		1.09		1.22	***	-7.05	.	2.08		4.52	
Importer VAagri	-8.81	.	-1.89		0.53		1.06		-4.76		-2.40		4.09	
Exporter VAagri	0.06		0.33		0.78		-0.23		-0.19		-0.53	*	0.05	
FTA dummy	0.06		0.28	*	0.03		0.82		0.12		-0.22		-0.22	.
Num. obs.	7,223		24,805		9,106		4,372		28,771		9,274		20,895	

	Meat		Prepared fruits & fruit juices		Corn		Nuts		Cocoa and cocoa products		Eggs		Tobacco	
Intercept	72.39		-3.07		196.60		117.80		-26.39	**	41.47		26.51	
Distance (log)	-2.44	***	-1.43	***	-1.31	***	-1.47	***	0.09		-1.44	***	-0.63	***
Importer GDP (log)	-2.87		-3.92		3.27		-10.27		0.98	*	-5.11		0.92	
Exporter GDP (log)	-2.58	.	3.58		-16.47		-2.21	*	0.55		0.57		-2.88	**
Importer VAagri	0.64		0.39		0.14		2.90		0.19		1.99		0.11	
Exporter VAagri	0.40	.	-0.07		-6.32		-0.82	***	0.37		0.17		0.53	***
FTA dummy	0.14		-0.23	.	-0.36	.	-0.19		2.65	***	-0.18		-0.16	
Num. obs.	26,254		13,635		8,263		16,268		5,007		5,687		13,939	

	Spices		Other sweeteners		Beverages		Cotton		Rice		Pulses and legumes	
Intercept	53.30		-10.38		99.29		-23.50		-154.40		-44.33	
Distance (log)	-1.36	***	-1.21	***	-2.22	***	-1.60	***	-0.76	**	-1.3	***
Importer GDP (log)	-9.11		4.99		-7.36		-3.38		22.03		10.74	
Exporter GDP (log)	2.05		-2.19	*	-2.11	.	4.30		-1.80		-3.13	
Importer VAagri	2.17		-1.33		1.54		0.94		-5.45		-2.53	
Exporter VAagri	0.11		-0.53	.	0.64	***	3.86		-1.62		0.38	
FTA dummy	-0.05		0.46	.	-0.52	***	-0.71	***	-1.12		-0.27	*
Num. obs.	26,097		9,847		27,584		11,051		4,187		16,651	

Note: Importer- and exporter-time fixed effects were estimated as well (as elaborated in the chapter on the estimation), but this table depicts the focal variables only. The "Meat" category also includes livestock products & live animals. Significance is depicted using stars an dots: . means $p < 0.1$, * means $p < 0.05$, ** means $p < 0.01$, *** means $p < 0.001$.

FTAs generally provide an incentive for countries to increase trade. However, the trade flows the EU has with its external trading partners in the agricultural sector show that there are more sectors with higher trade volumes with countries where there is no FTA. So trade is not significantly larger in most agricultural sectors if there is an FTA, with the exception being the 3 above-mentioned positively correlated sectors. This puts the role of FTAs in EU external trade into perspective. Looking at the results, one could also summarize: If EU producers and consumers need and want to import a certain products, they will do so, regardless of whether the selling country is tied to the Union by an FTA or not. The political and economic repercussions of this insight will be discussed in section 5.

Coming to global trade in agricultural goods, one can see that out of the 20 analysed sectors, 18 show a positive relation between the existence of a free trade agreement and bilateral trade flows, 17 of them are significant at the 10% level: Fresh vegetables (+131.94%), fresh fruit (+116.12%), cocoa and cocoa-products (+79.50%), wheat (+43.65%), rice (+41.65%), prepared fruits and fruit juices (+39.72%), corn (+32.46%), spices (+29.97%), cotton (+23.70%), other cereals (+23.61%), other oilseeds (+22.27%), pulses and legumes (+22.23%) other sweeteners (+20.12%), nuts (+19.33%), other meats and livestock products (+18.55%), eggs (+13.75%) and tobacco (+7.94%) . Only the soy bean trade has a negative correlation with FTAs which is significant at the 0.1% level: There is -37.10% less trade globally between countries which have no agreement.

These results reflect general trade theory and confirm the aggregate long-term trade-creating effect of free trade agreements. In the same line, the authors of the ITPD-E dataset have found that, across the 170 industries of their dataset, all but 7 sectors highlight the positive relation between FTAs and trade[13].

[13] Unfortunately, these 7 sectors are not explicitly mentioned.

Table 5: OLS estimation results for the global trade set (Specification B)

	Wheat	Fresh vegetables	Other cereals	Soybeans	Fresh fruit	Animal feed ingredients	Other oilseeds
Intercept	74.29	-36.46	-167.90	216.50	-21.11	-496.71	133.20
Distance (log)	-1.57 ***	-1.63 ***	-1.57 ***	-1.31 ***	-1.51 ***	-1.46 ***	-1.29 ***
Importer GDP (log)	-1.92	4.71	22.30	-26.87	3.74	66.45	-17.75
Exporter GDP (log)	-6.01 *	0.39	-0.61	1.31	-1.09	-3.27	1.42
Importer VAagri	1.62	-1.47	-5.28	7.20	-0.56	-17.11	4.96
Exporter VAagri	0.57	0.27 *	-0.29	-0.37	0.56 **	-0.57	0.02
FTA dummy	0.36 ***	0.84 ***	0.21 ***	-0.46 ***	0.77 ***	-0.15	0.20 ***
Num. obs.	22393.00	60142.00	25775.00	15387.00	74358.00	23436.00	55592.00

	Meat	Prepared fruits & fruit juices	Corn	Nuts	Cocoa and cocoa products	Eggs	Tobacco
Intercept	117.70	649.80 **	92.63	108.00	24.29	-97.97	80.51
Distance (log)	-1.37 ***	-1.10 ***	-1.53 ***	-1.31 ***	-0.60 ***	-1.58 ***	-0.44 ***
Importer GDP (log)	-14.29	-85.22 **	-5.95	-0.02	-5.64 .	12.65	-8.85
Exporter GDP (log)	0.28	7.29	-0.71	-8.07 *	1.52 .	0.24	-1.09 *
Importer VAagri	3.95	18.59 **	0.50	-1.07	0.72	-3.09	2.68
Exporter VAagri	0.18	-1.58 *	-2.17 .	-1.28 ***	1.81	-0.06	0.44 ***
FTA dummy	0.17 ***	0.33 ***	0.28 ***	0.18 ***	0.59 ***	0.13 .	0.08 .
Num. obs.	57478.00	35618.00	26690.00	43092.00	11644.00	17671.00	34665.00

	Spices	Other sweeteners	Beverages	Cotton	Rice	Pulses and legumes
Intercept	35.64	4.99	7.45	113.80	-174.30	36.29
Distance (log)	-1.01 ***	-0.78 ***	-1.02 ***	-0.73 ***	-1.38 ***	-1.14 ***
Importer GDP (log)	-4.21	-9.44	1.37	-13.26	22.07	-6.08
Exporter GDP (log)	-0.56	7.18	-2.11 *	0.04	-1.60	1.78
Importer VAagri	1.41	1.48	-0.13	3.14	-4.70	1.70
Exporter VAagri	0.48 *	0.41	0.48 **	0.05	0.62	-0.19
FTA dummy	0.26 ***	0.18 ***	0.05	0.21 ***	0.35 ***	0.20 ***
Num. obs.	67797.00	24978.00	68340.00	29275.00	14208.00	45837.00

Note: Importer- and exporter-time fixed effects were estimated as well (as elaborated in the chapter on the estimation), but this table depicts the focal variables only. The "Meat" category also includes livestock products & live animals. Significance is depicted using stars an dots: . means p <0.1, * means p <0.05, ** means p <0.01, *** means p <0.001.

When contrasting the results, one can see that EU external trade in the agricultural sector is positively correlated with FTAs for 3 sectors, while it is 17 in global trade. There are many possible explanations for this stark difference. First of all, in the global data set, intra-EU trade is included. Today, 14% of world trade is EU trade, the majority of which being intra-EU trade (Eurostat, 2022b). Also, in 2016, 72.7% of EU countries' exports in the farming sector where going to fellow EU countries (Commission, 2017)[14]. Therefore, including the intensive agricultural trade among EU countries in the sample naturally raises the positive significance of free trade agreements in the global sample. The immense trade-creating effect of the EU common market for agriculture has been highlighted by the literature (see Sun and Reed (2010, 1356) or Sarker and Jayasinghe (2007)). Therefore, the analysis of extra-EU trade has been done in order to filter out this "EU effect" for agricultural trade. Further explanations require a more thorough analysis of the economic and political context, which will be performed in the next section.

[14]More recent figures are not available. Yet, it is reasonable to assume that there was no major change in this share between 2016 and today.

5 Economic and political context

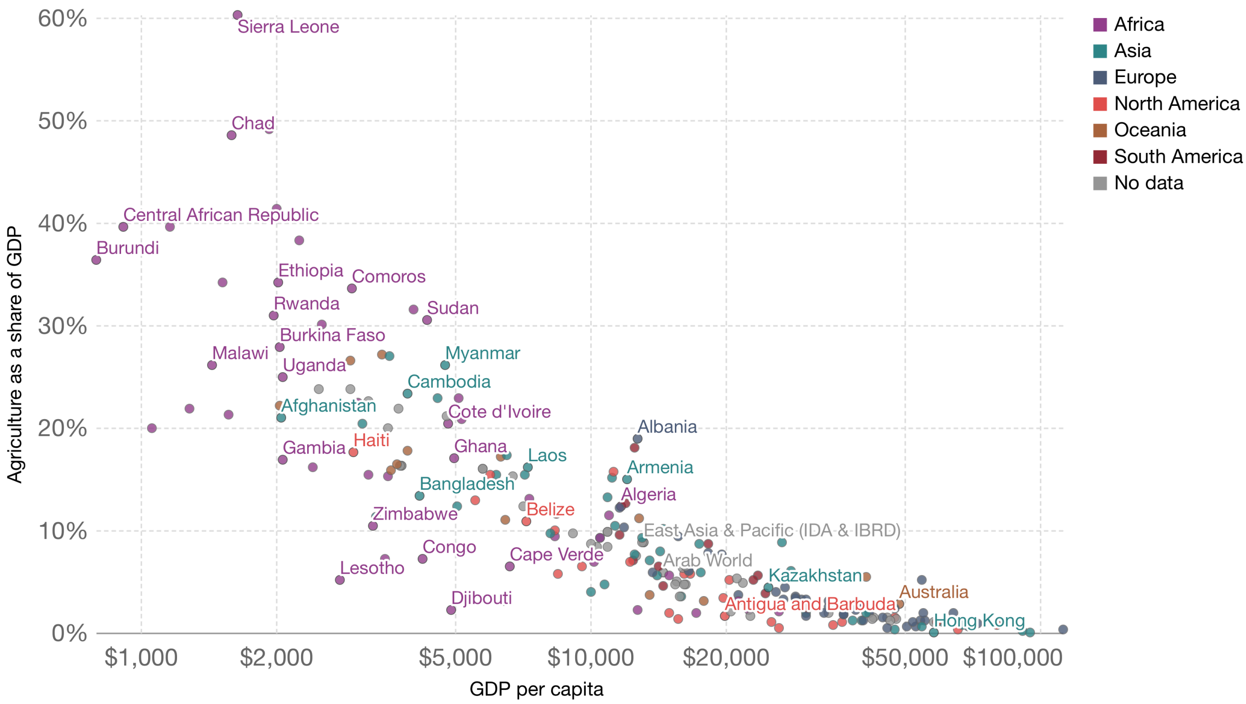
While the EU is the largest global trader of agricultural products, agricultural trade does not account for a large share in the EU's total external trade (8.1% in 2021, Eurostat (2022a)). Nonetheless, this sector plays a significant role in EU policy making, gains large media attention and agricultural stakeholders are political heavy-weights. For the past years, the EU as a bloc has always run a slight surplus in agri-food trade[15]. It is also the world's biggest exporter of agri-food products (European Commission, 2021, 1). Attention to detail is necessary in order to interpret these numbers: Luxury products like wine, spirits, liqueurs, chocolate and confectionery are the powerhouses of EU agri-food exports, but barely related to farming income. As the analysis in section 4 follows the classification of agricultural sectors from the ITPD-E dataset, these are not included in the empirical estimation of this paper. The EU institutions use the wording "agricultural trade" for the sectors matching my analysis, and "agri-food trade" for a more extensive product range including the above-mentioned cash-cows.

This external agricultural trade takes place in a complex institutional framework: The internal production is subject to the EU's Common Agricultural Policy (CAP), trade falls under the Common Commercial Policy (CCP), and both of these are constrained by the binding commitments the EU and its MS have through their membership in the World Trade Organisation (WTO). When the latter was founded in 1995, its new membership also signed the Agreement on Agriculture (AoA), which is based on three pillars: market access, domestic support and export subsidies. This is because agricultural sector trade is exempted from the general WTO rulebook, allowing for higher tariff ceilings, domestic support and subsidies which are not allowed in other industries. This special situation of agriculture also leads to the OECD's report on agriculture emphasizing year after year that this market remains heavily distorted due to countries' protectionist policies (OECD, 2020, 20). While the EU does not fund export subsidies and thus technically adheres to the WTO rulebook, the CAP is sometimes cynically displayed as a "workaround" of this prohibition on export subsidies. This is because supporting farmers' income indirectly provides the products they export with an unfair advantage as opposed to producers in countries which do not enjoy income support through public policy. However, it has to be noted that the CAP has transformed extensively in the years leading up to the creation of the WTO and those which followed, shifting from production-based support to income support. This shift was done exactly for the reason that CAP funds should not influence production decisions, thus distorting prices and quantities on the market. But as it was (and still is) the goal of the CAP to stabilize farmers' incomes regardless, this had then to be done via income support which is decoupled from production. Before this decisive shift, distortive agricultural policy of the EU has lead to a flooding of world markets with cheap produce, most notably with "Butter mountains" and "Milk lakes" in the 1970s and early 1980s. The introduction of milk quotas within the CAP in the early 1980s was one first step to stop such overproduction, which was not only using a large amount of taxpayer's money but also having a detrimental impact on third countries' agricultural markets.

[15] This information is derived through comparing multiple EU-Agri-Food Trade Reports here: European Commission (2022)

After looking at the institutional context, the role and meaning of the explanatory variables in the gravity model and their results will be analysed. The explanatory variable VAagri acts as a key indicator in development economics. First of all, it is an indicator for growth of the agricultural sector itself. Yet, being a relative measure, it can also be influenced by the developments of a country's overall GDP. If overall GDP shrinks while the output of the agricultural sector stays the same, VAagri rises just as it does if overall GDP remains constant and farming output grows. Furthermore, as it is measured in current US dollars, countries' exchange rates and inflation may cause the indicator to change without an underlying change in the sector. Despite these shortcomings, VAagri is also used as a measurement of economic development. The dataset used for the estimation in section 4 shows that developing countries are characterised by a high VAagri, while it is less than 7% in developed countries.[16] This is due to the fact that there is a clear negative correlation between VAagri and GDP per capita, which is depicted in Figure 2.

Figure 2: The relation between share of agriculture in GDP and GDP per capita



Source: Our World in Data (2017)

As a decline in VAagri is accompanied by an increase in factor productivity in the sector, it is related to the rise in living standards and income in rural areas (Arias, 2016). A higher share of agriculture in GDP is associated with less stable economies, especially when agricultural goods also play a key role in exports. The instability of the sector follows, inter alia, from its weather and climate risk, high exposition to volatile world market prices and a strong informal sector. This leads to a lack of resilience of economies as well as a larger risk for balance of

[16] Anderson (1987) elaborates in his seminal paper why the agriculture sector declines relative to other sectors with economic growth.

payments crises of countries.

These issues are the backdrop of analysing the strong role trade with agriculture-based countries has for the EU. Eurostat (2022a) provides some numbers on agricultural exports, separating them into 4 categories: Animal products, vegetable products, oils and fats as well as foodstuffs. In line with the insights from the EU-Agri-Food Trade Reports, the foodstuffs category dominates exports (54%). After animal products (22%) follow vegetable products with 20% of EU-Agri-Food exports. Oils and fats make up 9% of the EU's exports. Coming to imports, vegetable products are leading with 39%. This category includes grains as well as fruits and vegetables. And for this most important category of EU agricultural imports, the estimation Specification A presented in the previous chapter provided some interesting findings in regard to the role of the exporting country's agricultural share of GDP: More of the EU's external trade in grains and fruits is with exporting countries which have a higher VAagri. By contrast, VAagri plays nearly no role in global trade in vegetable products.

Possible explanations for this strong trade relationship between the EU and countries with a high VAagri in the grains and fruits sectors are manifold. Some are historic, as the European colonizers profited from the rich land and cheap production costs for these foodstuffs in their colonies. These colonial trade relations prevail until today, as is reflected in the ITPD-dataset which was used to build the dataset in section 4 (Borchert et al., 2020b). This effect is intensified by the fact that in many cases, former colonies still share the same language as their colonizers, and sharing a common language is another trade-creating factor in the gravity model. Numerous authors have discussed these colonial trade relations, one of them is Sandberg et al. (2006). Another reason for the strong trade ties between the EU and agriculture-focused countries are the climatic conditions of the exporters. These are favourable for the production of vegetable products generally and allow for the cultivation of certain grains and fruits which cannot be produced in the EU. This is one of the reasons for the high price-competitiveness of the EU's main suppliers in these sectors. Others are lower environmental and social standards, lower taxes and higher export supports of the EU's trading partners, which lead to their low production costs.

In this context, the "Everything but Arms Initiative" (EBA) of the Union needs to be mentioned. Having started in 2001 and being part of the Union's Generalized Scheme of Preferences (GSP), it allows all goods apart from weapons to be imported tariff-free into the EU from a list of so-called "Least Developed Countries (LDCs)"[17]. All of these LDCs have a high agricultural share of GDP. The goal of this initiative is to provide export opportunities for LDCs, thus enabling them to grow their economies, which in turn provides the base for generating tax revenues and making these countries less dependant of foreign development aid money. Yet, it comes with a number of negative effects: First of all, it leads to trade diversion. Countries which do not classify as LDCs might produce some goods more efficiently, yet face high tariffs. Their

[17] The list of EBA countries as of 2022, grouped by continent: Angola, Benin, Burkina Faso, Burundi, Central African Republic, Chad, Comoros, Congo (DRC), Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea Bissau, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Sao Tome Principe, Senegal, Sierra Leone, Somalia, South Sudan, Sudan, Tanzania, Togo, Uganda, Zambia, Afghanistan, Bangladesh, Bhutan, Cambodia, Lao PDR, Myanmar/Burma, Nepal, Timor-Leste, Yemen, Kiribati, Solomon Islands, Tuvalu Vanatu, Haiti

products are not able to compete with the tariff-free imports under EBA, which leads to a deadweight loss[18] in efficiency[19]. Furthermore, as the EBA does not include environmental or human rights safeguards, it possibly leads to negative human rights impacts, which are frequently criticized by human rights organizations. Looking at the results of the gravity estimation, further potential problems are revealed. As explained above, the economies of countries with a high VAagri are highly volatile. And depending on importing agricultural goods to a large extent from such volatile countries threatens the food security within the EU. This topic has gained renewed interest following the disruption of international supply chains due to the COVID pandemic starting in 2020 and the Russian invasion in Ukraine in 2022. Moreover, grains and fruits are low-value products compared to other export goods (for instance, IT products). Focusing on exporting these goods to the EU binds resources in LDCs which could be used to establish a more diversified and resilient economy. This way, development away from an agriculture-based economy might be hindered to some extent by the EBA.

At this point it is important to note that the EBA initiative is not the only way in which the EU provides unilateral preferential access to its internal market for developing countries. Under the GSP umbrella, standard GSP and GSP+ allow for reduced tariffs for further developing countries.

After the role of agricultural share of GDP, the role of free trade agreements in EU external agricultural trade will be discussed. Within the Union, trade policy is performed on the EU level. Consequently, concluding an FTA falls under the scope of the Common Commercial Policy (CCP, see Art.3(1)(e) TFEU) and Art. 207 TFEU (on CCP), Art. 217 and Art. 218 TFEU (on international agreements) provide the Union with a prerogative for doing so. The numerous free trade agreements of the Union cement its position as a trading giant. While in the past they were focused on reducing tariffs, their scope and contents vary strongly today. Pure trade interests are interwoven with political, social and environmental considerations. Apart from the above-mentioned EBA initiative and the economic partnership agreements with African, Carribbean and Pacific countries or trade agreements related to the association agreements preparing for EU integration, the EU has announced a focus on "New Generation Trade Agreements" from 2006 onwards. The negotiations for these include aspects on intellectual property, public procurement, environment and social standards and follow a policy of "regulatory export". The idea behind it is that through enforcing EU standards on imported products covered by the FTA, it contributes to improving standards globally. This policy shift was also partly made to address the growing public concern over the consequences of "traditional" trade agreements. Examples of these "New Generation Trade Agreements" of the EU include those with Japan, Canada, Singapore or the Ukraine. While their high ambitions can be regarded positively, their negotiations generally take much longer, and sometimes fail altogether due to the plethora of sub-chapters that have to be agreed on.

With this context on free trade agreements, the effect of the FTA dummy used as an

[18]Deadweight loss is a concept in welfare theory which describes a market inefficiency situation where the sum of consumer and producer surplus is smaller than in the free market situation.

[19]Sun and Reed (2010) elaborate on this effect in detail and also estimate a gravity model which provides results on dynamic trade diversion effects of some FTAs in agriculture.

explanatory variable in the gravity model of section 4 can be analysed. One of its main insights was that 3 out of the 20 agricultural sectors analysed show a positive and significant correlation between the existence of an FTA and trade in the EU external trade set, while for the global trade set this was the case for 17 sectors[20]. This means that globally, FTAs have a notable trade-creating effect in the agriculture industry, while this does not seem to be the case for EU external trade. As the EU external trade dataset does not include intra-EU trade and the internal trade of other trading blocs, comparing the two sets of estimations highlights the powerful role of such trading blocs.

The more novel insight is the insignificant role of the EU's FTAs in the explanation of agricultural trade flows. There are a number of possible explanations for this. Four of them will be presented as hypotheses in the following.

First of all, it could be that EU external agricultural trade in all but the 3 positively significant sectors[21] is not affected by the trade diverting effects of the EU's FTAs. This means that existing bilateral trade ties with a country which produces goods most efficiently are not disrupted by favouring another countries' products through an FTA. Sun and Reed (2010) elaborate on this effect in detail. Their gravity estimation uses agricultural trade data from 1993 to 2007, and finds mixed results for the question on trade diversion following the EU-15, EU-25, ASEAN-China and NAFTA agreements. Using their methodology to estimate the trade diversion effect of the EU's FTAs might yield interesting results to this possible explanation.

Secondly, the insignificant role of FTAs for all but 3 agricultural sectors in EU external trade might be a consequence of the EU's imports from EBA-countries or further developing countries with preferential market access under the GSP. The share of EBA trade or GSP trade of total EU external agricultural trade could indicate whether this effect is practically relevant. Unfortunately, it is not easily available and would necessitate a data analysis using EU agricultural trade data. This is beyond the scope of this thesis and provides an interesting question for further research. Just as with the first hypothesis, it would be insightful to perform a trade diversion analysis for this hypothesis as well. If it was the case that EU imports from EBA countries divert agricultural imports from other countries, this would be in line with the results regarding FTAs and EU external trade as presented in subsection 4.3. Furthermore, this would highlight inefficient deadweight losses. If EU imports from EBA countries divert agricultural imports from other developing countries, the question could arise on how fair and targeted the EBA initiative is in supporting economic development in low-income economies generally.

Thirdly, the insight that FTAs do not lead to more agricultural imports into the EU for most of the products that can be produced domestically[22] questions a causal relationship frequently repeated in public and political discussions: "Free Trade Agreements lead to cheap agricultural imports and therefore unfair price pressure on domestic producers and negative environmental effects." Combining trade protectionism with environmental arguments and the

[20]Note that agreements such as the EBA initiative are not considered as FTAs in the dataset, as they are not reciprocal.

[21]These are: Sweeteners excluding sugar, fresh vegetables, and oilseeds (excluding peanuts).

[22]The three categories with a positive relationship between FTA and trade flows mainly consist of goods which cannot be produced in the EU due to climatic conditions (certain sweeteners, certain vegetables, certain oilseeds).

protection of "our" farmers is a powerful political tool, as it generates support from all sides of the political spectrum. Yet, this alleged causal relationship is a hypothesis and not a law of nature. The results presented in subsection 4.3 show that it cannot not hold for EU external agricultural trade. This would require the estimated coefficient associated with the FTA dummy to be positive and significant for a majority of the sectors representing a large share of agricultural imports. While FTAs reduce bureaucracy for existing trade flows (e.g. through elimination of lengthy tariff-declaration forms or quota calculations) the results of subsection 4.3 show that it cannot be proven that FTAs also incentivize agricultural producers in the partner countries to start dedicating more resources to exports to the EU. A further interesting field of inquiry would be to analyze the trade-creating effect of the EU's FTAs in agriculture following the methodology Luckstead (2021) used for the USA-South American trade agreements.

The last hypothesis is that as the EU has larger bilateral trade flows with countries without an FTA in most of the agricultural sectors analysed, its current collection of free trade agreements might not correspond to its economic needs. For instance, if cocoa beans are imported into the EU from a country which does not share an FTA with the Union, concluding one would lead to cheaper consumer prices for cocoa products. Without the FTA, there is still trade, but the imports are more expensive for consumers through tariffs. On the exporting side, this means that since EU producers are exporting more to countries with which the EU does not share an FTA, concluding one would lead either to domestic products being more competitive on foreign markets or allow domestic producers larger profit margins. Without an FTA, there is still trade, but exporters have to pay foreign tariffs. Therefore, regarding economic needs of the agricultural sector, the Union should have more FTAs with countries from which it imports a large range of agricultural products from or exports a large range of agricultural products to. In reality, the conclusion of an FTA is an inherently political process subject to complex decision-making process of the EU, political interests, the (perceived) public opinion and influential stakeholders. Moreover, agriculture makes up 1.3% of EU GDP (in 2020, see Eurostat (2021)) with a falling tendency. This means that when it comes to the negotiation of FTAs, the interests of the other 98.7% of the Union's economy might hold much more economic weight. As the Union's export cash cows are machinery and equipment, pharmaceutical products, motor vehicles and electronics (summing up to 50% of its exports, see Eurostat (2021)), gaining preferential market access for these products frequently constitutes the primary goal of the Union's trade negotiations. Furthermore, opening negotiations and concluding them is a process which needs political willpower. As mentioned above, for most national and EU-politicians, it is a dominant strategy to be sceptic about trade agreements. Additionally, simplifying heuristics such as the statement of the previous paragraph, a lack of public understanding about international trade, the consequential mistrust in trade deals paired with euro-scepticism and environmental and social concerns lead to the fact that the majority of the European voters prefers not starting new trade negotiations. Furthermore, EU politics is characterized by representatives of small but influential interest groups. For instance, farmer's representatives themselves mobilize against new trade openings. It is believed that FTAs might ultimately lead to importing the type of unsustainable industry-farming which both EU funding and legislation aims to remove from Europe[23]. The public concern over the wider effects of a trade agreement was highlighted recently in the context of the EU-Mercosur negotiations. Stakeholders in the EU's agricultural sector as well as civil society organizations have voiced concerns that it might lead to a lowering of environmental and social standards[24], create unfair conditions for small and family farms or exacerbate illicit deforestation and other environmentally harmful behavior in Mercosur countries as a consequence of their rising export opportunities. All the arguments mentioned in this paragraph contribute to the fact that negotiating FTAs which would liberalize existing agricultural trade flows of the EU is a complicated endeavour. Therefore, it is plausible that while there would be efficiency gains to be made in the agricultural sector through negotiating new FTAs, this can be hindered by the political process and the public opinion of FTAs. This would be in line with the finding that more EU external agricultural trade is with countries it does not share an FTA with. This last of the four hypothesis regarding the results of the FTA dummy in the gravity estimation for EU external trade provides an interesting field of further qualitative research, potentially inspecting the issue from a political science or sociology point of view.

[23]For instance, the strongest European farmer's interest group, Copa-Cogeca published open letters on against the EU-Mercosur agreement: Pekka Pesonen (Secretary General of Copa Cogeca) (2019), Copa Cogeca (2021).

[24]In an open letter to the presidents of the European Council, the European Commission and the European Parliament, published on 17 June 2019, 340+ organisations advocated for abandoning the negotiated agreement due to human rights concerns, see http://s2bnetwork.org/wp-content/uploads/2019/06/Joint-letter-Brazil-EU-Mercosur.pdf

6 Conclusion

This thesis aimed at answering the question which role free trade agreements and agricultural share of GDP play in determining EU external agricultural trade flows. To this end, a gravity model of trade was estimated using the OLS technique and the software R. A secondary goal of this thesis was constructing a dataset which includes recent data on all the necessary variables, as such a dataset did not exist so far. The dependent variable was the bilateral agricultural trade flows of 20 agricultural sectors, the list of which can be found in the appendix. In order to answer the research question, agricultural share of GDP was included as an explanatory variable as well as the existence of an FTA between the trading partners in form of a dummy variable. Two sets of estimations were performed and contrasted: A global dataset containing all trade flows for 243 countries (the global dataset) and a dataset which included only the trade between EU and non-EU states (the EU external trade dataset). The former proved useful in putting the results of the latter into context. Furthermore, these two datasets were each estimated using two different estimation specifications. In Specification A, an interaction term between the value added of the agricultural sector and the FTA-dummy was added as an explanatory variable, while Specification B did not include such an interaction term. The reasons for using two specifications were elaborated in section 4.

This provided some interesting results: More of the EU's external trade in grains and fruits is with exporting countries which have a higher share of agriculture of GDP. This means that in said sectors, the EU imports more from countries where agriculture plays a larger role in the economy. This effect is by far less pronounced for global trade than for EU external trade. In section 5, these results were put into their economic and political context: It was highlighted that countries with a higher agriculture share of GDP are more vulnerable to climate risks, volatile world market prices and exchange rate crises while countries with a low share are more resilient. As this measure is also negatively related to GDP per capita, it is often used as an indicator in development economics. Possible explanations for this strong trade relationship between the EU and countries with a high agriculture share of GDP in the grains and fruits sectors were highlighted. First were historical and linguistic reasons related to Europe's colonial history. Second was the high price competitiveness of the EU's trading partners with a high agriculture share of GDP, which itself stems from a variety of factors. In this context, the "Everything but Arms Initiative" (EBA) of the Union as part of its Generalized Scheme of Preferences (GSP) was elaborated. This initiative allows all goods apart from weapons to be imported tariff-free into the EU from a list of LDCs in order to support their economic development. Yet this initiative comes with some downsides, as all of these LDCs have a high agricultural share of GDP, making their economies highly vulnerable and volatile, due to a variety of reasons elaborated in the chapter.

Further interesting results were related to the FTA dummy. It was highlighted that in the global dataset, 18 sectors (17 out of which significant) showed a positive correlation between FTAs and trade, thus confirming the trade-creating effect of FTAs. Yet, for the EU external trade set, these results were different: Only 3 sectors showed a significant positive relation. Therefore, for all other sectors it can be said that EU external trade is not significantly larger if there is an FTA between the trading partners. One possible reason for this stark difference between the results of the global and the EU dataset is that today, 14% of world trade is EU trade, the majority of which being intra-EU trade (Eurostat, 2022b) and in 2016, 72.7% of EU countries' exports in the farming sector where going to fellow EU countries (Commission, 2017). Therefore, the analysis of extra-EU trade filters out the immense trade-creating effect the EU has on the agricultural sector. In section 5, these findings were put into their political and economic context, starting with an overview of the institutional framework of the EU's external trade policy today: Apart from the EBA initiative and other GSP agreements, and the trade agreements related to the association agreements preparing for EU integration, the "New Generation Trade Agreements" play an important role in EU trade policy nowadays. The negotiations for these include aspects on intellectual property, public procurement, environment and social standards and follow a policy of "regulatory export". The idea behind this is that through enforcing EU standards on imported products covered by the FTA, it contributes to improving standards globally. This policy shift was also partly made to address the growing public concern over the consequences of "traditional" trade agreements. Next, four hypotheses were provided on the question why there was not more EU external trade with FTA-partners to be observed in most of the agricultural sectors. Hypothesis 1 elaborated that it is possible that the EU's FTAs do not simply divert agricultural trade from the Union's existing trading partners. This is supported by highlighting that previous research has generated mixed results on the question whether FTAs lead to trade diversion in the agricultural sector. The second hypothesis regarding the reason why the EU trades more agricultural exports with countries with which it does not share an FTA inquired into EU trade with GSP-countries generally and EBA-countries in particular. Potentially, these trade policies divert trade away from FTA countries. Both for the first and the second hypothesis, a trade diversion analysis following Sun and Reed (2010) would prove interesting. Hypthesis 3 stated that this thesis' findings question the causal relationship which is frequently repeated in public and political discussions: "Free Trade Agreements lead to cheap agricultural imports and therefore unfair price pressure on domestic producers and negative environmental effects." In order to inquire into this issue more thoroughly, an analysis of the trade-creating effect of the EU's FTAs in agriculture following the methodology of Luckstead (2021) would prove an interesting field of further research. The fourth and last hypothesis presented was that the EU's current collection of free trade agreements might not correspond to its economic needs, as the EU has larger bilateral trade flows with countries without an FTA in most of the agricultural sectors analysed. Without the FTA, there is still trade, but the imports are more expensive for consumers through tariffs. One the exporting side, this means that since EU producers are exporting more to countries with which the EU does not share an FTA, concluding one would lead either to domestic products being more competitive on foreign markets or allow domestic producers larger profit margins. Without an FTA, there is still trade, but exporters have to pay foreign tariffs. A number of possible explanations for this were identified: First, agriculture makes up 1.3% of EU GDP (in 2020, see Eurostat (2021)) with a falling tendency. This means that when it comes to the negotiation of FTAs, the interests of the other 98.7% of the Union's economy might hold much more economic weight. Furthermore, opening negotiations and concluding them is a process which needs political willpower. As elaborated in section 5, for most national and EU politicians it is preferable to be sceptic about trade agreements, as a lack of public understanding about international trade, the consequential mistrust in trade deals paired with euro-scepticism and environmental and social concerns lead to the fact that the majority of the European voters prefers not starting new trade negotiations. Also, representatives of small but influential interest groups play a role in opposing FTAs, despite their potential efficiency gains. This and the public concern over potential effects of FTAs has recently been highlighted in the context of the EU-Mercosur negotiations. All the arguments mentioned in this paragraph contribute to the fact that negotiating FTAs which would liberalize existing agricultural trade flows of the EU is a complicated endeavour. Therefore, it is plausible that while there would be efficiency gains to be made in the agricultural sector through negotiating new FTAs, this can be hindered by the political process and the public opinion of FTAs. This would be in line with the finding that more EU external agricultural trade is with countries it does not share an FTA with. This last of the four hypothesis regarding the results of the FTA dummy in the gravity estimation for EU external trade provides an interesting field of further qualitative research, potentially inspecting the issue from a political science or sociology point of view.

To summarize, the estimation results presented in this thesis showed some novel insights into the role FTAs and countries' agricultural share of GDP play in the EU's agricultural trade. There remains large potential for further quantitative and qualitative research in this field. This further research will play a crucial role for the future of global free trade, as agriculture remains the most trade-distorted sector globally. As the EU is the world's biggest exporter of agri-food products, and has always run a slight surplus in agri-food trade in the past years, analyzing this player's external agricultural trade presents a good point of departure.

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A Appendix

Table 6: The 26 agricultural sectors included in the ITPD-E

ITPD-E Escription	FCL Title
Wheat	Wheat
Rice (raw)	Rice, paddy
Corn	Maize
Other cereals	Barley
Other cereals	Rye
Other cereals	Oats
Other cereals	Millet
Other cereals	Sorghum
Other cereals	Buckwheat
Other cereals	Quinoa
Other cereals	Fonio
Other cereals	Triticale
Other cereals	Canary seed
Other cereals	Mixed grain
Cereal products	Bran of Wheat
Cereal products	Bran of Maize
Cereal products	Bran of Millet
Cereal products	Bran of Sorghum
Cereal products	Bran of Buckwheat
Cereal products	Bran of Fonio
Soybeans	Soybeans
Other oilseeds (exc. peanuts)	Groundnuts, in shell
Other oilseeds (exc. peanuts)	Groundnuts, shelled
Other oilseeds (exc. peanuts)	Coconuts
Other oilseeds (exc. peanuts)	Coconuts, desiccated
Other oilseeds (exc. peanuts)	Copra
Other oilseeds (exc. peanuts)	Oil palm fruit
Other oilseeds (exc. peanuts)	Palm kernels
Other oilseeds (exc. peanuts)	Karite Nuts (Sheanuts)
Other oilseeds (exc. peanuts)	Castor Beans
Other oilseeds (exc. peanuts)	Sunflower seed
Other oilseeds (exc. peanuts)	Rapeseed or colza seed
Other oilseeds (exc. peanuts)	Tung Nuts
Other oilseeds (exc. peanuts)	Safflower seed
Other oilseeds (exc. peanuts)	Tung Nuts
Other oilseeds (exc. peanuts)	Safflower seed
Other oilseeds (exc. peanuts)	Sesame seed

Continuation of Table 6	
ITPD-E Escription	FCL Title
Other oilseeds (exc. peanuts)	Mustard seed
Other oilseeds (exc. peanuts)	Poppy seed
Other oilseeds (exc. peanuts)	Melonseed
Other oilseeds (exc. peanuts)	Tung Nuts
Other oilseeds (exc. peanuts)	Kapok fruit
Other oilseeds (exc. peanuts)	Kapokseed in shell
Other oilseeds (exc. peanuts)	Kapokseed, shelled
Other oilseeds (exc. peanuts)	Seed Cotton
Other oilseeds (exc. peanuts)	Cottonseed
Other oilseeds (exc. peanuts)	Linseed
Other oilseeds (exc. peanuts)	Hempseed
Other oilseeds (exc. peanuts)	Oilseeds nes
Animal feed ingredients & pet foods	Beet Pulp
Animal feed ingredients & pet foods	Pulp, Waste of Fruit for Feed
Animal feed ingredients & pet foods	Cane Tops
Animal feed ingredients & pet foods	Straw & Husks
Animal feed ingredients & pet foods	Grasses nes for forage
Animal feed ingredients & pet foods	Clover for forage
Animal feed ingredients & pet foods	Legumes for silage
Animal feed ingredients & pet foods	Turnips for fodder
Animal feed ingredients & pet foods	Forage Products nes
Animal feed ingredients & pet foods	Vegetable Products for Feed nes
Animal feed ingredients & pet foods	Gluten Feed & Meal
Animal feed ingredients & pet foods	Hay (Clover, Lucerne, etc.)
Animal feed ingredients & pet foods	Hay nes
Animal feed ingredients & pet foods	Alfalfa Meal & Pellets
Raw & refined sugar & sugar crops	Sugar cane
Raw & refined sugar & sugar crops	Sugar beet
Other sweeteners	Sugar crops nes
Other sweeteners	Honey
Pulses & legumes(dried, preserved)	Beans, dry
Pulses & legumes(dried, preserved)	Broad beans, dry
Pulses & legumes(dried, preserved)	Peas, dry
Pulses & legumes(dried, preserved)	Chick-peas, dry
Pulses & legumes(dried, preserved)	Cow peas, dry
Pulses & legumes(dried, preserved)	Pigeon peas
Pulses & legumes(dried, preserved)	Lentils, dry
Pulses & legumes(dried, preserved)	Bambara beans
Pulses & legumes(dried, preserved)	Vetches

Continuation of Table 6	
ITPD-E Escription	FCL Title
Pulses & legumes(dried, preserved)	Lupins
Pulses & legumes(dried, preserved)	Pulses nes
Fresh fruit	Bananas
Fresh fruit	Plantains
Fresh fruit	Oranges
Fresh fruit	Tangerines, mandarins, clementines, satsumas
Fresh fruit	Lemons & limes
Fresh fruit	Grapefruit & pomelo
Fresh fruit	Citrus fruit nes
Fresh fruit	Apples
Fresh fruit	Pears
Fresh fruit	Quinces
Fresh fruit	Apricots
Fresh fruit	Sour cherries
Fresh fruit	Cherries
Fresh fruit	Peaches & nectarines
Fresh fruit	Plums
Fresh fruit	Stone fruit, fresh nes
Fresh fruit	Pome fruit nes
Fresh fruit	Strawberries
Fresh fruit	Raspberries
Fresh fruit	Gooseberries
Fresh fruit	Currants
Fresh fruit	Blueberries
Fresh fruit	Cranberries
Fresh fruit	Berries nes
Fresh fruit	Grapes
Fresh fruit	Raisins
Fresh fruit	Watermelons
Fresh fruit	Melons, Cantaloupes
Fresh fruit	Figs
Fresh fruit	Mangoes
Fresh fruit	Avocados
Fresh fruit	Pineapples
Fresh fruit	Dates
Fresh fruit	Persimmons
Fresh fruit	Cashewapple
Fresh fruit	Kiwi fruit
Fresh fruit	Papayas

Continuation of Table 6	
ITPD-E Escription	FCL Title
Fresh fruit	Fruit, tropical (fresh) nes
Fresh fruit	Fruit, fresh nes
Fresh vegetables	Potatoes
Fresh vegetables	Sweet potatoes
Fresh vegetables	Cassava
Fresh vegetables	Yautia (Cocoyam)
Fresh vegetables	Taro (Cocoyam)
Fresh vegetables	Yams
Fresh vegetables	Roots & tubers nes
Fresh vegetables	Olives
Fresh vegetables	Cabbages
Fresh vegetables	Artichokes
Fresh vegetables	Asparagus
Fresh vegetables	Lettuce & chicory
Fresh vegetables	Spinach
Fresh vegetables	Tomatoes, fresh
Fresh vegetables	Cauliflowers & broccoli
Fresh vegetables	Pumpkins, squash & gourds
Fresh vegetables	Cucumbers & gherkins
Fresh vegetables	Eggplants
Fresh vegetables	Chillies & peppers (green)
Fresh vegetables	Onions, shallots (green)
Fresh vegetables	Onions, dry
Fresh vegetables	Garlic
Fresh vegetables	Leeks & other alliaceous vegetables
Fresh vegetables	Beans, green
Fresh vegetables	Peas, green
Fresh vegetables	Broad Beans, Green
Fresh vegetables	String Beans
Fresh vegetables	Carrot
Fresh vegetables	Okra
Fresh vegetables	Green Corn (Maize)
Fresh vegetables	Mushrooms
Fresh vegetables	Chicory roots
Fresh vegetables	Vegetables, Fresh n.e.s.
Prepared fruits, fruit juices	Apricots, Dried
Prepared fruits, fruit juices	Plums, dried
Prepared fruits, fruit juices	Figs, Dried
Prepared fruits, fruit juices	Fruit, dried nes

Continuation of Table 6	
ITPD-E Escription	FCL Title
Prepared vegetables	Potato Offals
Prepared vegetables	Cassava, Dried
Nuts	Brazil nuts
Nuts	Cashew nuts
Nuts	Chestnuts
Nuts	Almonds
Nuts	Walnuts
Nuts	Pistachios
Nuts	Kolanuts
Nuts	Hazelnuts (Filberts)
Nuts	Areca nuts
Nuts	Brazil Nuts, Shelled
Nuts	Cashew Nuts, Shelled
Nuts	Almonds, Shelled
Nuts	Walnuts, Shelled
Nuts	Hazelnuts, Shelled
Nuts	Nuts nes
Live Cattle	Cattle
Live Cattle	Buffaloes
Live Swine	Pigs
Eggs	Hen eggs
Eggs	Eggs, exc. hen eggs
Other meats, livest. pr. live animals	Sheep
Other meats, livest. pr. live animals	Wool, Greasy
Other meats, livest. pr. live animals	Wool, Hair Waste
Other meats, livest. pr. live animals	Goats
Other meats, livest. pr. live animals	Skins, Wet-Salted (Goats)
Other meats, livest. pr. live animals	Coarse goat hair
Other meats, livest. pr. live animals	Chickens
Other meats, livest. pr. live animals	Ducks
Other meats, livest. pr. live animals	Turkeys
Other meats, livest. pr. live animals	Pigeons and other birds
Other meats, livest. pr. live animals	Horses
Other meats, livest. pr. live animals	Asses
Other meats, livest. pr. live animals	Mules
Other meats, livest. pr. live animals	Camels
Other meats, livest. pr. live animals	Hides, Wet-Salted (Camels)
Other meats, livest. pr. live animals	Hides nes, Camels
Other meats, livest. pr. live animals	Rabbits

Continuation of Table 6	
ITPD-E Escription	FCL Title
Other meats, livest. pr. live animals	Other rodents
Other meats, livest. pr. live animals	Other camelids
Other meats, livest. pr. live animals	Live animals, non food nes
Other meats, livest. pr. live animals	Live animals nes
Other meats, livest. pr. live animals	Bees
Other meats, livest. pr. live animals	Beeswax
Other meats, livest. pr. live animals	Cocoons, reelable
Other meats, livest. pr. live animals	Hides nes
Other meats, livest. pr. live animals	Hair, fine
Cocoa and cocoa products	Cocoa beans
Beverages, nec	Coffee green
Beverages, nec	Tea
Beverages, nec	Mate
Cotton	Cotton Lint
Cotton	Cotton Waste
Tobacco leaves	cigarettes & Tobacco leaves
Spices	Pepper
Spices	Pimentov
Spices	Vanilla
Spices	Cinnamon (canella)
Spices	Cloves
Spices	Nutmeg, mace, cardamoms
Spices	Anise, badian, fennel
Spices	Ginger
Spices	Spices nes
Other ag. products, nec	Vegetable products, fresh or dry nes
Other ag. products, nec	Carobs
Other ag. products, nec	Dregs from brewing, distillation
Other ag. products, nec	Hops
Other ag. products, nec	Peppermint, Spearmint
Other ag. products, nec	Pyrethrum, dried flowers
Other ag. products, nec	Pyrethrum Extract
Other ag. products, nec	Flax, raw or retted
Other ag. products, nec	Hemp fibre and tow
Other ag. products, nec	Kapok fibre
Other ag. products, nec	Jute
Other ag. products, nec	Jute-like fibres
Other ag. products, nec	Ramie
Other ag. products, nec	Sisal

Continuation of Table 6	
ITPD-E Escription	FCL Title
Other ag. products, nec	Agave fibres nes
Other ag. products, nec	Abaca manila hemp
Other ag. products, nec	Coir
Other ag. products, nec	Fibre crops nes
Other ag. products, nec	Natural rubber
Other ag. products, nec	Rubber, Natural (Dry)
Other ag. products, nec	Natural gums
Other ag. products, nec	Crude Organic Materials nes
End of Table	