# TRADE EFFECTS OF THE CANADA-UKRAINE FREE TRADE AGREEMENT

by

Alla Gorb

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Thesis Supervisor: _____ Professor Elena Besedina

Approved by _____
Head of the KSE Defense Committee, Professor

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Date _____

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Abstract

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Free trade agreements are generally recognized as the drivers of international trade and economic growth. This thesis is devoted to the study of the trade effect of the Canada-Ukraine Free Trade Agreement (CUFTA) on bilateral trade flows and in particular on Ukrainian exports to Canada. The trade effect of CUFTA is econometrically assessed over the period from 2017 till September 2025 using gravity model. Gravity estimation results provide mixed evidence on the effect of CUFTA on Ukrainian exports to Canada. While some sectors experience growth, exports in other sectors either remained unchanged or declined. Overall, increase in intensive margin was recorded in 20% of sectors, while a stronger effect is observed on extensive margin: new product categories appeared in 60% of exporting sectors. During the studied period, which covers also full-scale Russian invasion in Ukraine, Ukrainian exports structure changed from the raw materials to the goods with higher value added as well as products of agri-food industry.

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## AI USE DECLARATION

During the preparation of this thesis, generative AI tools (Claude, ChatGPT) was used as a supplementary tool to support grammar and spelling correction, improvement of sentence clarity, and code assistance in R.

Any suggestions produced by the AI tool were critically evaluated and substantially modified by the author before being incorporated into the thesis. The tool was not used to generate research findings, produce literature summaries used directly in the thesis, create citations, or conduct any form of data analysis. All research questions, theoretical framing, methodology, analysis, interpretation of results, and conclusions were developed independently by the author. The author takes full responsibility for the originality, validity, and academic integrity of the work presented in this thesis.

# LIST OF ABBREVIATIONS

**CIS**. Commonwealth of Independent States.

**CGE.** Computable General Equilibrium.

**CUFTA.** Canada-Ukraine Free Trade Agreement.

**EU.** European Union.

**EFTA.** European Free Trade Association.

**FE.** Fixed Effect

**FTA.** Free Trade Agreement.

**GATT.** General Agreement on Tariffs and Trade.

**GTAP.** Global Trade Analysis Project.

**PPML.** Poisson Pseudo Maximum-Likelihood.

**SCM.** Synthetic Counterfactual Methodology.

**WTO.** World Trade Organization.

*Chapter 1*

# INTRODUCTION

The fact that trade is one of the main sources of enrichment and economic development of a state has been known since ancient times. In the Middle Ages, states waged wars for control over trade routes, and the right to free trade often became one of the key provisions of the peace treaty that ended the war. Thus, the Peace Treaty between Prince Oleh of Kyiv and the Roman emperors Leon and Alexander, recorded in the Tale of Bygone Years under the year 907, stipulated the exemption of merchants who arrived in Constantinople from Kyiv, Chernihiv, Pereyaslav and other cities from paying trade duties:

"And let them enter the city by one gate, with the emperor's man, without arms, fifty men at a time, and let them trade as they please, without paying duty on anything." (Complete Collection of Rus' Chronicles, 1908).

In 1948, after the end of World War II, 23 leading countries of the world concluded the General Agreement on Tariffs and Trade (GATT) aimed at elimination of discriminatory measures in international trade, reduction of the trade duties and import quotas for member states. In 1995, GATT was transformed into the World Trade Organization (WTO).

The regulation of international trade relations by GATT/WTO led to the rapid development of international trade in the post-war years: "In 1948–1999, world trade turnover increased from 58.0 (1948) to 5473 (1999) bln. dollars" (Ibrahimi and Jankovich, 2021).

Ukraine became a member of the WTO in 2008.

The rules established by the WTO still make important framework for international trade relations. At the same time, the transformation of the world

from a bipolar to a multi-polar one, as well as the involvement in the international trade of a large number of states with transitional or underdeveloped economies call for more flexible regulation of trade rules by the means of bilateral and regional trade agreements. Ukraine joined this process in 2010 by concluding a Free Trade Agreement with the member states of the European Free Trade Association (EFTA): the Republic of Iceland, the Principality of Liechtenstein, the Kingdom of Norway, and the Swiss Confederation. This Agreement entered into force on 01.06.2012. It has been renewed on 08.04.2025.

Since then, Ukraine has also entered in free trade agreements with the EU (effective from 01.09.2017, renewed on 29.10.2025), the United Kingdom (effective from 01.01.2021), Israel (effective from 01.01.2021), Canada (effective from 01.08.2017) and some of the former republics of the USSR.

The focus of the present study is the Canada-Ukraine Free Trade Agreement (CUFTA).

CUFTA entered into force on August 1, 2017. The main goal of the Agreement was to eliminate import duties for most goods, as well as to gradually reduce customs tariffs for individual groups of goods. Each Party to the Agreement took on obligation not to increase existing import duties and to gradually eliminate duties on goods originating in the other Party in accordance with the Parties' national schedules set out in Annex 2-B to the Agreement. The Agreement also limited such measures as regulating the applicability of export duties, introducing restrictive measures for balance of payments purposes, applying other charges or fees levied in connection with the import of goods of another Party, prohibiting or restricting the import of goods of another Party or the export or sale for export of goods intended for the territory of another Party, to the exceptions provided for in the relevant articles of GATT 1994.

After the Agreement entered into force, Ukraine eliminated duties on one third of the list of Canadian import items, and Canada eliminated duties on one quarter of Ukrainian imports. Thus, 98.1% of Ukrainian and 72.6% of Canadian imports were completely exempt from customs duties immediately after the CUFTA effective date. The remaining duties were to be gradually reduced to zero on a pro rata basis and annual scale in accordance with the schedule set out in Article 2-B of the Agreement.

According to the International Monetary Fund, Canada has been among the ten largest economies in the world by GDP (IMF, 2025). Therefore, studying the impact of the Canada-Ukraine Free Trade Agreement (CUFTA) on trade relations between Ukraine and Canada is of utmost importance.

A number of studies limited to the initial stage of CUFTA implementation have documented a positive impact of CUFTA on bilateral trade between Ukraine and Canada in the first two years. However, two years is too short a period to reveal the economic effect of CUFTA in its full capacity - generally it takes approximately 6-7 years (Jackson and Shepotylo, 2018). The impact of amendments to CUFTA adopted in 2024 have not been studied at all as well as the influence of the full-scale Russian invasion on CUFTA implementation.

This paper tries to fill the existing gap by examining a longer post-adoption period. This research will complement the existing results and allow us to clearly outline the future prospectives of Canada-Ukraine bilateral trade. In particular, I analyze the impact of CUFTA on trade flows after February 24, 2022, when the Russian Federation unleashed full-scale war against Ukraine and after adoption of amendments to CUFTA in July 2024.

My work is mostly concentrated on the dynamics of CUFTA impact on bilateral trade flows both in terms of intensive and extensive margins, which, in particular

may be useful for developing recommendations for Ukrainian business regarding the restructuring of international trade in current conditions.

The research hypotheses of my study are as follows. CUFTA and amendments thereof has been producing general positive effect on Canada-Ukraine bilateral trade since 2017 Since the beginning of the full-scale Russian invasion in 2022 CUFTA has been providing resilience of economic relations between the Parties. The full-scale Russian invasion became the driver of changes in the structure of existing Ukraine's exports to Canada.

To assess the impact of CUFTA on bilateral trade, I will use the gravity model taking into account international trade flows between all countries. Today it is generally recognized instrument which has shown its effectiveness in trade-related studies. The data were sourced from the UN Comtrade database, and International Trade Center for the period from January 2014 to September 2025. Gravity estimation results provide evidence of CUFTA on Ukrainian export to Canada. The growth in export volume that can be attributed to CUFTA was recorded in 20% of the Ukrainian export sectors, while product lines increased in of exporting sectors. Both CUFTA and full-scale Russian invasion seem to result in restructuring of Ukraine's export to Canada: it has been reorienting from the raw materials to the goods with higher value added and products of agri-food industry.

The structure of the thesis is as follows. Review of early papers on CUFTA, discussion of CUFTA amendments as well as the latest advances in the gravity model development is given in Chapter 2. Chapter 3 is devoted to the methodology applied herewith. The sources of data, data preparation and the dataset used in econometric analysis are described in Chapter 4. The estimation results are presented and discussed in Chapter 5. Chapter 6 summarize the

conclusions of research done in this thesis. These chapters are followed by the Works Cited and Appendix containing the tables of numerical results and figures.

*Chapter 2*

# LITERATURE REVIEW

Reviewing of the literature on such a complex issue requires additional structuring. We will start reviewing the papers on the effect produced by CUFTA implementation at its initial stage. Next as the CUFTA itself has been amended in 2024 the key provisions of these amendments will be observed. After that review of the literature on FTA research instruments will be given. Finally, we will review the papers on the latest progress in application of the gravity model which is the basic method used in this thesis.

## 2.1. Early studies on CUFTA

The regulatory framework of CUFTA and its initial results (in the period of 2017-2019) were discussed by Yatsenko et.al (2017), Golovash, 2017; Kryvenko, 2020; Bogdanova, 2021; Radziyevska, 2023.

Yatsenko (2017) studied Canada-Ukraine bilateral trade in 1999-2015 and considered potential economic effects of FTA between the Parties thereof. The author applied the gravity model to assess the impact of the manifestations of the economic crisis in Ukraine and Canada on trade turnover between them. The gravity model equation describing the dynamics of foreign trade turnover between Ukraine and Canada for the period of 1999-2015 contained a minimum set of independent variables: the GDP values of Canada and Ukraine and the average world prices on oil as an indicator. Quantitative assessments were conducted for two scenarios: without a free trade zone and with a FT zone created in 2017. The assessment showed a slight increase in trade turnover in the absence of a free trade zone (due to slow GDP growth in both countries). Forecast for quantitative

indicators of bilateral trade under FTA provided that the Canada -Ukraine trade turnover by 2021 would double compared to 2016 and make 411 million US dollars.

The paper by Golovash (2017) presented general overview of the main provisions of CUFTA. However the author decided that CUFTA has "psychological and image effect rather than an economic one" and suggested that it must be further harmonized with existing trade regulations between Ukraine and the EU.

Kryvenko (2020) analyzed complementarity of the commodity structure of Canada-Ukraine trade under the terms of CUFTA in 2017-2018 by the Trade Complementarity Index (TCI). The less is TCI the better are perspectives for bilateral trade development. Kryvenko took into consideration 32 groups of goods covering more than 92% of total Ukrainian exports to Canada and found that by 2018 the TCI index was 53.09%. However, Kryvenko (2020) only provided a comparison of the volumes of Ukraine's exports and imports to Canada in 2016 and 2018, i.e., changes that occurred within a very short period of trade under CUFTA. Based on these comparisons attempts were made to assess the possible consequences of entering CUFTA for Ukraine and examples of measures were provided that, in the authors' opinion, would contribute to the trade flow growth.

Based on the data from the State Statistics Service of Ukraine, Radziyevska (2023) analyzed the dynamics of exports, imports, balances, and volumes of trade in goods between Ukraine and Canada in the period of 2016-2021. It was found that the export of goods during this period increased by 5.5 times, and the share of Ukrainian exports to Canada in the total exports from Ukraine increased by 3 times. The author outlined that the share of raw materials is growing in the exports to Canada, which is definitely a negative feature and suggested that CUFTA covenants must be revised with a purpose of inducing re-industrialization of Ukrainian economy.

Bogdanova (2021) gave general descriptive overview of Canada-Ukraine trade under CUFTA. The paper is concentrated mostly on how CUFTA challenges regulatory environment and economic related reforms in Ukraine. In author's opinion CUFTA has positive effect however it does not provide significant increase in bilateral trade flows.

It is worth noting that none of these articles contains a qualitative empirical analysis of trade relations between Ukraine and Canada, in particular, bilateral trade flows.

Profound study of CUFTA impact on bilateral trade which however was also limited by the period 2017-2019 is given in the report of the Center for International Trade Research of the Kyiv School of Economics by Hamaniuk et. al. (2020). This study was based on 2017-2019 data, that is on the initial stage of CUFTA implementation.

To assess the impact of CUFTA on bilateral trade, the authors used the gravity model taking into account the international trade flows between all countries. To simplify analysis and clean up the results from unnecessary errors the sample of countries used in their gravity model has been limited to the countries with GDP>$25 billion. The authors also made a successful attempt to clean up the results from the dramatic reduction in coal imports from Canada, which was in no way related to the CUFTA covenants. The gravity model used in this study also included such variables (gravity covariates) as distance, common law system, colonial relations and a free trade agreement. Instead of the GDP and population variables, the authors used fixed effects for both pairs of partner countries and for country-partner-year. Zero values of trade flow were applied for the periods in which no trade was observed between the certain pairs of the countries and the Poisson Pseudo Maximum Likelihood method (PPLM) was involved in the analysis.

The study showed that Ukraine's exports to Canada have been growing steadily and expanding much faster than to the other trading partners – by 70% in 2017, by 55% in 2018, and by 9.4% in 2019 (according to Ukrainian data). The study revealed new product positions promising for exporting to Canada by extensive margin as well as top 20 positions of intensive margin increase in Ukrainian exports.

The authors found that Canadian exports to Ukraine has also increased and identified the promising goods for import from Canada to Ukraine both in intensive and extensive margins.

Using a comparative nomenclature analysis of goods imported by Ukraine from countries "with no free trade agreements" and exported by Canada to Eastern Europe and Central Asia, the authors identified Ukrainian imports from such countries (for example, Turkey, the USA and Japan, etc.) which could be replaced by Canadian products.

In my work I plan to expand these studies by involving all the data available today. This will allow us to more fully assess the impact of CUFTA-2017, the changes-consequences in bilateral trade between Ukraine and Canada caused by the full-scale Russian invasion in Ukraine in 2022, and to assess the impact of CUFTA amendments, which entered into force on July 1, 2024. I also plan to analyze trade at the disaggregated level of industries (by HS codes). This will allow me to better understand how CUFTA affects different sectors of Ukrainian exports to Canada.

## 2.2. Amended CUFTA provisions

Article 19.2 of CUFTA provided for the liability of the Parties to review and update CUFTA: "The Parties undertake to review this Agreement within two years after its entry into force in the light of further changes, including within the framework of the WTO Agreement and other agreements in which the Parties are involved, with a purpose of analyzing the further development and deepening of its

provisions and extending its scope to areas not currently covered by it, in particular such as cross-border trade in services, financial services, investment, telecommunications, temporary stay and other subject areas determined by the Parties."

In accordance with the quoted article, CUFTA was reviewed by the Parties in 2024. On 10.04.2024, the Agreement in its new version was ratified by the Verkhovna Rada of Ukraine, and on 01 July 2024 the new Agreement entered into force. The new Agreement extended the list of goods free of customs duties. As of 01.01.2025, more than 99% of the tariff lines of mutual imports of the Parties became duty-free. The new Agreement has also extended the principle of cumulation of origin to the goods of the Parties manufactured using components originating from countries with which the Parties have separate free trade agreements (EFTA, EU, the United Kingdom, Israel). The updated Agreement has also included a provision on a favorable regime for trade in services and digital trade.

### 2.3. International trade studies

Academic research of the economic effects of free trade regimes in the international trade has been actively conducted since the mass conclusion of bilateral free trade agreements in the second half of the 20th century. Initially, to analyze the economic consequences of such FTAs, researchers used the input-output analysis developed by Leontief before the WWII (more on this approach see in Leontief, 1986), descriptive statistics and trade indices: trade intensity index; trade creation and trade diversion (Viner, 1950); intra-trade index (Scott, 1975), and the principle of partial equilibrium (partial equilibrium, 1960-1970) for individual markets. In some cases, simple regressions without theoretical justification and ordinary qualitative analysis were used.

In 2003 Abadie and Gardeazabal introduced the Synthetic counterfactual method (SCM) for studies of casual impact of particular events on economy (see Abadie and Gardeazabal, 2003 and Abadie et al., 2010, 2015). The SCM is a quasi-experimental research method used to estimate the causal impact of a particular policy or event (e.g., an FTA) on a unit of study (e.g., trade flows) by constructing a "synthetic" unit of comparison. That is, a scenario is created that answers the question of what would have happened to trade flows if the intervention (CUFTA in our case) had not occurred. Time series of certain variables of interest after the intervention are compared with similar ones that were not affected by the policy (using a weighted combination of control units ("donor pool")). To give robust results the SCM must be based on a long series of variables taken in stable pre-treatment period which was not the case in Ukraine before CUFTA. That is why SCM feasibility in CUFTA studies is doubtful.

To assess the impact of trade policy, climate change, and other economic factors, a multi-regional, multi-sector general equilibrium computational model called the Global Trade Analysis Project (GTAP) has been developed (see Countryman and Nivievskiy, 2023). The GTAP model framework assumes perfect competition with constant returns to scale. Bilateral trade in this model is accounted for by using the Armington assumption (Armington, 1969). Thus, Countryman and Litvinov (2025) used this model to study the impact of shocks in the agricultural supply chain and changes in bilateral trade, simulating scenarios of reduction in agricultural exports from Ukraine which allowed them to describe the changes associated with the war in prices, production volume, bilateral trade, negative impact on GDP and welfare in different regions.

The GTAP model requires a large amount of data and expert tuning. Being effective in case of in-depth modeling of policies within the framework of general equilibrium (CGE) it however has low forecasting accuracy. Therefore, for conducting empirical assessments, forecasting trade flows, taking into account the

impact of non-tariff barriers, and revealing unused trade potential between countries, the gravity model is considered more effective.

### 2.4. Gravity model as an instrument of FTA studies

The gravity model is considered one of the most successful models in the literature on international economics today. The gravity model takes its name from the Newton's law of universal gravitation, which states that the force of attraction between two bodies is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. Jan Tinbergen (1962) used this analogy in his work to describe the volume of bilateral trade flows between any two countries, assuming that bilateral trade of any two countries is directly proportional to the product of their GDP and inversely proportional to the distance between the borders. Initially, the gravity equation was considered only as a reflection of the empirically stable relationship between the size of the economies of countries, the distance between the borders, and the volume of trade. This appeared to be intuitive but smart assumption providing successful explanation of bilateral trade flows in a number of studies. The theoretical justification of the gravity model was first presented in the work of Anderson (1979). In his model the goods were differentiated by country of origin, and consumer preferences were shared across all differentiated products. This meant that each country consumed at least some of the goods from all other countries, regardless of price levels. All countries were involved in trade, all goods were traded internationally, and national income in equilibrium was determined by the sum of domestic and foreign demand for the specific good that a country produced. This explained the fact that large countries (with large economies) had larger exports and imports.

The further development of the gravity model was the result of many research efforts and a large body of literature has provided the model with a solid theoretical basis (see Capoani, 2023; Leitão, 2024).

The next step was adding into consideration of the Heckscher-Ohlin structure which accounts for monopolistic competition. Thus, in Bergstrand (1985, 1989) we see that the gravity model is a consequence of the model developed by Krugman (1980), which was based precisely on monopolistic competition. And in Deardorff (1998) it is shown that the gravity model can arise from the explanation of trade in factor proportions. A similar gravity equation has also been derived using the Ricardian model (Eaton and Kortum, 2002), as well as from the models that incorporate firm heterogeneity (Melitz, 2003; Chaney, 2008; Arkolakis, Costinot, and Rodríguez-Clare, 2012). Studies of the effects of geographic proximity and distance on the trade flows in the context of monopolistic competition have been reported in Isard and Peck (1954); Isard (1969); Anderson (1979); Anderson (2011); Anderson and van Wincoop (2003).

The gravity model is currently the standard method used to assess the impact of various policies on trade flows between the countries, such as implementation of free trade agreements, imposition of sanctions, and tariff wars. The modern gravity model is applied not only to trade in goods, but also to trade in services (Kimura and Lee, 2006).

Choosing the gravity model specification in the issue of prime importance. As shown in Yotov et al. (2016) specification of the gravity model must account for the problems such as zero trade flows and data heteroscedasticity. Santos-Silva and Tenreyro (2006) pointed out that nonlinear transformation of variables (via logarithm) can lead to unreliable results obtained in the gravity model. The authors argue that the heteroskedastic error term in gravity models leads to a linear correlation between its logarithmic form and the covariates. This, in turn, leads to

inconsistent coefficient estimates. Another problem in gravity models is the presence of zero observations, which is more pronounced when small countries are considered (Santos-Silva and Tenreyro, 2006, 2010). Therefore, PPML should be used instead of OLS to estimate the trade flow by the gravity model. Santos-Silva and Tenreyro (2006) have also provided evidence that fixed effects are also used to reliably estimate the effects of FTAs.

There is an increasing number of works that use country characteristics and geographical characteristics (the presence of common borders, a common language, etc.) to analyze and estimate trade flows using gravity model. Leitão (2023) used gravity model to assess export capabilities of Portugal to its biggest 11 trade partners based on PPML, OLS, random effects, and panel quantile regression.

In the work of Pacheco (2022), gravity model was used to address the question of "the impact of diplomacy (in particular, diplomatic missions of Portugal) on international trade in both exports and imports".

In modern literature, there are more and more works that use the gravity models to analyze the consequences of various events, in particular, Ukraine's non-integration into the EU, the creation of the Customs Union of the Eurasian Economic Union in 2010, the impact of the DCFTA on Ukrainian trade, which were undoubtedly very important issues for Ukraine.

For example, in the work of Oleksandr Shepotylo (2010), the gravity model was used to assess the losses from Ukraine's non-integration into the EU in 2000-2007. The point of the paper was to assess which strategy would be more profitable for Ukraine: integration into the EU or a Russian-centric one (a Commonwealth of Independent States (CIS)). The assessment showed that Ukraine benefits in both cases, but the benefits from integration with the EU (increased trade volumes and, accordingly, GDP growth) are greater than that from integration with the CIS.

The next work by Shepotylo (2013) continued his analysis done in 2010. Using the gravity model, the author made an attempt to assess what would be the best of the three counterfactual scenarios, for the trade: joining the CU (Customs Union), signing a free trade agreement with the EU, or joining the EU. According to the model's estimates, the total value of Ukraine exports as compared to export data of 2009-2011 would increase in any case. Joining the CU would give the growth by17.9%, entering into FTA with EU and joining EU - 36%, and 46.1%, respectively. This gave the evidence that Ukraine's current trade policy has definitely needed changes.

In the work of Söderlund (2024), the gravity model was applied to study the effect of conclusion of the Free Trade Agreement between Ukraine and the EU (DCFTA). To simplify the application of the gravity model the countries were divided into three categories by GDP level, and into four - by GDP per capita. To analyze the results of applying the model, the author used difference-in-difference regression. The results appeared to be in good agreement with the actual indicators for the period of observation thereby justifying such an approach.

Number of scholars included the fixed variable of ongoing conflict into the gravity equation to measure how conflict influences trade. The early results were controversial. Thus Polachek (1980) came to conclusion that relation between conflicts and international trade is negative. Barbieri (1999) stated that probability of military conflict positively depends on the level of interstate economic relations including trade. Similar statement was given in Ray (2005).

The estimation of damage caused by military conflict in trade also differs. Mansfield and Pevehouse (2000) stated that conflicts have insignificant influence on trade, while Blomberg and Hess (2006) compared it to as much as 30% tariff on trade (the figure includes conflicts of all types). Ward and Hoff (2005) based on data from 1980 to 2001 found that "often reported link between international conflict

and bilateral trade is elusive", which was really the case in times when the majority of conflicts were driven by the reasons of the Cold War rather than by any trade considerations.

Recent papers provide more deliberate analysis dividing conflicts by types and taking into consideration political environment thereof. Kamin (2022) employed the gravity model and the PPML method to analyze how conflicts influence international trade based on UCDP and COMTRADE data for the period from 1992 to 2011. The study involved five different types of conflict: interstate armed conflict; internal armed conflict; internationalized internal armed conflict; one-sided violence; non-state conflict.

The study showed that conflicts of different types produce different influence on international trade in terms of magnitude and direction. In particular, interstate armed conflict which is the point of our interest in this Thesis reduces trade flows by 3.9% for the involved state (exporter or importer) and being the territory of such conflict adds additional trade flow decrease by 24.2% (the author outlined that results are robust in PPML specification, that is with account of only two control variables - distance and preferential trade agreements). Karam and Zaki (2016) studied influence of conflicts on trade in Middle East and Northern Africa covering 21 MENA countries and data from 1995 to 2014. Their gravity model also included war variables different for different types of conflicts. The negative impact of war on the trade in goods was estimated at the rate equal to 5% tariff, while no harm to trade in services was detected regardless of the type of conflict. In case of armed conflict (corresponds to interstate armed conflict in Kamin (2022)) ad valorem equivalent differs by sectors and unexpectedly give positive figures for the "furniture except metal" +185%, "other chemistry" +24%, "other non metal min.prod." +51%, "fabricated metal products" +19%.

Gravity model for aggregated data estimates the change in the total volume if bilateral trade flow. Moving to the sector-level analysis using to different specifications of the gravity model equation give more details. In the specification where the dependent variable is the value of exports to the partner country in a given sector, the model allows us to estimate the overall growth in the scale (intensity) of trade within a particular industry.

Number of scholars applied gravity model to the studies of intensive and extensive margins of trade.

The definitions of intensive and extensive margins may differ depending on the unit of analysis (Altan and Olcay, 2016). Product based definition states that extensive margin includes only those exporting items that have never been exported before, while exporting traditional item to a new market is considered as intensive margin. In contrast, the product-country approach by Besedes and Prusa (2011) implies that entry of traditional exporting product to a new market is included in extensive margin.

*Chapter 3*

# METHODOLOGY

Based on the review of existing studies given in the Chapter 2 I consider the gravity model as the best instrument for studying CUFTA impact on Ukrainian exports to Canada both on aggregate and sectoral trade flow levels.

## 3.1. Gravity model of trade

The classical gravity model originates from physics and is expressed as follows:

$$T_{ij} = A \times Y_i^a \times Y_j^b / D_{ij}^c, \quad (1)$$

where $A$ is a constant term, $T_{ij}$ is the value of trade between country *i* and country *j*; $Y_i$ is country *i*'s GDP, $Y_j$ is country *j*'s GDP; $D_{ij}$ is the distance between the two countries. The powers *a*, *b*, and *c* are chosen to fit the actual data as closely as possible. GDP captures the size of the partners' economies: larger countries are expected to trade more, while distance serves as a trade barrier, and hence would reduce the trade between the countries.

Yotov et al. (2016) pointed out that in order to secure unbiased results of gravity model application a researcher must consider the following problems.

First of all this is a treatment of multilateral resistance term, since bilateral trade flows are determined not only by the direct bilateral trade costs between the two partner countries, but also by their trade costs relative to other partners.

Neglecting multilateral resistances will mix the effect of bilateral trade costs with general equilibrium forces.

The standard solution to the problem of multilateral resistance in panel gravity is to include fixed effects of exporter time and importer time. Use of fixed effects of exporter-year and importer-year has become an established best practice in the empirical trade literature, and any specification of gravity model that does not take them into account may result in estimates that are theoretically inconsistent and empirically unreliable (Yotov et al., 2016).

Another problem is related to the presence of zero trade flows in bilateral trade data. Standard log-linear least squares estimation requires a logarithmic transformation of the dependent variable, which is not defined if trade flows are zero. Researchers have traditionally addressed this problem by dropping zero observations or adding a small constant before logarithmic transformation. However, such approaches lead to sampling bias and inconsistent estimates, especially when zeros are not randomly distributed across country pairs (Santos Silva and Tenreyro, 2006).

Heteroscedasticity in the trade data must be taken into consideration as well. Under heteroscedastic errors, the expected value of the log-linearized model is not equal to the logarithm of the expected value of the original multiplicative model. Santos Silva and Tenreyro (2006) showed that this generates inconsistent least squares estimates even in the absence of zero flows, and that the magnitude of the bias is empirically significant.

To simultaneously address the problems of zero trade flows and heteroscedasticity, it is worth using Poisson pseudo maximum-likelihood (PPML) estimation as the main estimation method. PPML estimates the gravity equation in its multiplicative form, without requiring a logarithmic transformation of the dependent variable.

In this study I will use the following specification for gravity model (Levchenko, 2025):

$$T_{ikt} = \exp\left(\beta_0 + \beta_1 bohtCUFTA_{ijt} + \beta_2 GDP_{it} + \beta_3 GDP_{jt} + \right. \quad (2)$$
$$+ \beta_4 FTA_{ijt} + \beta_5 ln(Distance_{ij}) + \beta_6 comlegal_{ij} +$$
$$+ \beta_7 comlang_{ij} + \beta_8 colony_{ij} + \beta_9 contiguity_{ij} +$$
$$\left. + \beta_{10} interstate_war_{ijt} + \beta_{11} any_conflict_{ijt} + \alpha_t\right) + \varepsilon_{ikt},$$

where $T_{ijt}$ is the trade flow from country *i* to country *j* in a period *t* (in thousands of US dollars). GDPs for origin(exporter) and destination (importer) countries at period *t* ($GDP_{it}$ and $GDP_{jt}$, correspondingly, in current thousands USD).

The model also includes standard binary variables proxying the trade costs: common language ($comlang$), common legal system ($comlegal$), common border ($contiguity$), colonial relations in the past ($colony$); distance between countries ($Distance_{ij}$).

$FTA_{ijt}$ reflects existence of free trade agreement between two trading partners. The FTA variable controls for the impact of other then CUFTA free trade agreements: I excluded CUFTA from the *FTA* variable for the Ukraine-Canada pair after 2017. This was done in order to separate the effect of CUFTA ($bothCUFTA$) from the effect of other FTAs. Otherwise, the effect of CUFTA would be "diffused" between the two variables.

$\alpha_t$ is a set of fixed effects exporter-year and importer-year, correspondingly. $\varepsilon_{ijt}$ is an iid zero-mean error term.

Binary variable $bothCUFTA$ =1 for the pair Ukraine-Canada in 2017-2024 when CUFTA was in effect and has zero value for this country pair in all preceding years and for any other country pair. This dummy would capture CUFTA effect on the trade between Ukraine and Canada.

Two more key binary variables are included to control for the impact of military conflicts on bilateral trade flows.

Binary variable $interstate_war_{ijt}$ = 1, if the countries are involved in an interstate armed conflict with each other in period *t*, $interstate_war_{ijt}$ = 0 otherwise.

Binary variable $any_conflict_{ijt}$=1, if at least one of the countries in the pair is involved in armed conflict of any type (including interstate war, inner conflict, internationalized inner conflict), and $any_conflict_{ijt} = 0$ otherwise.

Introducing these two conflict variables allows to separate the influence of direct interstate war from that produced by other conflicts which may be less destructive for international trade and thereby to assess particular effect of the interstate military conflict. The binary variable $any_conflict_{ijt}$ allows also to control general level of instability in the countries-partners.

To account for the heteroscedasticity and presence of zero trade flows, this study follows the recommendations of Santos Silva and Tenreiro (2006) and uses Poisson pseudo-maximum likelihood (PPML) estimation as the main estimation method.

The hypothesized effects of explanatory variables included in the models (Eqs. 2-4) are summarized in Table 1.

I estimated gravity model for aggregate export in two alternative specifications: with and without fixed effects. For the gravity model with fixed effects I used time-variant country fixed effects (exporter-year and importer-year).

Table 1. Explanatory variables and expected signs

| Variable | Expected sign | Explanation |
|---|---|---|
| Trade balance, CUFTA17, CUFTA24 | + | Reducing tariffs and barriers increase trade |
| Free trade agreements | + | An FTA reduces tariff and non-tariff barriers, thereby reducing trade costs and stimulating bilateral trade |
| Distance | - | Longer distance requires higher transportation costs |
| GDP | + | The larger the economy, the more goods a country produces |
| Common language | + | A common language reduces communication barriers |
| Common border | + | A common border facilitates trade, reducing trade costs |
| Common legal system | + | Similar legal systems reduce transaction costs |
| Colonial relations in the past | + | Colonial ties create long-term relationships |
| Covid | - | The pandemic destroys the global supply chains and demand by means of reducing trade flows |
| Interstate war | - | Interstate war significantly reduces bilateral trade |
| Any armed conflict | - | The presence of any conflict has a negative impact, but a smaller magnitude than interstate war |

The fixed effects of exporter-year and importer-year absorb all variables that vary only at the exporter or importer level over time, i.e. the GDP variables. The variables *FTA* and $bothCUFTA$ of the model have two-way and time-varying character, so they remain in play, as will the cultural-historical variables and the

distance variable. The advantage of using such fixed effects is to obtain unbiased estimates for CUFTA variables.

To better assess the impact of CUFTA on Ukraine's bilateral export flows at sectoral level, I build a gravity model of international trade between Ukraine and its each trading partner using a higher frequency of the data - quarterly. Changes in trade are assessed in terms of intensive and extensive margins. In the specification where the dependent variable is the number of active product lines at the 6-digit level of the Harmonized System (HS6) in sector, the model estimates the emergence of fundamentally new varieties of products within this sector (extensive margin). Such approach allows to separate CUFTA induced growth in Ukrainian exports to Canada due to increase in the volume of traditional goods from the exports growth due to expansion of the range of exported products.

As I study bilateral Ukraine-Canada trade I employ the product-country approach in the definition of intensive and extensive margins. Intensive margin refers to changes in trade volumes within existing trade relations (i.e., whether CUFTA increased the value of Ukraine's exports in sectors where Ukraine already traded with Canada before the agreement). Extensive margin reflects the emergence of new trade relations (new product categories).

The gravity equation used to estimate the intensive margin in this study has the following form (Bista, 2012):

$$T_{ikt} = \exp(\beta_0 + \beta_1 CUFTA17_{it} + \beta_2 CUFTA24_{it} + \beta_3 GDP_{it} + \\ + \beta_4 FTA_{it} + \beta_5 ln(Distance_i) + \beta_6 comlegal_i + \\ + \beta_7 colony_i + \beta_8 contiguity_i + \beta_9 covid_t + \\ + \beta_{10} interstate_war_{it}) + \varepsilon_{ikt}, \quad (3)$$

where $T_{ikt}$ is Ukraine's export value to partner country *i* in sector *k* in quarter *t* (in USD).

For sectoral analysis the policy variable CUFTA is divided in two components: $CUFTA17_{it}$ and $CUFTA24_{it}$. $CUFTA17_{it}$ is a binary variable equal to 1 for Canada from 2017Q3 onwards and zero otherwise. This variable captures the trade impact of the first stage of CUFTA, which entered into force on August 1, 2017. $CUFTA24_{it}$ is a binary variable equal to one for Canada since the third quarter of 2024. This variable captures the effect of the amended agreement. Both dummy variables are zero for all other trading partners in all periods. $covid_t$ is a binary variables, which equals to 1 from 2020Q1 to 2021Q3. This variable captures the trade disruption associated with the COVID19 pandemic. Binary variable $interstate_war_{it}$= 1 for the Ukraine-Russia pair from 2022Q1 onwards captures the trade effect of Russian's full-scale invasion of Ukraine, classified as an interstate armed conflict (type 2) in the UCDP/PRIO Armed Conflict Dataset. The $FTA_{it}$ variable, as well as the gravity covariates ($Distance_i, colony_i, contiguity_i, comlegal_i$) were set as before.

PPML is also applied in this case similar to the gravity model for total aggregate exports expressed by equation 2. As mentioned above, PPML takes into account two key limitations of the log-linearized OLS approach: the inconsistency of OLS estimates in the presence of heteroscedasticity in the trade data and the inability of log-linear models to account for zero trade flows. Since the dataset for the sector-level analysis covers a single reporter (Ukraine) that trades with several partner countries over quarterly time periods, the two-way fixed effects structure used in multilateral gravity models (exporter-year and importer-year FEs) were adapted accordingly: exporter - time fixed effects reduce to time fixed effects (quarter FE). I estimated the model in two alternative specifications: with and without fixed effect. To ensure comparability between specifications, the

estimation sample was determined by the observations used in the quarter FE model. Standard errors are clustered at the partner country level to account for serial correlation between trade flows within country pairs over time.

The extensive margin specification includes the same set of the independent variables as intensive one:

$$N_{ikt} = \exp(\beta_0 + \beta_1 CUFTA17_{it} + \beta_2 CUFTA24_{it} + \beta_3 GDP_{it} + \\ + \beta_4 FTA_{it} + \beta_5 ln(Distance_i) + \beta_6 comlegal_i + \\ + \beta_7 colony_i + \beta_8 contiguity_i + \beta_9 covid_t + \\ + \beta_{10} interstate_war_{it}) + \varepsilon_{ikt}, \quad (4)$$

where $N_{ikt}$ is the number of active HS6-digit product lines exported by Ukraine to partner country *i* in sector *k* and quarter *t*.

Gravity model was estimated econometrically in R using the "fepois" function from the "fixest" package. The "fixest" package implements a family of fixed-effects estimators (Berge, 2018). They are designed for high-dimensional panel data. The "fepois" function provides a pseudo-maximum likelihood Poisson estimator with an arbitrary number of fixed effects thereby allowing to avoid construction of a full matrix of dummy variables. Using the argument "vcov" contained in "fixest" package, two-way clustering was performed.

*Chapter 4*

# DATA

## 4.1. Data preparation

In this thesis the following sources of data are used for trade flow analysis: the CEPII (Centre d'Etudes Prospectives et d'Informations Internationales), which contains data on annual bilateral trade flows; the UN Comtrade (Commodity Trade Statistics) Database; the International Trade Center (https://www.intracen.org/); the data from the State Statistics Service of Ukraine, the World Bank database, Mario Larch's Regional Trade Agreement database, UCDP/PRIO Armed Conflict database (Pettersson, 2025), the IMF World Economic Outlook.

The CEPII dataset covers the period of 2000-2020 (Conte et al., 2022). This allows to check the changes in trade before the entry into force of CUFTA in 2017 and in the following 4 years. Similar data for the period from 2021 till September 2025) are collected from the UN Comtrade (Commodity Trade) Statistics Database, and International Trade Center. The CEPII contains a gravity dataset, which includes important trade covariates (data on common language, historical colonial relations, common borders, common legal system), data on distance between countries, the presence of trade agreements and macroeconomic variables. Annual values of GDP for the period from 2021-2024 are collected from the World Bank database (WDI). I applied forecasted GDP values for 2025 from the IMF World Economic Outlook (April 2025) to fill in currently absent WDI data for this year.

Information on existence of free trade agreement (FTAs) for the entire study period was taken from Mario Larch's Regional Trade Agreement database (version rta_20260111) (Egger and Larch, 2008), which is a standard source for

gravity models. This database consists of binary variables for each country-year pair including the existence of FTA. Data for 2014-2020 were used for validation and alignment with CEPII.

Data on armed conflicts were taken from the UCDP/PRIO Armed Conflict Dataset v.25.1 (Gleditsch et al., 2002; Petterson et al., 2023). This database is an authoritative source of information on armed conflicts worldwide since 1946 and defines armed conflict as "a dispute between a state and/or an organized group that results in at least 25 combat-related deaths during a calendar year." I used the variable "type_of_conflict" from this dataset, which corresponded to the one of four types of conflict: extrasystemic (type 1), interstate (type 2), intrastate (type 3) and internationalized intrastate (type 4) (see Table 8 in Appendix A).

### 4.2. Data description

CUFTA became effective in 2017 and I include into consideration pre-CUFTA period since 2014 to show the CUFTA induced changes in bilateral trade between Ukraine and Canada under CUFTA.

Previous studies of CUFTA were limited in time by three years from 2017 to 2019. I extended the period of study to September 2025 in order to get the effect of CUFTA in its full capacity, though the impact of CUFTA amendments adopted in 2024 may still require more detailed study in the future.

The data on annual Canada-Ukraine bilateral trade flow values reported by each country are presented in Figure 1. 2014-2017 is a reference period preceding CUFTA. The period from 2017 to 2019 has been covered by the previous studies, which have already demonstrated the growth of Ukraine's export to Canada under CUFTA (see Hamaniuk et al., 2020). The part of the Figure 1 from 2019 to 2024 present original results.

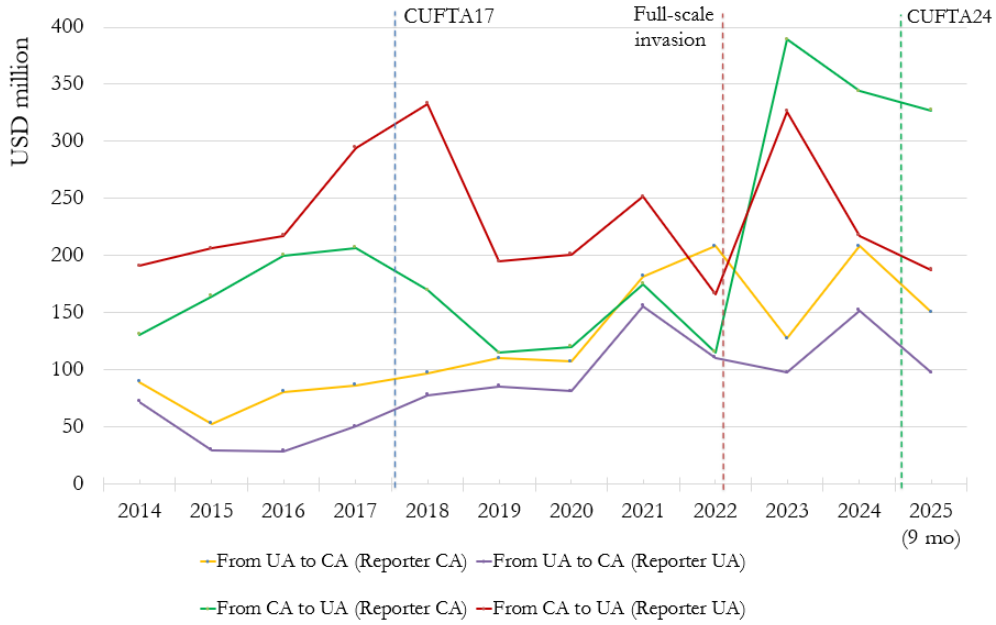



Figure 1. Trade flows from Canada to Ukraine and from Ukraine to Canada by reporter, USD million

Source: own calculations based on UN Comtrade data

The exports from Ukraine to Canada is depicted by blue (as reported by Ukraine) and yellow curves (as reported by Canada). Canadian exports to Ukraine is given by red (as reported by Ukraine) and green (as reported by Canada) ones. The graph clearly shows the discrepancies in reported values. Such difference may be attributed to different INCOTERMS conditions used by exporter and importer (FOB and CIF respectively), use of different currency exchange rates, recording of same shipment in different periods due to the time consuming shipment and likewise (Bustos et al., 2026).

The year 2022 gives a sharp decline in trade volumes except for the yellow curve depicting UA exports as reported by Canada. I explain this by the sea shipping time lag. In 2023 exports from Canada recovered its tendency to increase, while

Ukrainian exports had been declining until 2024. Observed behavior of Ukrainian exports is clearly the consequence of the full-scale Russian invasion.

4.2.1. Descriptive statistics of the aggregate trade flows (annual data, HS2-digit level)

In gravity model applied to the aggregate flows analysis I used data for countries, with GDP higher than $25 billion in order to minimize the "information noise" in the data. If a pair of countries had no trade during the period under consideration, we constructed zero trade flows for these observations. The dataset for the period 2014-2024 included 122 countries. After I excluded the pairs $i = j$ (i.e. the country trades with itself) the total number of observations was reduced to 121,708.

Table 2 provides descriptive statistics of the continuous variables which helps to take a first look at the data (2014-2024) before running a regression.

Table 2. Descriptive statistics of continuous variables in the trade gravity dataset

| | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Trade flow (exporter) | 121708 | 1620.47 | 11229.51 | 0 | 582756.1 |
| Distance (km) | 121708 | 7251.66 | 4527.79 | 55 | 19930 |
| GDP (exporter) | 121708 | 867178.32 | 2706211.99 | 25036.99 | 28750956.11 |
| GDP (importer) | 121708 | 839446.90 | 2623342.38 | 25008.68 | 28750956.11 |

Note: Trade flows and GDP in million current USD. Distance in kilometers

As we can see from the Table 2 trade flows vary from zero to hundreds of billions of dollars, reflecting the diversity of global trade relationships. The maximum value of the explained variable, China exports, is about 582 billion of dollars (the partner country was USA in 2022). The mean value of an export flow is 1.62 billion of dollars, while standard deviation is 7 times higher at 11.23 billion of dollars, meaning there is a large variation in trade. The minimum value of the trade flow is clearly zero.

GDP ranges from $25 billion (Trinidad and Tobago) to $28.7 trillion (USA), that is the sample includes economies of different sizes justifying the use of logarithmic transformations in the model.

The largest recorded distance is more than 19,930.00 km which separates Paraguay from Taiwan. The average distance between the countries in the sample is approximately 7,251.66 km, with large dispersion (sd=4,527.79), reflecting a diverse set of country pairs.

Table 3 shows that the treatment variable $bothCUFTA$ equals 1 for only 16 observations (Ukraine-Canada bilateral trade, 2017-2024). About 27% of observations involve free trade agreements. The *FTA* variable was adjusted to ensure clean identification of the CUFTA effect. Active interstate war was rare, occurring only in 0.07% of observations (86 country-pair). The highest rate among all binary variables belongs to the common legal system and any armed conflict: they include 36.74% and 39.51% of country pairs, correspondingly.

Descriptive statistics of the continuous and binary variables for the selected years: 2014, 2016, 2019, 2021 and 2024 additionally presented in Table 6 (Appendix A).

Table 3. Descriptive statistics of binary variables in the trade gravity dataset

| Variable | N | Proportion | N (value =1) |
|---|---|---|---|
| bothCUFTA | 121708 | 0.0001 | 16 |
| FTA | 121708 | 0.2707 | 32943 |
| Comon border | 121708 | 0.0276 | 3365 |
| Common language | 121708 | 0.1028 | 12508 |
| Colony | 121708 | 0.0565 | 6877 |
| Common legislation | 121708 | 0.3674 | 44719 |
| Interstate war | 121708 | 0.0007 | 86 |
| Any armed conflict | 121708 | 0.3951 | 48088 |

Notes: Binary variables coded as 0/1. Proportion shows the share of observations where variable equals 1. Sample period: 2014-2024

4.2.2. Descriptive analysis of the aggregate trade flows (annual data, HS2-digit level)

Figure 2 shows the structure of Ukraine's exports to Canada based on annual averages at the HS2-digit level as reported by Ukraine for three reference periods (main stages of the trade regime): three years of pre-CUFTA period (2014-2016); the 3-year period of CUFTA implementation before the full-scale Russian invasion (2019-2021); the 2- years period of operation under conditions of war and, partially, the amendments to CUFTA introduced in the mid of 2024 (2023-2024).

As seen from Figure 2 the structure of Ukrainian exports has been transformed dramatically between the first and third periods. In pre-CUFTA period the structure of Ukraine's exports to Canada was characterized by the dominance of several traditional categories. The largest export volumes were accounted for by Copper ($9.8 million), Railway equipment ($2.7 million), Tanning extracts ($4.2 million), and Iron and steel ($2.3 million). Together, they covered almost 60% of

Ukrainian exports. Other sectors had significantly smaller volumes, thereby indicating raw and semi-finished goods character of exports in 2014-2016.

The first signs of structural transformation became visible in 2019-2021.

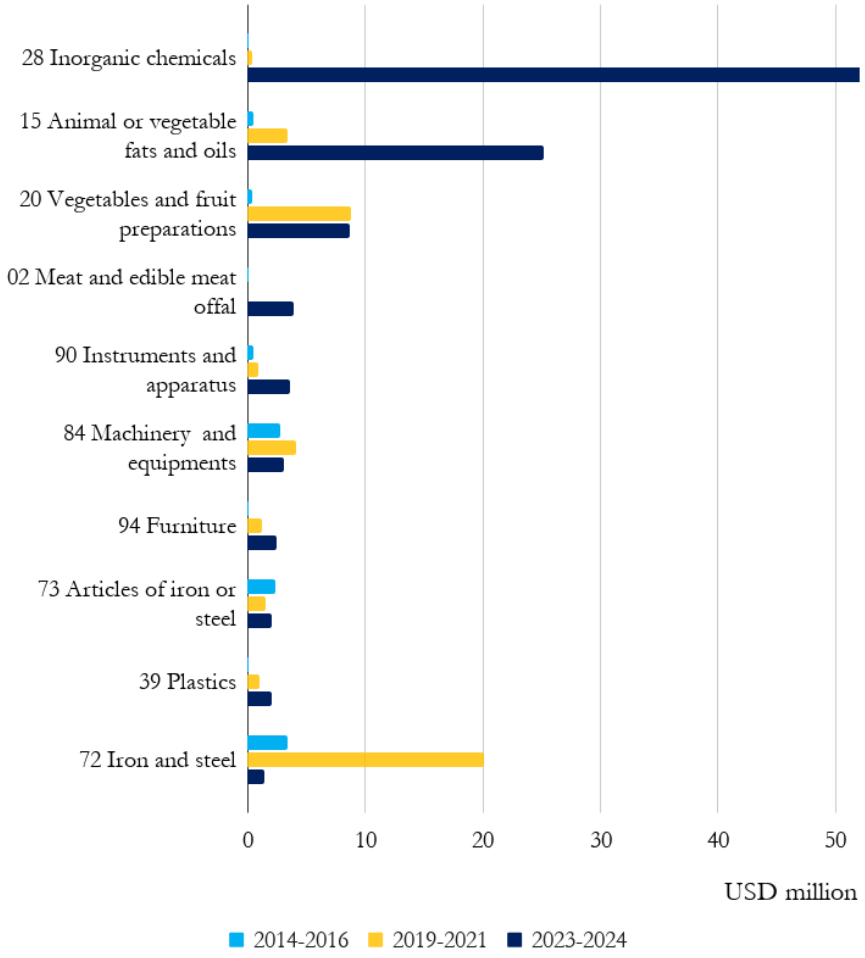



Figure 2. Structure of Ukraine's exports to Canada: 2014-2016, 2019-2021, and 2023-2024, annual averages, HS2, USD million

Source: own calculations based on UN Comtrade data

While the export volumes of Iron and steel increased to $20.1 million, and Copper- to $20.4 million, mostly reflecting the dynamics of world prices for raw materials, the new sectors started growing: Vegetables and fruit preparation; Vehicles; Animal or vegetable fats and oils. The beginning of interstate military conflict in 2022 resulted in the fundamental reorientation of the geography of Ukraine's exports, and in particular almost full elimination of traditional exports of raw materials to Canada with the simultaneous and sudden appearance of exports in Inorganic chemicals category. Detailed data on the structure of Ukraine's export to Canada and its dynamics for 2014-2025 are presented in Tables 7-13 in Appendix A.

The new trend continued after adoption of CUFTA amendments in 2024. Exports of Inorganic chemicals grew explosively to $52.7 million, becoming the leader with almost 40% share of total Ukrainian exports to Canada. Animal or vegetable fats and oils and Vegetables and fruit preparations have also strengthened positions reflecting growing orientation of Ukraine's export to Canada towards agri-food products. Meat and edible meat offal became yet another significant new category which benefited from CUFTA induced liberalization and reached $3.9 million in exports volume. The growth in Ukraine's export in Miscellaneous articles of base metal to $1.5 million in 2023-2024 indicates a shift in favor of products with higher value added in Ukrainian export.

The most recent data comparing the structure of Ukrainian exports to Canada in 2024 and the first 9 months of 2025 are given in Figures 9 and 10 in Appendix A.

#### 4.2.3. Descriptive statistics of the disaggregate trade flows (quarterly data, HS6-digit level)

For the analysis at sector level the Ukrainian monthly export flows were sourced from the UN Comtrade database for the period January 2014 through September 2025, covering 99 sectors. The intensive margin analysis was performed on the

two-digit HS classification level, and the HS6-digit level data were used for extensive margin analysis. The choice of 2014 as the starting year reflects the onset of the hybrid conflict in Luhansk and Donetsk oblasts of Ukraine, which constitutes a structural break in Ukraine's trade patterns as well as the starting point of the relevant pre-treatment period for the CUFTA17 analysis.

Note the UN Comtrade data base does mot include information on the trade between partner countries in case of zero trade flow - it reports on positive figure only. To cope with this information gap, I assigned zero value to each country-quarter combination that was absent in the initial dataset. Based on these monthly data I the constructed the quarterly datasets.

I also excluded from the observations all entries of "Other Asia, nes" and "Areas, nes" as they did not represent sovereign trading partners. The observation referring to the partner-countries with no information on GDP in the sample period (Cool Islands, North Korea and likewise) have also been excluded. Sectors HS47, HS50, HS78, HS80 were excluded from the analysis because there is no trade with Canada in these sectors.

Tables 14-15 in Appendix A provide descriptive statistics for the main variables in the categories of Ukraine's exports to Canada that have been used in the analysis. The number of partner countries depends on geographic coverage of export in each sector thereby ranging from 44 (Furskins and artificial fur) to 185 (Machinery and equipment).

Figures 3 and 4 show the exporting dynamics for the period from 2014 to September 2025 in sectors that cover more than 60% of exports from Ukraine to Canada (quarterly data, as reported by Ukraine): Furniture; Iron or steel; Inorganic chemicals; Animal or vegetable fats and oils; Meat and edible offal.

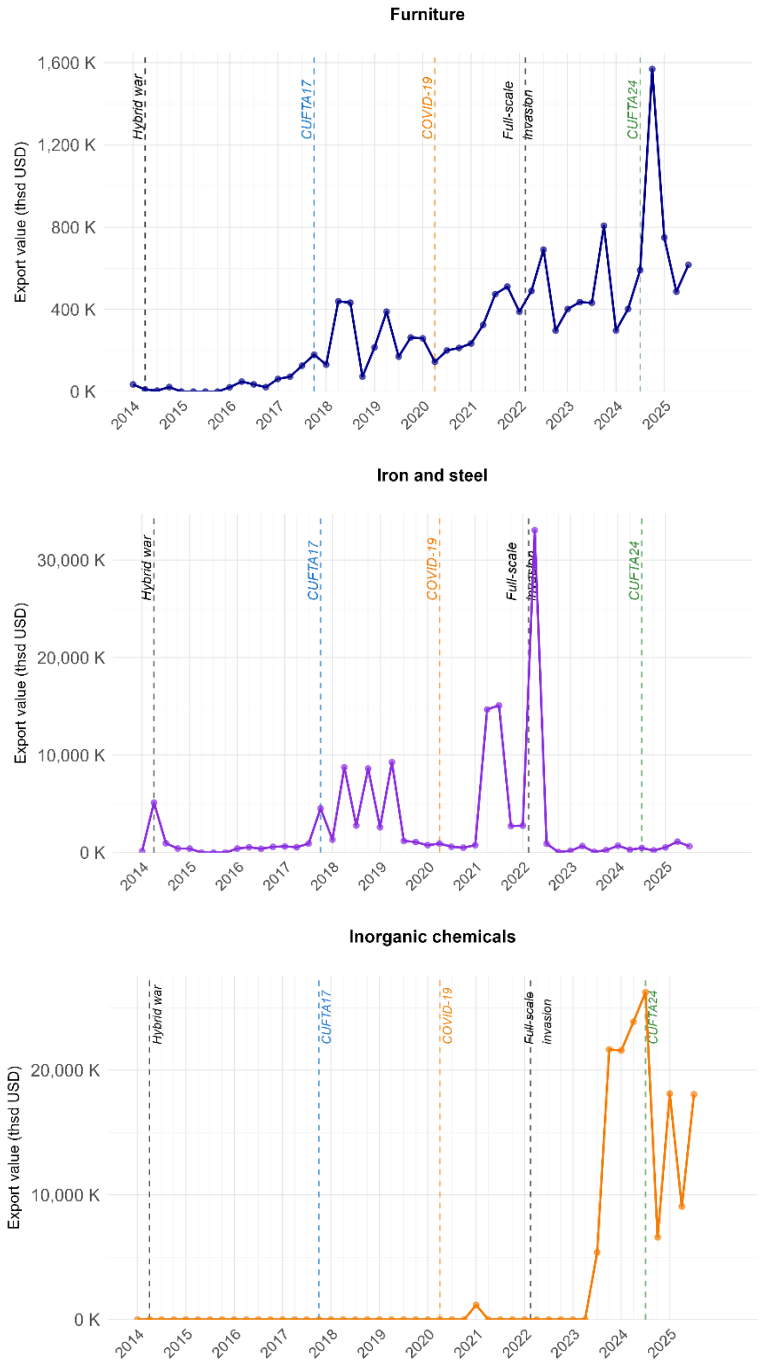



Figure 3. Ukraine's export to Canada by selected categories, quarterly data, USD thsd (as reported by Ukraine)

Source: own calculations based on UN Comtrade data

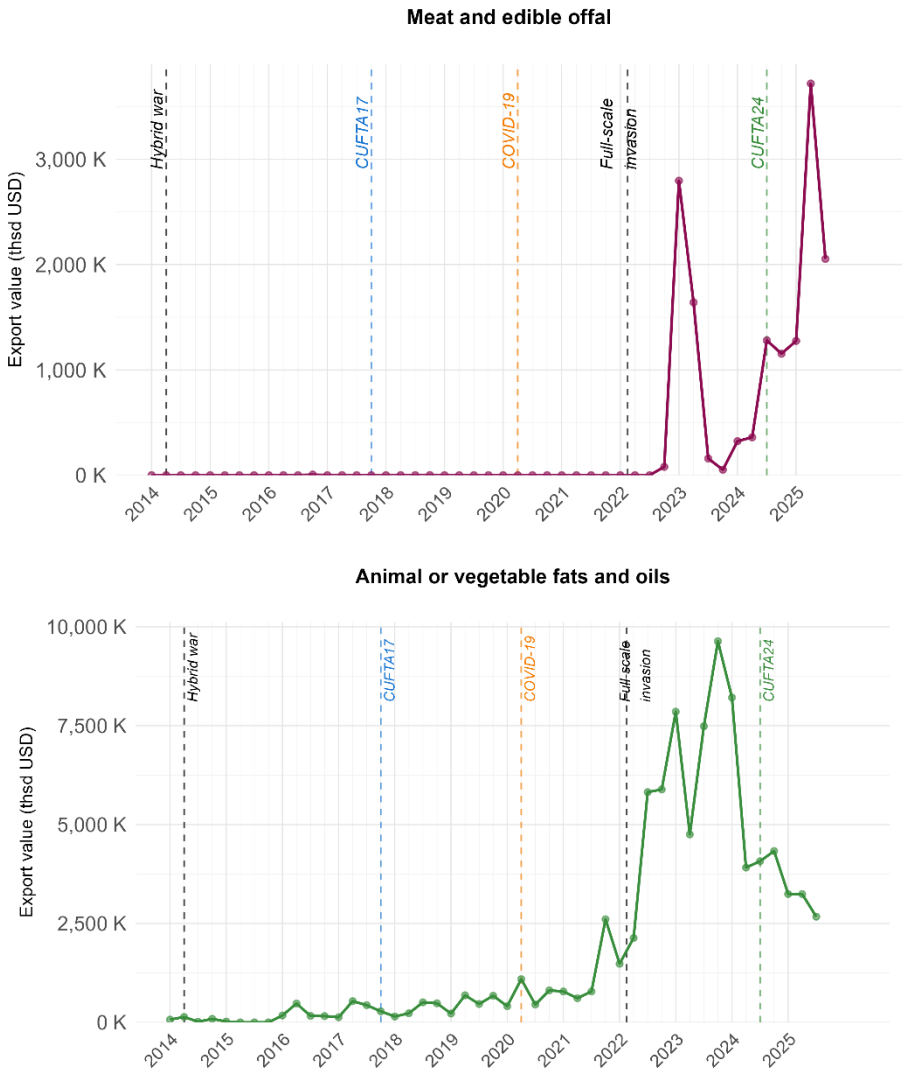



Figure 4. Ukraine's export to Canada in agri-food categories, quarterly data, USD thsd (as reported by Ukraine)

Source: own calculations based on UN Comtrade data

The vertical dashed lines on the graphs indicate key events that affected the trade flows: the start of hybrid war (2014Q2), entry into force of CUFTA17 (August 2017), Covid19, full-scale Russian invasion (2022Q1) and entry into force of amended CUFTA24 (July 2024). Quarterly data for different groups of goods

demonstrate different reactions to external influences. The dynamics of Ukraine's exports to Canada for other categories (based on quarterly data) for the period from 2014 to September 2025 are presented in Figure 11 in Appendix A.

Figures 5 and 6 show the quarterly dynamics of the number of HS6 product lines ($N_{ikt}$) of Ukraine's export to Canada (bars) along with the average number thereof for other active trading partners of Ukraine (solid line) for the period from 2014 to September 2025.

For the pre-CUFTA17 period, the number of HS6 product lines of goods exported to Canada is lower than the average among partner countries in most sectors. After CUFTA17 has entered into force, an increase in the number of HS6 product lines is observed in most sectors. For agri-food sectors (Animal fats and oils; Vegetable preparations) this indicator is higher than the average number of active trading partners. The full-scale invasion of 2022 (marked by the dashed red line) leads to disruptions in the vast majority of sectors. As seen from Figure 6 the number of product categories in Iron and steel decreased by half. Respective dynamics Inorganic chemicals and Vehicles is more stable. Certain quarters show even slight increase in the number of product lines in these sectors (see also Figure 12 and Table 15 in Appendix A).

CUFTA effects on Ukraine's export to Canada are discussed in detail below in Chapter 5.

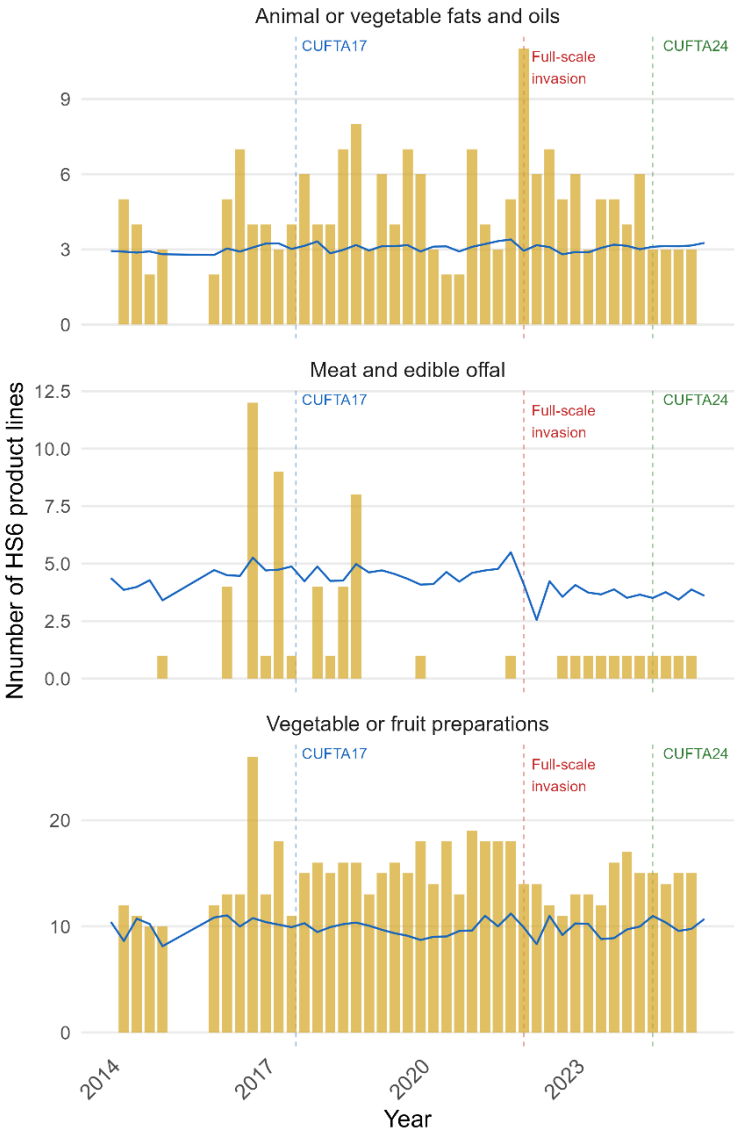



Figure 5. Dynamics of the number of HS6 product lines of Ukraine's export to Canada in agri-food sectors, quarterly data (as reported by Ukraine)

Source: own calculations based on UN Comtrade data

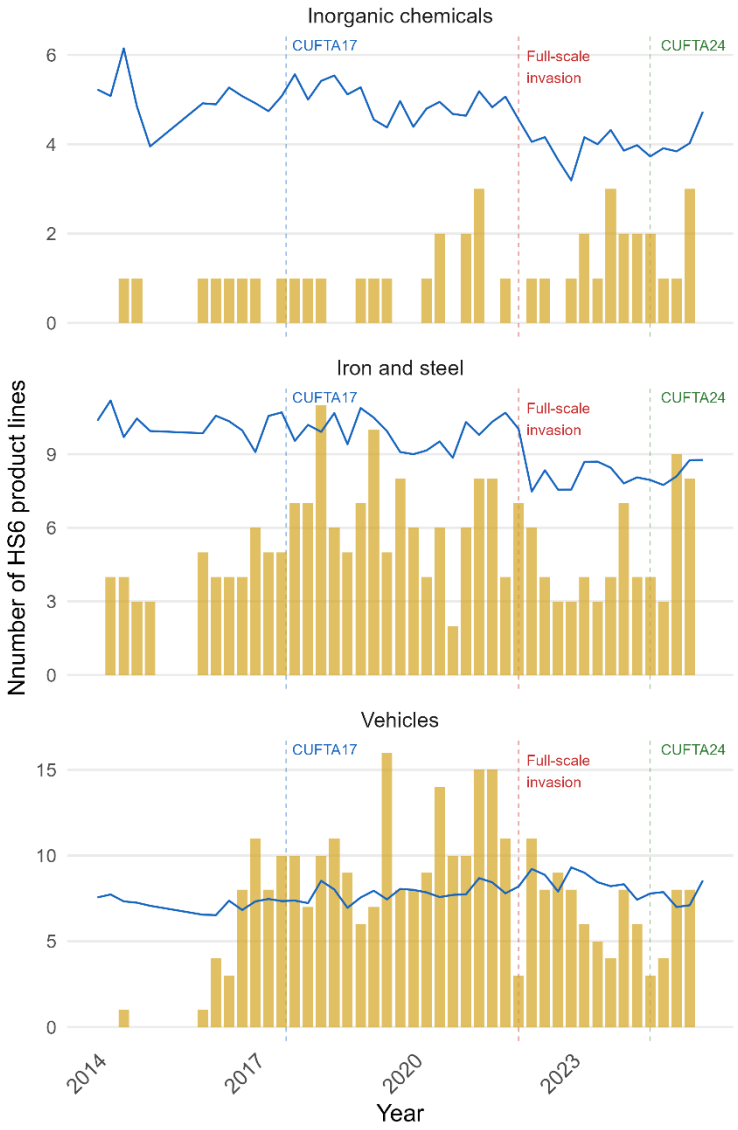



Figure 6. Dynamics of the number of HS6 product lines of Ukraine's export to Canada by selected categories, quarterly data (as reported by Ukraine)

Source: own calculations based on UN Comtrade data

*Chapter 5*

# ESTIMATION RESULTS

## 5.1. Gravity model results for aggregate trade flows

The results of the assessment of how CUFTA has affected Ukraine's exports to Canada using gravity model (2) are presented in this chapter.

Table 4 presents result of regression without (model 1) and with (model 2) fixed effects (exporter-year and importer-year). Model 1 shows the effects of variables that are absorbed by fixed effects (GDP, cultural factors). Model 2 takes into account all unobserved heterogeneity of the countries over time. So, two models complement each other.

Both models show a negative sign for the CUFTA variable (-77.3% and -39.9% respectively) and the variable itself is statistically significant. In model 2, this coefficient is smaller in absolute value compared to the model 1, since fixed effects (exporter-year and importer-year) already partially account for the factors that reduce trade (since FE control everything that is specific to the country in a particular year: political situation; macroeconomic shocks; trade policy changes; seasonal factors).

The negative value of this variable reflects the low level of bilateral trade between Ukraine and Canada compared to other pairs of countries in the sample. It is consistent with the structural characteristics of the Ukraine-Canada pair such as limited cultural and institutional ties, large geographical distance, low trade flows in the pre-CUFTA period, and the disruptions caused by the 2014-armed conflict, COVID-19, and the full-scale Russian invasion of 2022.

Table 4. Estimation results for gravity regressions (aggregate trade flows)

| | model 1 (without FE) | model 2 (with FE) |
|---|---|---|
| CUFTA | −1.483*** | −0.509*** |
| | (0.0006) | (0.0006) |
| FTA | 0.496*** | 0.438*** |
| | (0.000006) | (0.000008) |
| Distance (log) | −0.527*** | −0.646*** |
| | (0.000003) | (0.000004) |
| GDP(exporter) (log) | 0.847*** | |
| | (0.000002) | |
| GDP (importer) (log) | 0.822*** | |
| | (0.000002) | |
| Common border | 0.703*** | 0.637*** |
| | (0.000007) | (0.000008) |
| Common language | 0.124*** | 0.024*** |
| | (0.000007) | (0.00001) |
| Colony | 0.970*** | 0.557*** |
| | (0.00001) | (0.00002) |
| Common legislation | −0.070*** | 0.046*** |
| | (0.000005) | (0.000006) |
| Interstate war | −2.256*** | −1.293*** |
| | (0.000007) | (0.000007) |
| Any armed conflict | −0.273*** | −0.063*** |
| | (0.000005) | (0.000002) |
| Num.Obs. | 114994 | 114994 |
| R2 Adj. | 0.850 | 0.928 |
| FE: exp_year_fe | No | Yes |
| FE: imp_year_fe | No | Yes |

Notes: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The model employs PPML method. Standard errors are given in parentheses

The *FTA* variable shows the effect of other free trade agreements (except CUFTA). The coefficient on this variable in model 1 confirms that FTAs increase trade by 64.2%. Ceteris paribus, FTAs seems to increase trade on average by 54.9% (model 2). Note that FTA effect is statistically significant and stable in both models which confirms robustness of the results.

As expected, distance has a negative effect on trade, while economy size has a positive effect, which is in line with expectations. The coefficients of all variables are statistically significant.

Interstate war has a statistically significant destructive impact on bilateral trade, reducing it by 72.6% (model 2). It supports the hypothesis that direct interstate conflict results in the breakdown (complete or partial) of trade (Blomberg and Hess, 2006; Kamin, 2022).

If one of the trading partners is involved in any armed conflict, this also reduces bilateral trade by 6.5% (model 2), which is smaller but still statistically significant effect. This difference between the coefficient values of the two types of conflicts highlights the importance of distinguishing between conflict types in gravity model analysis. Note that the coefficient of variable *any armed conflict* in the fixed-effects model is significantly smaller than in the model without FE (-0.273 and -0.063, respectively). That is in model 1 (in the absence of fixed effects) the impact of armed conflict on bilateral trade might also capture the effect from the multilateral resistance.

Both models confirm that historical colonial ties have a strong positive effect on contemporary trade (i.e. coefficient 0.557 in the FE model, corresponding to an increase of 74.5%).

The increase in the adjusted $R^2$ value from 0.850 to 0.928 after adding fixed-effects suggests that significant part of trade flows variation is explained by country heterogeneity, rather than by standard gravity factors.

5.2. Intensive and extensive margin analysis

This section presents the gravity model estimation results at sector level as described in Chapter 3: the respective specifications are given by Eqs. 3 and 4 with quarter fixed effects, which control for global demand shocks common to all trading partners in each quarter. Both models were estimated for each 80 sectors with active Ukraine-Canada trade. The values of intensive and extensive margins for all sectors are presented in Tables 16-17 in Appendix B. The results for the PPML specification without fixed effects are reported as a robustness check in Tables 18-19 in Appendix B.

Positive effect on extensive margin of *CUFTA17* is observed in approximately 60% of sectors, while intensive margin increased in about 20% of them. That is *CUFTA17* is more effective in enlarging variety of exported goods than in exports volume increase. Rationale behind such a difference is that the entry of new export product on the market requires one-time fixed costs while change in volumes implies variable export costs.

The sectors demonstrating statistically significant values in both intensive and extensive margins are of prime interest. In Chapter 4 of this thesis, I have already discussed the structural changes in Ukrainian exports to Canada and discovered advances in industrial and agri-food groups of goods. As shown in Figure 2, Table 8 industrial sectors of biggest CUFTA-induced exports were: Inorganic chemistry; Vehicles; Furniture; Machinery and equipment; Iron and steel. In agri-food category the most promising sectors include (see Figure 2 and Table 8): Vegetable and fruit preparations; Animal or vegetable fats and oils; Meats and edible offal.

Intensive and extensive margins in these specific sectors are discussed below.

The gravity regression results of intensive and extensive estimation for selected manufacturing sectors are presented in Table 5 and Figure 7.

Table 5. Intensive and extensive margin regression results for selected manufacturing sectors

| | Intensive margin | | | Extensive margin | | |
|---|---|---|---|---|---|---|
| Variable | HS28 | HS72 | HS94 | HS28 | HS72 | HS94 |
| CUFTA17 | 3.037*** | -0.919** | 1.231* | 0.258 | 0.831*** | 1.913*** |
| | (0.488) | (0.291) | (0.491) | (0.467) | (0.167) | (0.326) |
| CUFTA24 | 2.937*** | -1.157*** | 0.543*** | 0.911*** | 0.705*** | 0.093* |
| | (0.541) | (0.240) | (0.106) | (0.124) | (0.115) | (0.038) |
| FTA | -0.132 | -0.830* | 2.087*** | 0.257 | -0.028 | 1.073*** |
| | (0.402) | (0.396) | (0.542) | (0.292) | (0.160) | (0.208) |
| Distance (log) | -1.655*** | -1.452*** | -1.779*** | -1.091*** | -1.199*** | -0.969*** |
| | (0.301) | (0.155) | (0.468) | (0.222) | (0.116) | (0.118) |
| GDP (importer) (log) | 1.450*** | 0.681*** | 0.878*** | 0.445*** | 0.311*** | 0.308*** |
| | (0.231) | (0.087) | (0.104) | (0.112) | (0.047) | (0.052) |
| Common border | 2.692*** | 0.529 | 0.900* | 0.758** | 0.490** | -0.113 |
| | (0.351) | (0.491) | (0.450) | (0.293) | (0.187) | (0.148) |
| Common legislation | 1.020*** | 0.409 | -0.817* | 0.003 | 0.079 | -0.190. |
| | (0.283) | (0.353) | (0.351) | (0.213) | (0.124) | (0.111) |
| Colony | 0.828 | -0.407 | 0.326 | 1.033** | 0.349. | 0.452* |
| | (0.802) | (0.385) | (0.619) | (0.400) | (0.197) | (0.211) |
| COVID | — | — | — | — | — | — |
| Interstate war | -1.641*** | -2.227*** | -4.963*** | -2.499*** | -1.751*** | -2.987*** |
| | (0.343) | (0.471) | (0.302) | (0.329) | (0.190) | (0.138) |
| Observations | 5412 | 7084 | 6644 | 5412 | 7084 | 6644 |
| Adj. $R^2$ | 0.853 | 0.63 | 0.824 | 0.518 | 0.591 | 0.657 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The categories are: HS28 Inorganic chemicals; HS72 Iron and steel; HS94 Furniture.

The model employs PPML method. Standard errors are given in parentheses

For Inorganic chemicals which was the largest sector of Ukraine's exports to Canada for the entire period from 2014 to 2025 both *CUFTA17 and CUFTA24* have positive and statistically significant effect on the intensive margin, reflecting considerable increase in the value of exports to Canada compared to other partner countries (almost 190 times). This was the result of complete tariff elimination in Inorganic chemicals by *CUFTA17*. At the same time there is no significant extensive margin increase in this sector. The main chemical exported to Canada since 2023 is Natural Uranium and its compounds. In 2024 it constituted 43.8% of total Ukrainian exports to Canada in Inorganic chemicals. It should be noted that previously Ukraine exported Uranium to the Russian Federation. However, after full-scale Russian invasion and export ban Ukraine has fully redirected it to Canada. Thus, both combined effect of CUFTA and war resulted in considerable increase in Inorganic chemicals export to Canada.

In Furniture category, *CUFTA17* has statistically significant positive impact on both intensive and extensive margins. Intensive margin increased by 242%, the list of exporting product categories increased by 576%. The coefficients for *CUFTA24* are also positive and statistically significant (+72% intensive, +10% extensive margins). These results are consistent with the descriptive data in Figure 6 demonstrating increase in furniture exports to Canada in all three periods of observation.

Canada is a big consumer of metal and wooden furniture. Elimination of tariffs by CUFTA opened this market Ukrainian businesses. This is the main reason for such a progress of Ukrainian exporters in Furniture category.

Vehicles category shows positive effect of *CUFTA17* on both intensive and extensive margins. Intensive margin coefficient of 2.821 means 1579% increase in exports volume, while the corresponding extensive margin coefficient shows a

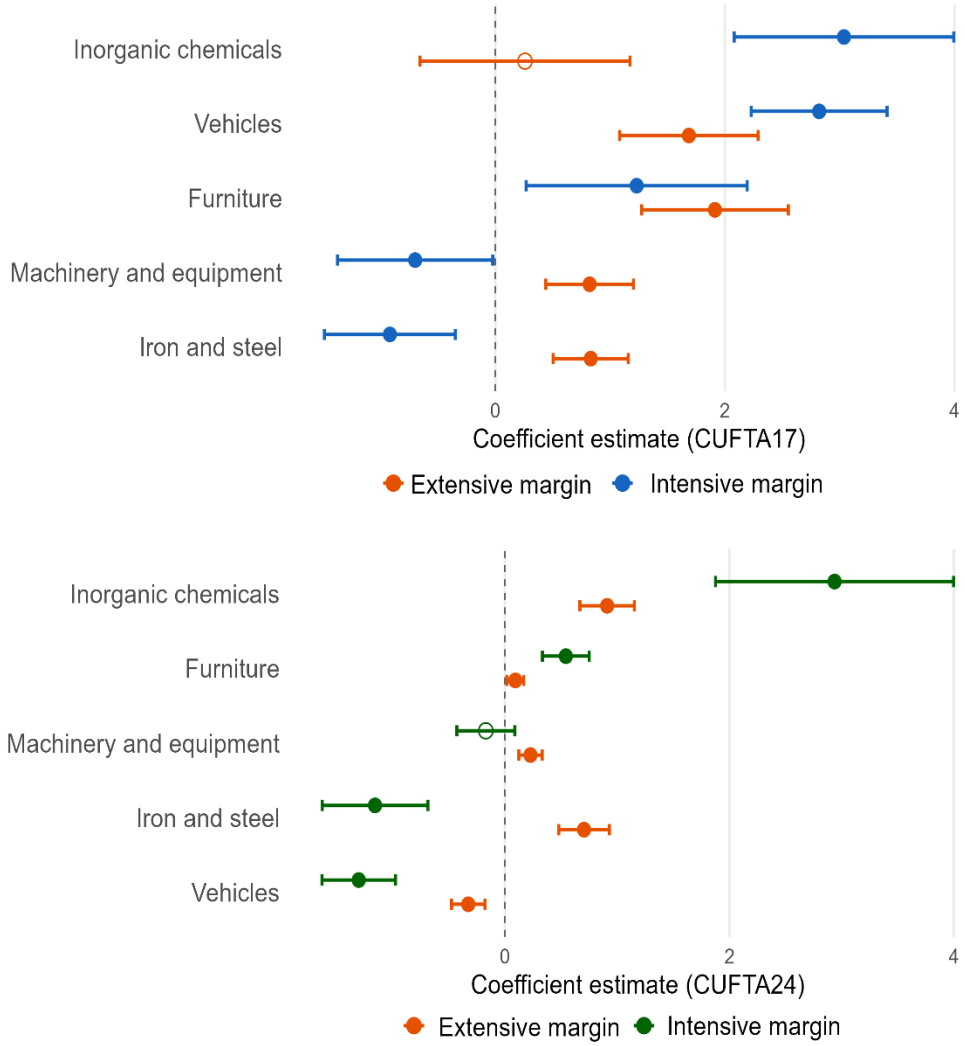



Figure 7. CUFTA effects: manufacturing sectors

Notes: p≤0.05 (filled markers); p≤0.10 (triangles); not significant (open circles). Confidence intervals truncated at ±8 for readability. PPML estimates with 95% confidence intervals

Source: own calculations based on UN Comtrade data

440% increase in the number of exported articles. Such big numbers are explained by almost zero level of exports to Canada in this sector in the period before *CUFTA17*. Ukraine found its own niche on the vehicle market of Canada under

CUFTA which mostly cars for recreation and sports (snow bikes, golf cars and likewise). However, the beginning of war forced Ukrainian producers to concentrate mostly on the needs of defense. Respectively *CUFTA24* gives negative values for intensive and extensive margins in Vehicles: -1.302 and -0.326, respectively. Summarizing, I can state that vehicles exports to Canada is affected simultaneously by CUFTA and war and has good prospective in the postwar period.

Iron and Steel is the second largest sector in terms of exports to Canada for the entire period. However intensive margin coefficients of *CUFTA17* as well as *CUFTA24* are negative in this sector reflecting the fact that Canada became less favorable market for Ukrainian iron and steel compared to other trading partners. On the contrary extensive margin coefficients of *CUFTA17* and *CUFTA24* are positive implying addition of new export products enhancing resilience of Ukrainian iron and steel industry under war conditions. Machinery and equipment sector is yet another strategically important sector of industrial exports which demonstrates behavior identical to that of Iron and steel. Summarizing I can state that these two sectors demonstrate progress in expanding the range of exported articles rather than increasing export volumes.

Intensive and extensive margin estimates for selected agri-food sectors are presented in Table 6 and Figure 8.

Vegetable and fruit preparations is one of three agri-food sectors which benefited from CUFTA implementation most of all. Both intensive and extensive CUFTA17 coefficients are strongly positive in Vegetable and fruit preparations demonstrating thereby considerable impact of CUFTA on trade liberalization in this field.

Table 6. Intensive and extensive margin regression results for selected agri-food sectors

| | Intensive margin | | | Extensive margin | | |
|---|---|---|---|---|---|---|
| Variable | HS20 | HS15 | HS21 | HS20 | HS15 | HS21 |
| CUFTA17 | 2.153*** | -1.815** | 1.068* | 1.395*** | 0.884*** | 1.343*** |
| | (0.651) | (0.566) | (0.451) | (0.330) | (0.180) | (0.273) |
| CUFTA24 | -1.707*** | 0.290 | 0.651*** | 0.001 | -0.476*** | 0.031 |
| | (0.209) | (0.191) | (0.130) | (0.083) | (0.039) | (0.057) |
| FTA | 0.141 | -0.773 | 0.406 | 0.554 | -0.072 | 0.573. |
| | (0.454) | (0.604) | (0.381) | (0.398) | (0.169) | (0.313) |
| Distance (log) | -1.470*** | -1.104*** | -1.655*** | -0.324 | -0.709*** | -0.432* |
| | (0.439) | (0.249) | (0.270) | (0.262) | (0.103) | (0.217) |
| GDP (importer) (log) | 0.961*** | 0.816*** | 0.410** | 0.132 | 0.227*** | 0.136. |
| | (0.128) | (0.078) | (0.153) | (0.087) | (0.044) | (0.075) |
| Common border | 1.331* | 0.306 | 0.429 | 0.277 | 0.349 | 0.201 |
| | (0.540) | (0.597) | (0.469) | (0.292) | (0.230) | (0.251) |
| Common legislation | -1.158*** | 0.197 | -0.038 | -0.413* | -0.192 | -0.312* |
| | (0.338) | (0.513) | (0.337) | (0.190) | (0.123) | (0.159) |
| Colony | 1.308* | -0.156 | 1.052. | 0.773** | 0.583* | 0.538* |
| | (0.628) | (0.426) | (0.544) | (0.261) | (0.233) | (0.221) |
| COVID | — | — | — | — | — | — |
| Interstate war | -8.584*** | -8.497*** | -4.944*** | -2.662*** | -3.103*** | -2.633*** |
| | (0.374) | (0.678) | (0.548) | (0.282) | (0.193) | (0.237) |
| Observations | 5720 | 7436 | 6600 | 5720 | 7436 | 6600 |
| Adj. $R^2$ | 0.66 | 0.53 | 0.653 | 0.261 | 0.323 | 0.264 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The categories are: HS20 Vegetables and fruit preparations; HS15 Animal or vegetable fats and oils; HS21 Miscellaneous food.

The model employs PPML method. Standard errors are given in parentheses

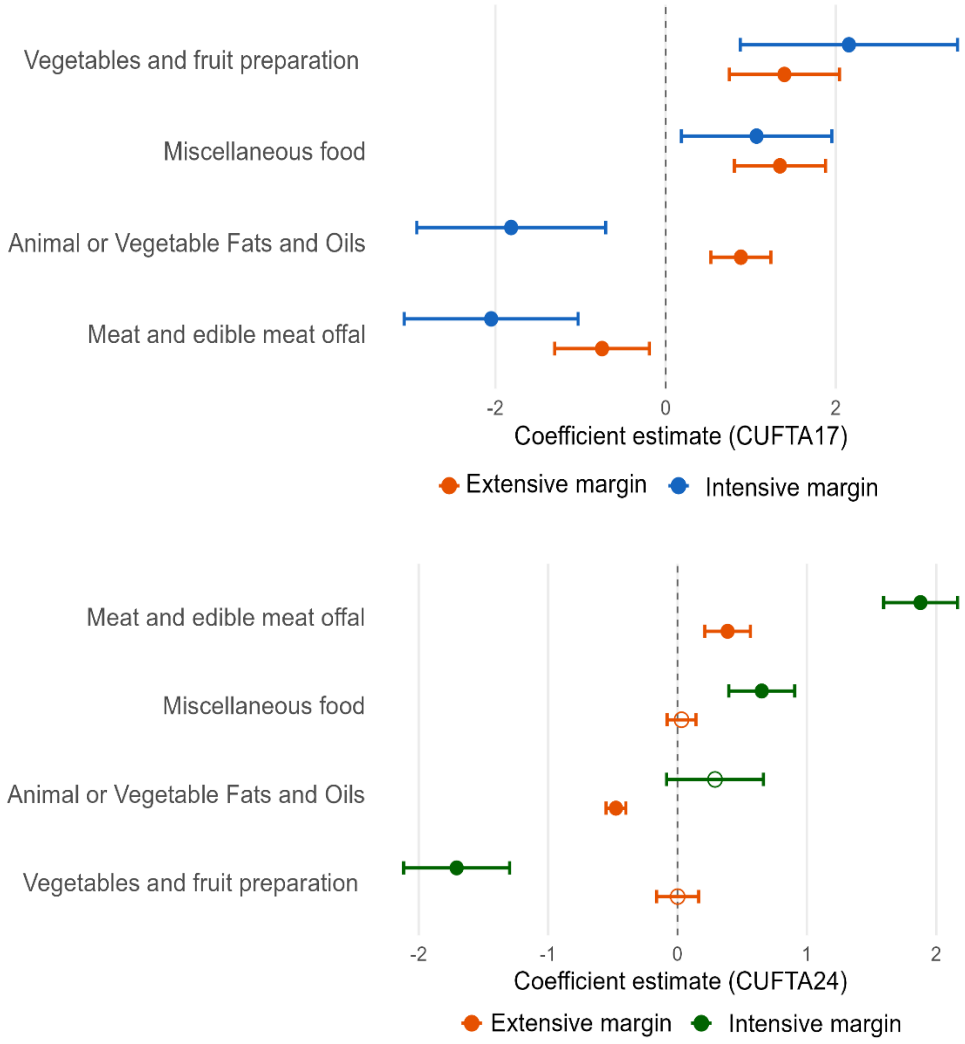



Figure 8. CUFTA effects: agri-food processing sectors

Notes: p≤0.05 (filled markers); p≤0.10 (triangles); not significant (open circles). Confidence intervals truncated at ±8 for readability. PPML estimates with 95% confidence intervals

Source: own calculations based on UN Comtrade

The reason for such tremendous growth is elimination of pre-CUFTA constraints and tariffs. However, since February 24th 2022 the trade margins in this sector capture, at least partially, the effect of farming lands shrinkage and complicated

logistics caused by the full-scale Russian invasion. This may be the reason that the coefficient of *CUFTA24* intensive margin in Vegetable and fruit preparations became negative.

Animal and vegetable fats and oils is the second largest agri-food sector of Ukrainian exports to Canada. Big volume of exports in this sector combined with simultaneous negative value of *CUFTA17* intensive margin coefficient gives an evidence that sunflower oil exports to Canada has gained its maximum. Meanwhile the positive value of *CUFTA17* extensive margin shows that CUFTA gave good prospective for expanding range of Ukrainian products in this sector.

Meats and edible offal has recently demonstrated substantial progress which may be cautiously attributed to the effect of CUFTA amendments adopted in 2024. One more possible reason for such a success is significant efforts applied by Ukrainian agri-food agencies in implementing international food safety standards. Both intensive and extensive margins of *CUFTA24* in this sector are strongly positive (1.878 and 0.387 respectively) providing for 554% of increase in export value with simultaneous enlargement of the list of exporting goods by 47%. Accordingly this sector has bright prospective for the future development of Ukrainian exports to Canada with a reservation that such a statement requires further verification.

Below we discuss the values of standard gravity covariates obtained from regression at sector level. In general, they have expected signs. Thus, the coefficient of distance is negative, statistically significant. The coefficient of GDP is positive, statistically significant and for most sectors has elasticity close to 1.

The interstate war coefficient is negative and significant across all sectors. Note that in such agri-food sectors as Meats and edible offal, Animal and Vegetable Fats and Oils, Vegetable and Fruit Preparations the negative impact of interstate war is more influential than in the other sectors. This can be explained by combined effect

of occupation by Russian troops of significant part of Ukrainian farming lends and destruction of traditional logistic routes.

The coefficient on *FTA* is positive and statistically significant in Furniture and some other sectors (see Tables 18-19 for details). However, in most sectors this coefficient is not significant.

The common legal system coefficient is statistically insignificant except for Furniture and Vegetables and fruit preparations. In these two sectors this coefficient is negative and statistically significant which can be attributed to the fact that Ukraine dramatically decreased exports in this category to Former Soviet Union countries.

Summarizing the results presented in this chapter, I would like to outline the following. The gravity model results for aggregate trade flows gave negative value of CUFTA coefficient. It is in line with previous studies (see Hamaniuk et al., 2020) and the reasons are discussed above. For better understanding of CUFTA impact, the estimation was additionally performed at the sectoral level. It revealed the mixed effect of CUFTA on Ukrainian export to Canada: CUFTA-induced growth in export volume was recorded in 20 % of the Ukrainian export sectors, while the number of product lines increased in 60 % of exporting sectors. The interstate war demonstrated its destructive influence on Ukrainian exports to Canada on aggregate level. Sectoral analysis showed that exports decreasing was accompanied by sectoral restricting thereof. Thus, the full-scale Russian invasion stimulated export growth (both intensive and extensive margins) in Inorganic chemicals, Animals and vegetable fats and oils, Meat and edible meat offal, and Furniture. Simultaneously it suppressed traditional exports of raw materials to Canada including Copper, railway equipment, Iron and steel.

*Chapter 6*

# CONCLUSIONS AND POLICY RECOMMENDATIONS

In this thesis, the impact of CUFTA on Ukraine's exports to Canada has been studied using a gravity model and available statistical data over the period of 2017-2025, with the period of 2014-2016 being a pre-CUFTA. Gravity estimation results provide evidence of a mixed effect of CUFTA on Ukrainian export to Canada. The growth in export volume that can be attributed to CUFTA was recorded in 20 % of the Ukrainian export sectors, while product lines increased in 60 % of exporting sectors. The gravity model applied in this study accounted for the interstate conflicts between the country pairs. The war has destructive impact on Ukrainian exports to Canada.

Both CUFTA and full-scale Russian invasion in Ukraine seem to result in restructuring of Ukrainian exports to Canada: it has been reorienting from the raw materials to the goods with higher value added (machinery and equipment, vehicles, inorganic chemistry and likewise) and products of agri-food industry (Animal or vegetable fats and oils, Vegetable and fruit preparations, Meats and edible meat offal).

Amendments to CUFTA adopted in 2024 seem to strengthen structural changes in Ukrainian exports to Canada: after mid of 2024 when CUFTA amendments became effective the extensive margin has been recorded in sectors of Furniture, Machinery and equipment, Inorganic chemicals, and Vehicles. However, the effect from the amendments should be taken with caution as the period of observation was too short (5 quarters only).

Based on gravity model estimations and descriptive analysis of structural changes in Ukraine's export to Canada the set of sectors prospective for further advances in trade with Canada has been identified: Inorganic chemicals, Animal or vegetable

fats and oils, Vegetable and fruit preparations, Furniture, Machinery and equipment, and Plastics.

As these sectors benefited the most from the FTA with Canada, Ukrainian government may prioritize these sectors with export potential. Inorganic chemistry is already one of the most advanced industries of Ukraine and it has potential for the further progress in exporting goods to Canada as well as to the rest of the world. For example, shifting to a higher value added goods: Ukraine may create its own production of nuclear fuel and start exporting in instead of Uranium ore.

As agricultural sectors are traditionally one of the most protected, further liberalization within CUFTA may have expand opportunities for Ukrainian Agri producers on the Canadian market. Ukraine has a number of unique food products- such as traditional cheeses, honey, and berry-based goods - which could be effectively exported.

# WORKS CITED


Abadie, Alberto, and Javier Gardeazabal. 2003. "The Economic Costs of Conflict: A Case Study of the Basque Country". *American Economic Review,* 93 (1): 113–32. https://doi.org/10.1257/000282803321455188.

Abadie, Alberto, Alexis Diamond, and Jens Hainmueller. 2010. "Synth: An R Package for Synthetic Control Methods in Comparative Case Studies". *Journal of Statistical Software,* 42 (13). https://doi.org/10.18637/jss.v042.i13.

Altan, Aldan, and Yücel Çulha Olcay. 2016 "The role of the extensive margin in export of Turkey: A comparative analysis." *Central Bank Review*, 16(2):59-64. https://doi.org/10.1016/j.cbrev.2016.05.002.

Anderson, James E. 1979. "A Theoretical Foundation for the Gravity Equation." *The American Economic Review,* 69 (1): 106–16.

Anderson, James E, and Eric Van Wincoop. 2003. "Gravity with Gravitas: A Solution to the Border Puzzle." *American Economic Review,* 93 (1): 170–92. https://doi.org/10.1257/000282803321455214.

Anderson, James E. 2011. "The Gravity Model." *Annual Review of Economics,* 3: 133–60. https://doi.org/10.1146/annurev-economics-111809-125114.

Arkolakis, Costas, Arnaud Costinot, and Andrés Rodríguez-Clare. 2012. "New Trade Models, Same Old Gains?" *American Economic Review,* 102 (1): 94–130. https://doi.org/10.1257/aer.102.1.94.

Armington, Paul S. 1969. "A Theory of Demand for Products Distinguished by Place of Production." *IMF Economic Review,* 16 (1): 159-78.

Barbieri, K., and G. Schneider. 1999. "Globalization and Peace: Assessing New Directions in the Study of Trade and Conflict." *Journal of Peace Research,* 36(4), 387-404. https://www.jstor.org/stable/425295.

Berge, Laurent R. 2018. "Efficient estimation of maximum likelihood models with multiple fixed-effects: the R package FENmlm." *CREA Discussion Papers*, 13. https://econpapers.repec.org/paper/lucwpaper/18-13.htm.

Bergstrand, Jeffrey H. 1985. "The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence." *The Review of Economics and Statistics,* 67 (3): 474–81. https://doi.org/10.2307/1925976.

———. 1989. "The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade." *The Review of Economics and Statistics,* 71 (1): 143–53. https://doi.org/10.2307/1928061.

Besedes, Tibor, and Thomas J. Prusa. 2007. "The Role of Extensive and Intensive Margins and Export Growth." *NBER Working Paper* 13628. https://doi.org/10.3386/w13628.

Bista, Rishav. 2012. "Three essays on the role of extensive and intensive margin in international trade." Theses and Dissertations. *Economics*. 6. https://uknowledge.uky.edu/economics_etds/6.

Blomberg, S. B., and G. Hess. 2006. "How Much Does Violence Tax Trade?" *Review of Economics and Statistics*, 88 (4): 599–612. https://doi.org/10.1162/rest.88.4.599.

Bogdanova, Iryna. 2021. "Turning Crisis into Opportunity: Unfolding Ukraine's Trade Potential with the Canada-Ukraine Free Trade Agreement". *East/West: Journal of Ukrainian Studies,* 8 (2): 151-191. https://doi.org/10.21226/ewjus561.

Bustos, S., E. Jackson, D. Torun, B. Leonard, N. Tuzcu, P. Lukaszuk, A. White, R. Hausmann, and M.A. Yildirim. 2026. "Tackling Discrepancies in Trade Data: The Harvard Growth Lab International Trade Datasets." *Scientific Data,* 13: 170. https://doi.org/10.1038/s41597-025-06488-2.

"Canada–Ukraine Free Trade Agreement Implementation Act. 2023". https://laws.justice.gc.ca/eng/acts/C-10.541/FullText.html

Capoani, Luigi. 2023. "Review of the Gravity Model: Origins and Critical Analysis of its Theoretical Development." *SN Business and Economics,* 3 (5): 1–95. https://doi.org/10.1007/s43546-023-00461-0.

Chaney, Thomas. 2008. "Distorted Gravity: The Intensive and Extensive Margins of International Trade." *American Economic Review,* 98 (4): 1707–21. https://doi.org/10.1257/aer.98.4.1707.

*Complete Collection of Rus' Chronicles*. 1908. Vol. 2. *The Chronicle according to the Hypatian Codex*. 2nd ed. Saint Petersburg: Typography of M.A. Aleksandrov. http://litopys.org.ua/ipatlet/ipat.htm

Conte, Maddalena, Pierre Cotterlaz, and Thierry Mayer. 2022. "The CEPII Gravity database". CEPII Working Paper N°2022-05, July 2022. https://www.cepii.fr/DATA_DOWNLOAD/gravity/doc/Gravity_documentation.pdf

Countryman, Amanda M., Mariia Bogonos, and Oleg Nivievskyi. 2023. "Agricultural and Economywide Effects of the Conflict in Ukraine." *The 26th Annual Conference on Global Economic Analysis (Bordeaux, France)* https://gtap.agecon.purdue.edu/uploads/resources/download/11834.pdf

Countryman, Amanda M., Valentyn Litvinov, and Ivan Kolodiazhnyi et al. 2025. "Global economic effects of war-induced agricultural export declines from Ukraine." *Applied Economic Perspectives and Policy,* 47 (2): 624-665. https://doi.org/10.1002/aepp.13468.

Deardorff, Alan. 1998. "Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?" *NBER Chapters*, 7–32. http://www.nber.org/chapters/c7818.

Eaton, Jonathan, and Samuel Kortum. 2002. "Technology, Geography, and Trade." *Econometrica,* 70(5): 1741–79. https://www.jstor.org/stable/3082019.

Egger, Peter H. and Mario Larch. 2008. "Interdependent Preferential Trade Agreement Memberships: An Empirical Analysis." *Journal of International Economics,* 76(2): 384-399. https://www.ewf.uni-bayreuth.de/en/research/RTA-data/index.html

"Free Trade Agreement between Ukraine and the EFTA States." https://zakon.rada.gov.ua/laws/show/998_456#Text

Ibrahimi, Agron, and Maria Jankovic. 2021. "World Trade Flows in XX Century." *Journal of World Economy: Transformations and Transitions (JOWETT)*, 1: 07. https://doi.org/10.52459/jowett1271121.

International Monetary Fund, *World Economic Outlook Database, April 2025*. Washington, DC:IMF, 2025. https://www.imf.org/en/Publications/WEO/weo-database/2025/April

International Monetary Fund, *World Economic Outlook Database*. Washington, DC: IMF. https://www.imf.org/en/publications/sprolls/world-economic-outlook-databases

Isard, Walter. 1969. "Some Notes on the Linkage of the Ecologic and Economic Systems." *Papers of the Regional Science Association,* 22: 85–96. https://doi.org/10.1111/j.1435-5597.1969.tb01455.x.

Isard, Walter, and Merton J. Peck. 1954. Location Theory and International and Interregional Trade Theory. *The Quarterly Journal of Economics,* 68: 97–114. https://doi.org/10.2307/1881920.

Gleditsch, Nils Petter, Peter Wallensteen, Mikael Eriksson, Margareta Sollenberg and Håvard Strand. 2002. "Armed Conflict 1946–2001: A New Dataset." *Journal of Peace Research*, 39(5): 615–637.

Global Trade Analysis Project.
https://www.gtap.agecon.purdue.edu/models/default.asp

Golovash, B. 2017. "Current state and prospects for the development of foreign economic relations between Ukraine and Canada." *Economy and Society,* 9: 49-54. https://economyandsociety.in.ua/journals/9_ukr/7.pdf.

Hamaniuk, Oleksii, Pavlo Iavorskyi, Maryna Khorunzha, Olga Nikolaieva, and Svitlana Taran. 2020."Canada-Ukraine Free Trade Agreement: Patterns and Tendencies". Kyiv: Kyiv School of Economics, Trade+ International Trade Research Center. https://kse.ua/ua/kse-research/canada-ukraine-free-trade-agreement-patterns-and-tendencies/

Jackson, Karen and Oleksandr Shepotylo. 2018. "Post-Brexit trade survival: Looking beyond the European Union." *Economic Modelling, Elsevier*, 73(C): 317-328. https://doi.org/10.1016/j.econmod.2018.04.010.

Kamin, Katrin. 2022. "Bilateral trade and conflict heterogeneity: The impact of conflict on trade revisited." Kiel Working Papers 2222, Kiel Institute for the World Economy. https://www.kielinstitut.de/fileadmin/Dateiverwaltung/IfW-Publications/fis-import/3843f6ad-7b35-467e-abcc-861c36091e0d-KWP_2222.pdf.

Karam, F., and C. Zaki. 2016. "How did wars dampen trade in the MENA region?" *Applied Economics*, 48 (60): 5909-5930. https://doi.org/10.1080/00036846.2016.1186799.

Kimura, Fukunari, and Hyun-Hoon Lee. 2006. "The gravity equation in international trade in services." *Review of World Economics* 142 (1): 92–121. https://doi.org/10.1007/s10290-006-0058-8.

Krugman, Paul. 1980. "Scale Economies, Product Differentiation, and the Pattern of Trade." *American Economic Review,* 70 (5): 950–59.

Kryvenko, Nadiia. 2020. "The trade and economic cooperation between Ukraine and Canada in the context of the free trade agreement." *Herald of Economics*, 3 (97): 144-155. https://doi.org/10.35774/visnyk2020.03.144.

Leitão, Nuno Carlos. 2023. "The Impact of Geopolitical Risk on Portuguese Exports." *Economies,* 11 (12): 291. https://doi.org/10.3390/economies11120291.

----------. 2024. "Gravity Model and International Trade: A Survey of the Literature." *Administrative Sciences,* 14 (9): 219. https://doi.org/10.3390/admsci14090219

Leontief, Wassily. 1986. *Input-Output Economics*. 2nd Edition. New York: Oxford University Press. 436 p.

Levchenko, Yeleazar. 2025. "Ukraine's DCFTA with the EU: Trade Effects on Economic Integration." https://kse.ua/wp-content/uploads/2025/08/Yeleazar-Levchenko-UKRAINES-DCFTA-WITH-THE-EU_-TRADE-EFFECTS-OF-ECONOMIC-INTEGRATION.pdf.

Mansfield, E. D., and J. C. Pevehouse. 2000. "Trade Blocs, Trade Flows, and International Conflict." *International Organization*, 54: 775–808. https://doi.org/10.1162/002081800551361.

Melitz, Marc J. 2003 "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica*, 71 (6): 1695–1725. http://www.jstor.org/stable/1555536.

Pacheco, Luís Miguel, and André Pereira Matos. 2022. "Foreign Presence and Export Performance: The Role of Portuguese Commercial Diplomacy." *The International Trade Journal,* 36: 147–69.

Pettersson, Therese. 2025. UCDP/PRIO Armed Conflict Dataset Codebook v 25.1 . https://ucdp.uu.se/downloads/

Polachek, Solomon. 1980. "Conflict and Trade." *Journal of Conflict Resolution,* 24: 55-78. https://doi.org/10.1177/002200278002400103.

Radziyevska, Svitlana. 2023. "Integration Relations Between Ukraine and Canada in the Context of Free Trade Agreement." *Scientific notes of TN V.I. Vernadsky University Series: Economics and Management, 34* (73): 15–22. https://econ.vernadskyjournals.in.ua/journals/2023/34_73_1/5.pdf

Ray, J. L. 2005. "Constructing Multivariate Analyses (of Dangerous Dyads)." *Conflict Management and Peace Science*, 22 (4): 277-292. https://doi.org/10.1080/07388940500339175.

Scott, M.F.G. 1975. "Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products." *The Economic Journal,* 85 (339): 646-648. https://doi.org/10.2307/2230917.

Silva, J. M. C. Santos, and Silvana Tenreyro. 2006. "The Log of Gravity." The Review of Economics and Statistics 88 (4): 641–58. https://doi.org/10.1162/rest.88.4.641.

Silva, J. M. C. Santos, and Silvana Tenreyro. 2010. "On the existence of the maximum likelihood estimates in Poisson regression." Economics Letters, 107 (2): 310-312. https://doi.org/10.1016/j.econlet.2010.02.020.

Shepotylo, Oleksandr. 2010. "A Gravity Model of Net Benefits of EU Membership: The Case of Ukraine." *Journal of Economic Integration* 25 (4): 676-702. https://doi.org/10.11130/jei.2010.25.4.676.

----------. 2013. "Export Potential, Uncertainty, and Regional Integration: Choice of Trade Policy for Ukraine." *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2288652.

Söderlund, Bengt. 2024. "Trade Effects of the EU–Ukraine Deep and Comprehensive Free Trade Agreement." *National Board of Trade Sweden*. https://www.kommerskollegium.se/globalassets/publikationer/rapporter/2024/trade-effects-of-the-eu-ukraine-deep-and-comprehensive-free-trade-agreement.pdf

Tinbergen, Jan. 1962. *Shaping the World Economy: Suggestions for an International Economic Policy*. Twentieth Century Fund Study. New York: Twentieth Century Fund. https://archive.org/details/shapingworldecon0000unse_h8g8/

Viner, Jacob, and Paul Oslington. 2014. *The Customs Unio. Issue*. New York, 2014; online edn, Oxford Academic, 30 Apr. 2015. https://doi.org/10.1093/acprof:osobl/9780199756124.001.0001.

Ward, M., and P. Hoff, 2005. "Persistent Patterns of International Commerce." *Journal of Peace Research,* 44 (2): 157-175. https://journals.sagepub.com/doi/10.1177/0022343307075119.

Yatsenko, Olha, William H. Meyers, Olexander Iatsenko, and Ivanna Biletska. 2017. "Modeling of development processes of bilateral trade and economic integration between countries." *Economic Annals-XXI,* 168 (11-12): 18-23. https://doi.org/10.21003/ea.V168-04.

Yotov, Yoto, Roberta Piermartini, José-Antonio Monteiro, and Mario Larch. 2016. *An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model. Geneva*: World Trade Organization. https://doi.org/10.30875/abc0167e-en.

# APPENDIX A

## DATA DESCRIPTION

Table 7. Types of armed conflicts

| Type | Name of conflict | Definition |
|---|---|---|
| 1 | Extrasystemic | Between a state and a non-state group outside its own territory, where the government side is fighting to retain control of a territory outside the state system |
| 2 | Interstate | Both sides are states in the Gleditsch and Ward membership system |
| 3 | Intrastate | Side A is always a government; side B is always one or more rebel groups; there is no involvement of foreign governments with troops, i.e. there is no side_a_2nd or side_b_2nd coded |
| 4 | Internationalized intrastate | Side A is always a government; side B is always one or more rebel groups; there is involvement of foreign governments with troops, i.e. there is at least ONE side_a_2nd or side_b_2nd coded |

Source: Pettersson, Therese. 2025. UCDP/PRIO Armed Conflict Dataset Codebook v 25.1 . https://ucdp.uu.se/downloads/

Table 8. Descriptive statistics by selected years

| | Trade Flow (Exporter) | | | | Trade Flow (Importer) | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Mean | SD | Min | Max | Mean | SD | Min | Max |
| 2014 | 1613.14 | 10680.77 | 0 | 397099.2 | 1660.15 | 10333.49 | 0 | 486293.6 |
| 2016 | 1537.84 | 9994.95 | 0 | 385666.2 | 1563.52 | 9916.62 | 0 | 481301.3 |
| 2019 | 1453.75 | 9975.58 | 0 | 418583.0 | 1509.92 | 9880.30 | 0 | 472463.5 |
| 2021 | 1793.53 | 12526.38 | 0 | 568174.9 | 1830.40 | 11778.50 | 0 | 541531.3 |
| 2024 | 1767.87 | 12774.00 | 0 | 525648.8 | 1839.19 | 12033.55 | 0 | 509963.3 |

| | GDP (Exporter) | | | |
|---|---|---|---|---|
| Year | Mean | SD | Min | Max |
| 2014 | 764700.7 | 2079606 | 25054.23 | 17393103 |
| 2016 | 775163.1 | 2246900 | 25527.91 | 18569100 |
| 2019 | 813320.2 | 2496611 | 25089.98 | 21372572 |
| 2021 | 947731.5 | 2973961 | 26109.41 | 23315081 |
| 2024 | 1075699.7 | 3495709 | 25303.19 | 28750956 |

| | GDP (Importer) | | | | |
|---|---|---|---|---|---|
| Year | Mean | SD | Min | Max | FTA (%) |
| 2014 | 764700.7 | 2079606 | 25054.23 | 17393103 | 26.32 |
| 2016 | 775163.1 | 2246900 | 25527.91 | 18569100 | 27.07 |
| 2019 | 813320.2 | 2496611 | 25089.98 | 21372572 | 25.67 |
| 2021 | 896889.3 | 2883766 | 26109.41 | 23315081 | 28.62 |
| 2024 | 942636.9 | 3176565 | 25008.68 | 28750956 | 29.50 |

Note: All monetary values in million USD. FTA shows percentage of observations with trade agreements

Table 9. Top 20 Ukraine's exports to Canada, 2025, and their dynamics (2014-2025), HS2, USD thousands (as reported by Ukraine)

| Product label | Product code | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals | 28 | 3 | 6 | 1 | 1 | 4 | 2 | 1 | 1179 | 3 | 27050 | 78321 | 45262 |
| Animal, vegetable or microbial fats and oils and their cleavage products; prepared edible fats; | 15 | 184 | 194 | 973 | 1379 | 1366 | 2046 | 3080 | 5137 | 15324 | 29786 | 20557 | 9160 |
| Meat and edible meat offal | 02 | 0 | 0 | 5 | 1 | 2 | 0 | 0 | 0 | 79 | 4646 | 3117 | 7048 |
| Articles of iron or steel | 73 | 5468 | 580 | 968 | 1612 | 2461 | 1730 | 854 | 1832 | 2046 | 881 | 3216 | 5682 |
| Miscellaneous articles of base metal | 83 | 1 | 1 | 3 | 56 | 162 | 47 | 16 | 59 | 330 | 747 | 1537 | 2369 |
| Iron and steel | 72 | 6885 | 1429 | 1939 | 6651 | 21470 | 14159 | 12665 | 33408 | 36797 | 1172 | 1699 | 2312 |
| Plastics and articles thereof | 39 | 81 | 40 | 122 | 350 | 257 | 459 | 760 | 1603 | 1681 | 1915 | 2036 | 2045 |
| Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings ... | 94 | 72 | 61 | 126 | 437 | 1076 | 1037 | 886 | 1615 | 1866 | 2100 | 2834 | 1852 |
| Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof | 84 | 4347 | 2514 | 1318 | 5135 | 5904 | 2991 | 3166 | 6220 | 1739 | 3443 | 2613 | 1811 |
| Preparations of vegetables, fruit, nuts or other parts of plants | 20 | 207 | 290 | 457 | 2618 | 5983 | 10374 | 1346 | 14696 | 3418 | 1869 | 15516 | 1641 |

Table 9 - Continued

| Product label | Product code | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicles other than railway or tramway rolling stock, and parts and accessories thereof | 87 | 7 | 1 | 252 | 3880 | 4821 | 3319 | 5596 | 11100 | 9031 | 445 | 2312 | 1597 |
| Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere | 04 | 2312 | 827 | 1096 | 1733 | 82 | 160 | 1356 | 424 | 560 | 713 | 870 | 1318 |
| Wood and articles of wood; wood charcoal | 44 | 1383 | 1587 | 1471 | 1884 | 1935 | 1936 | 2296 | 8845 | 1814 | 1093 | 1564 | 1223 |
| Preparations of cereals, flour, starch or milk; pastrycooks' products | 19 | 239 | 205 | 190 | 340 | 399 | 668 | 598 | 618 | 526 | 914 | 1180 | 1206 |
| Aluminum and articles thereof | 76 | 16 | 6 | 252 | 13 | 118 | 35 | 95 | 367 | 778 | 698 | 604 | 1063 |
| Ships, boats and floating structures | 89 | 949 | 622 | 536 | 904 | 1029 | 1123 | 1023 | 2129 | 1742 | 1212 | 1113 | 979 |
| Cocoa and cocoa preparations | 18 | 338 | 180 | 181 | 238 | 330 | 306 | 205 | 251 | 309 | 712 | 1394 | 972 |
| Miscellaneous edible preparations | 21 | 100 | 79 | 86 | 100 | 281 | 309 | 359 | 489 | 793 | 619 | 1150 | 807 |
| Beverages, spirits and vinegar | 22 | 744 | 462 | 424 | 560 | 501 | 591 | 615 | 715 | 603 | 552 | 819 | 737 |
| Preparations of meat, of fish, of crustaceans, molluscs or other aquatic invertebrates | 16 | 0 | 26 | 29 | 65 | 10 | 34 | 42 | 129 | 40 | 66 | 317 | 716 |
| Edible vegetables and certain roots and tubers | 07 | 34 | 38 | 57 | 22 | 73 | 305 | 50 | 190 | 94 | 441 | 958 | 637 |

Table 9 - Continued

| Product label | Product code | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal | 12 | 37 | 53 | 500 | 34 | 78 | 31 | 137 | 3453 | 920 | 452 | 141 | 633 |
| Edible fruit and nuts; peel of citrus fruit or melons | 08 | 4 | 9 | 8 | 6 | 32 | 20 | 56 | 550 | 319 | 334 | 548 | 600 |
| Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical | 90 | 591 | 467 | 289 | 1060 | 417 | 1348 | 591 | 621 | 4831 | 6637 | 512 | 565 |
| Articles of apparel and clothing accessories, knitted or crocheted | 61 | 1037 | 639 | 782 | 732 | 676 | 643 | 467 | 846 | 932 | 1164 | 652 | 481 |
| Copper and articles thereof | 74 | 20192 | 8967 | 341 | 7792 | 14538 | 12663 | 14717 | 33782 | 6575 | 1907 | 0 | 433 |
| Railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures | 86 | 895 | 3474 | 8939 | 1499 | 230 | 357 | 2904 | 11358 | 4345 | 2 | 823 | 0 |

Table 10. Groups with the biggest decline of Ukraine's exports to Canada in 2023-2024 compared to the base period of 2014-2016

| Product code | Product label | Change, % |
|---|---|---|
| 74 | Copper and articles thereof | -21.68% |
| 86 | Railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures | -9.79% |
| 32 | Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring | -9.46% |
| 27 | Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ... | -6.66% |
| 72 | Iron and steel | -6.65% |
| 95 | Toys, games and sports requisites; parts and accessories thereof | -3.84% |
| 84 | Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof | -3.80% |
| 73 | Articles of iron or steel | -3.70% |
| 04 | Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere | -2.59% |
| 31 | Fertilisers | -2.39% |
| 44 | Wood and articles of wood; wood charcoal | -2.32% |

Table 11. Groups with the biggest increase of Ukraine's exports to Canada in 2023-2024 compared to the base period of 2014-2016

| Product code | Product label | Change, % |
|---|---|---|
| 28 | Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals | 42.08% |
| 15 | Animal, vegetable or microbial fats and oils and their cleavage products; prepared edible fats | 19.08% |
| 20 | Preparations of vegetables, fruit, nuts or other parts of plants | 6.22% |
| 02 | Meat and edible meat offal | 3.10% |
| 90 | Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical … | 1.83% |
| 94 | Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings | 1.77% |
| 39 | Plastics and articles thereof | 1.39% |
| 83 | Miscellaneous articles of base metal | 0.91% |
| 87 | Vehicles other than railway or tramway rolling stock, and parts and accessories thereof | 0.90% |
| 21 | Miscellaneous edible preparations | 0.50% |
| 07 | Edible vegetables and certain roots and tubers | 0.46% |

Table 12. Groups with the biggest decline of Ukraine's exports to Canada in 2024 compared to the base year 2014

| Product code | Product label | Change, % |
|---|---|---|
| 74 | Copper and articles thereof | -0.29 |
| 27 | Mineral fuels, mineral oils and products of their distillation; bituminous substances | -0.12 |
| 32 | Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring | -0.09 |
| 72 | Iron and steel | -0.08 |
| 73 | Articles of iron or steel | -0.05 |
| 31 | Fertilisers | -0.04 |
| 84 | Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof | -0.04 |
| 95 | Toys, games and sports requisites; parts and accessories thereof | -0.03 |
| 04 | Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere | -0.03 |
| 69 | Ceramic products | -0.02 |
| 40 | Rubber and articles thereof | -0.02 |

Table 13. Groups with the biggest increase of Ukraine's exports to Canada in 2024 compared to the base year 2014

| Product code | Product label | Change,% |
|---|---|---|
| 28 | Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals | 51.36% |
| 15 | Animal, vegetable or microbial fats and oils and their cleavage products; prepared edible fats | 13.23% |
| 20 | Preparations of vegetables, fruit, nuts or other parts of plants | 9.89% |
| 02 | Meat and edible meat offal | 2.04% |
| 94 | Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings | 1.76% |
| 87 | Vehicles other than railway or tramway rolling stock, and parts and accessories thereof | 1.51% |
| 39 | Plastics and articles thereof | 1.22% |
| 83 | Miscellaneous articles of base metal | 1.01% |
| 21 | Miscellaneous edible preparations | 0.62% |
| 07 | Edible vegetables and certain roots and tubers | 0.58% |
| 18 | Cocoa and cocoa preparations | 0.45% |

Table 14. Groups with the biggest decline of Ukraine's exports to Canada in 2019-2021 compared to the base period 2014-2016

| Product code | Product label | Change, % |
|---|---|---|
| 27 | Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ... | -6.54% |
| 86 | Railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures | -5.65% |
| 73 | Articles of iron or steel | -3.99% |
| 74 | Copper and articles thereof | -3.73% |
| 32 | Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring | -2.80% |
| 04 | Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere | -2.63% |
| 84 | Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof | -2.44% |
| 95 | Toys, games and sports requisites; parts and accessories thereof | -2.42% |
| 31 | Fertilisers | -1.72% |
| 69 | Ceramic products | -1.33% |
| 61 | Articles of apparel and clothing accessories, knitted or crocheted | -1.27% |

Table 15. Groups with the biggest increase of Ukraine's exports to Canada in 2019-2021 compared to the base period 2014-2016

| Product code | Product label | Change,% |
|---|---|---|
| 72 | Iron and steel | 10.62% |
| 20 | Preparations of vegetables, fruit, nuts or other parts of plants | 7.35% |
| 87 | Vehicles other than railway or tramway rolling stock, and parts and accessories thereof | 5.92% |
| 29 | Organic chemicals | 5.13% |
| 15 | Animal, vegetable or microbial fats and oils and their cleavage products; prepared edible fats | 2.11% |
| 10 | Cereals | 1.39% |
| 94 | Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings | 0.89% |
| 39 | Plastics and articles thereof | 0.68% |
| 12 | Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal | 0.66% |
| 70 | Glass and glassware | 0.64% |
| 44 | Wood and articles of wood | 0.62% |

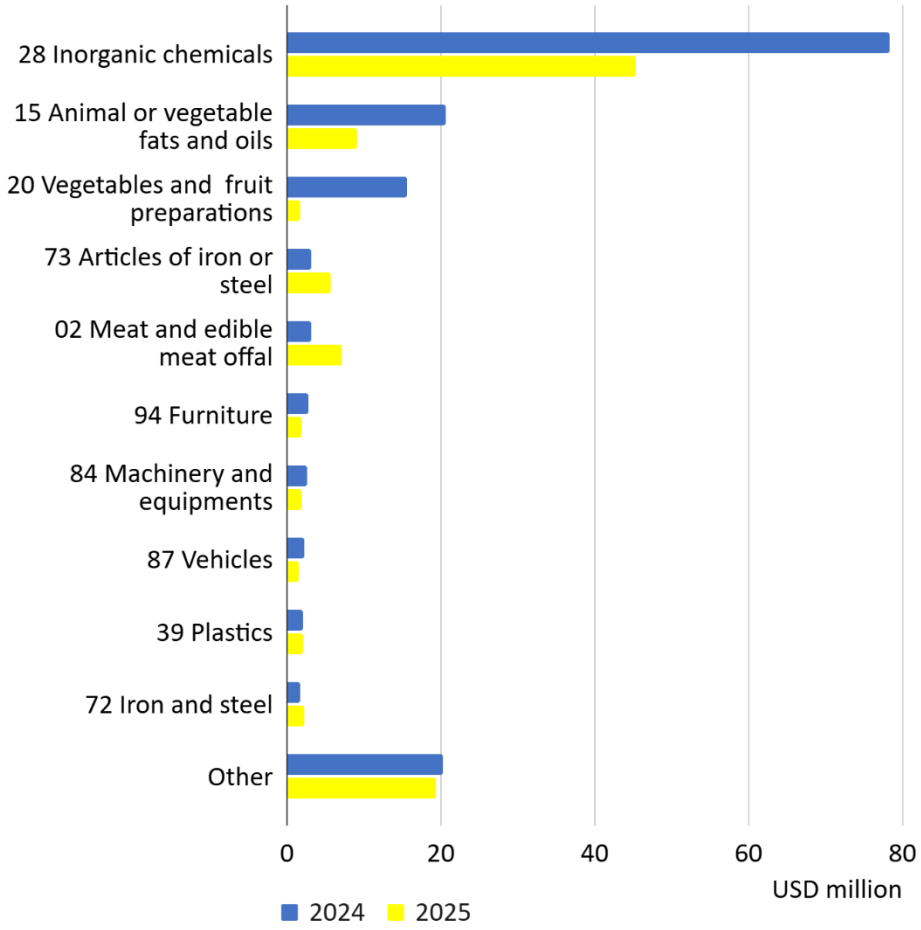



Figure 9. Structure of Ukraine's exports to Canada, 2024 and 2025, annual averages, HS2, USD million (as reported by Ukraine)

Source: own calculations based on UN Comtrade data

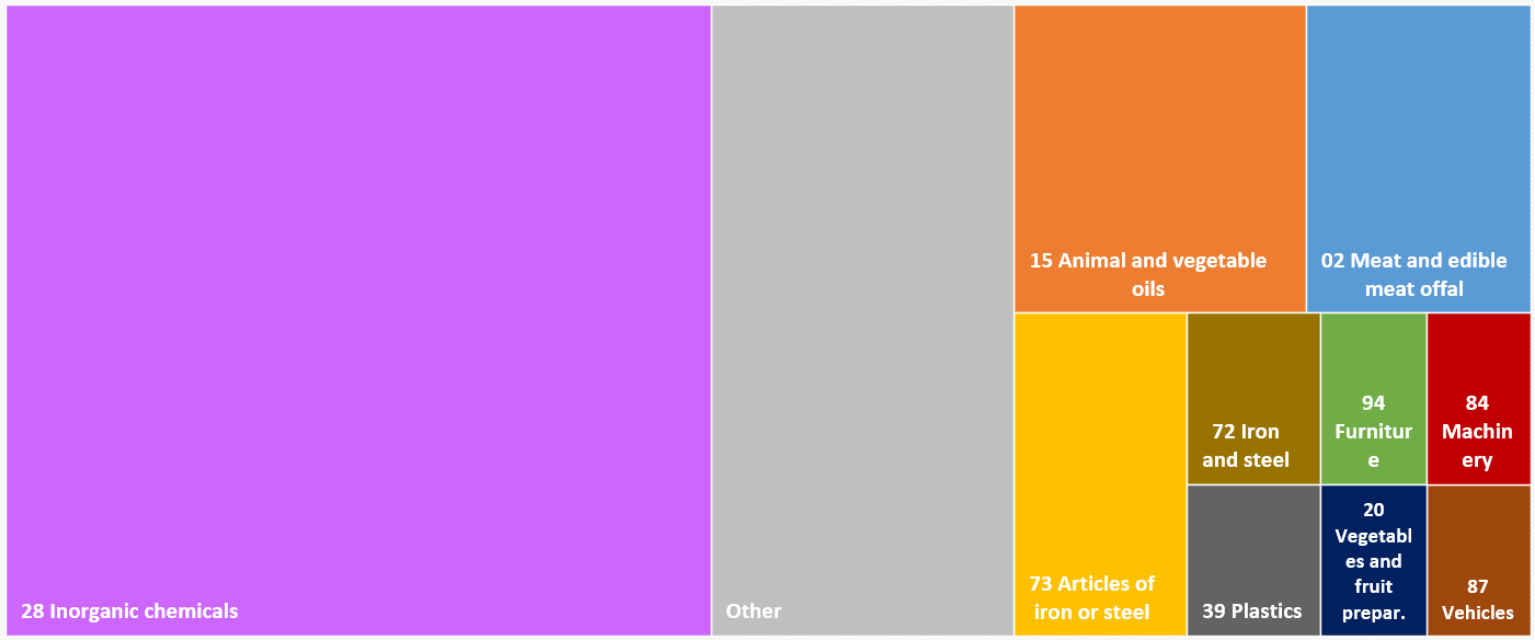



Figure 10. Structure of Ukraine's exports to Canada, 2025 (9 months), annual averages, HS2, USD million (as reported by Ukraine)

Source: own calculations based on UN Comtrade data

Table 16. Descriptive statistics (quarterly data, HS6-digit level)

| Product label | Variable | Observations | Mean | SD | Maximum |
|---|---|---|---|---|---|
| Iron and steel | Export value (mln USD) | 7567 | 10.79 | 40.38 | 558.971 |
| | GDP partner (bln USD) | 7567 | 521.37 | 2049.61 | 22980.56 |
| | Distance (km) | 7567 | 5379.5 | 3638.39 | 16805 |
| | HS6 categories | 7567 | 4.67 | 9.39 | 69 |
| Meat and edible offal | Export value (mln USD) | 6815 | 1.155 | 4.92 | 105.383 |
| | GDP partner (bln USD) | 6815 | 539.76 | 2152.77 | 22980.56 |
| | Distance | 6815 | 5082.58 | 3479.75 | 16805 |
| | HS6 categories | 6815 | 2.16 | 3.7 | 28 |
| Animal or vegetable fats and oils | Export value (mln USD) | 7943 | 7.02 | 32.969 | 763.63 |
| | GDP partner (bln USD) | 7943 | 494.13 | 2003.718 | 22980.56 |
| | Distance | 7943 | 5638.44 | 3757.388 | 16805 |
| | HS6 categories | 7943 | 1.87 | 2.77 | 21 |
| Vegetable or fruit preparation | Export value (mln USD) | 6110 | 0.384 | 1.99 | 40.88 |
| | GDP partner (bln USD) | 6110 | 610.308 | 2265.86 | 22980.56 |
| | Distance | 6110 | 5201.838 | 3807.71 | 16805 |
| | HS6 categories | 6110 | 4.26 | 7.26 | 35 |
| Miscellaneous food | Export value (mln USD) | 7050 | 0.234 | 0.974 | 37.992 |
| | GDP partner (bln USD) | 7050 | 543.788 | 2119.26 | 22980.56 |
| | Distance | 7050 | 5280.507 | 3678.93 | 16805 |
| | HS6 categories | 7050 | 2.2 | 3.44 | 16 |

Table 16 - Continued

| Product lable | Variable | Observations | Mean | SD | Maximum |
|---|---|---|---|---|---|
| Inorganic chemicals | Export value (mln USD) | 5781 | 1.181 | 11.26 | 259.44 |
| | GDP partner (bln USD) | 5781 | 664.317 | 2323.79 | 22980.56 |
| | Distance | 5781 | 5042.195 | 3846.73 | 16805 |
| | HS6 categories | 5781 | 1.81 | 4.52 | 52 |
| Furniture | Export value (mln USD) | 7097 | 1.098 | 5.606 | 97.925 |
| | GDP partner (bln USD) | 7097 | 555.14 | 2112.06 | 22980.56 |
| | Distance | 7097 | 5389.13 | 3868.21 | 16805 |
| | HS6 categories | 7097 | 5.39 | 8.99 | 46 |
| Vehicles | Export value (mln USD) | 7097 | 0.217 | 1.219 | 40.18 |
| | GDP partner (bln USD) | 7097 | 555.82 | 2111.89 | 22980.56 |
| | Distance | 7097 | 5284.89 | 3679.66 | 16805 |
| | HS6 categories | 7097 | 2.78 | 5.86 | 42 |
| Plastics | Export value (mln USD) | 7990 | 0.666 | 3.412 | 70.41 |
| | GDP partner (bln USD) | 7990 | 495.15 | 1997.71 | 22980.56 |
| | Distance | 7990 | 5659.09 | 3834.3 | 16805 |
| | HS6 categories | 7990 | 7.26 | 12.85 | 79 |
| Wood and articles | Export value (mln USD) | 7191 | 2.214 | 7.39 | 98.24 |
| | GDP partner (bln USD) | 7191 | 547.57 | 2099.23 | 22980.56 |
| | Distance | 7191 | 5316.97 | 3763.47 | 16805 |
| | HS6 categories | 7191 | 6.1 | 10.49 | 63 |

Table 17. Number of HS6 product categories by sector of Ukraine's export (2014-2025)

| Product code | Product label | Observations | Active partners | Ukraine's export to world | | | Ukraine's export to Canada | |
|---|---|---|---|---|---|---|---|---|
| | | | | mean | sd | max | mean | max |
| 01 | Live animals | 3102 | 65 | 0.41 | 0.87 | 7 | 0.66 | 2 |
| 02 | Meat and edible offal | 7050 | 145 | 2.14 | 3.67 | 28 | 1.28 | 12 |
| 02 | Fish and seafood | 4653 | 95 | 2.15 | 4.39 | 34 | 1.74 | 11 |
| 02 | Dairy, eggs, honey | 7802 | 160 | 2.48 | 4.03 | 24 | 3.62 | 12 |
| 06 | Live trees and plants | 2162 | 45 | 0.5 | 0.98 | 9 | 0.51 | 1 |
| 07 | Edible vegetables | 7238 | 149 | 3.63 | 6.91 | 33 | 5.6 | 22 |
| 08 | Edible fruits and nuts | 6627 | 136 | 2.65 | 4.85 | 32 | 4.15 | 17 |
| 09 | Coffee, tea, spices | 5781 | 118 | 1.99 | 4.03 | 28 | 9.06 | 16 |
| 10 | Cereals | 7708 | 155 | 1.27 | 1.95 | 14 | 1.17 | 3 |
| 11 | Milling products | 8131 | 167 | 1.6 | 2.73 | 18 | 6.89 | 12 |
| 12 | Oil seeds | 5922 | 121 | 1.98 | 3.02 | 23 | 2.34 | 5 |
| 13 | Lac, gums, resins | 2679 | 57 | 0.3 | 0.69 | 6 | 0.55 | 2 |
| 14 | Vegetable plaiting mat. | 2632 | 56 | 0.32 | 0.59 | 2 | 0.06 | 1 |
| 15 | Animal or veg fats and oils | 8272 | 169 | 1.83 | 2.73 | 21 | 4.3 | 11 |
| 16 | Meat or fish preparations | 6204 | 127 | 1.78 | 3.53 | 23 | 2.53 | 8 |
| 17 | Sugars | 7567 | 156 | 0.87 | 1.26 | 9 | 1.98 | 3 |
| 18 | Cocoa and preparations | 5922 | 120 | 1.42 | 1.71 | 7 | 3 | 5 |
| 19 | Cereal preparations | 7614 | 155 | 2.9 | 4.11 | 19 | 7.7 | 13 |
| 20 | Vegetable or fruit prep. | 6345 | 130 | 4.28 | 7.26 | 35 | 13.79 | 26 |

Table 17 - Continued

| Product code | Product label | Observations | Active partners | Ukraine's export to world | | | Ukraine's export to Canada | |
|---|---|---|---|---|---|---|---|---|
| | | | | mean | sd | max | mean | max |
| 21 | Miscellaneous food | 7332 | 150 | 2.18 | 3.42 | 16 | 6.6 | 11 |
| 22 | Beverages and spirits | 7943 | 163 | 2.2 | 3.51 | 22 | 7.94 | 12 |
| 23 | Food industry residues | 5311 | 111 | 1.31 | 2.24 | 17 | 0.43 | 6 |
| 24 | Tobacco | 5029 | 103 | 0.38 | 0.75 | 7 | 0.4 | 2 |
| 25 | Salt, sulphur, cement | 6533 | 133 | 1.52 | 3.47 | 30 | 0.96 | 5 |
| 26 | Ores and ash | 3713 | 78 | 1.08 | 1.72 | 10 | 0.6 | 3 |
| 27 | Mineral fuels and oils | 7849 | 159 | 0.86 | 1.57 | 15 | 1 | 3 |
| 28 | Inorganic chemicals | 5969 | 123 | 1.76 | 4.46 | 52 | 1 | 3 |
| 29 | Organic chemicals | 6063 | 125 | 4.2 | 14.42 | 191 | 2.43 | 8 |
| 30 | Pharmaceutical products | 7614 | 157 | 1.76 | 3.38 | 25 | 3.34 | 8 |
| 31 | Fertilisers | 4888 | 103 | 0.44 | 1.15 | 11 | 0.06 | 1 |
| 32 | Tanning/dyeing extracts | 6909 | 141 | 1.74 | 3.82 | 29 | 2.91 | 6 |
| 33 | Essential oils and cosmetics | 5969 | 123 | 2.86 | 5.84 | 28 | 2.51 | 9 |
| 34 | Soap and waxes | 7332 | 150 | 1.83 | 3.49 | 21 | 2.64 | 5 |
| 35 | Albuminoids & starches | 6251 | 129 | 0.69 | 1.38 | 9 | 0.83 | 3 |
| 38 | Miscellaneous chemicals | 7379 | 153 | 2.08 | 4.36 | 34 | 2.19 | 8 |
| 39 | Plastics | 8366 | 170 | 7 | 12.63 | 79 | 12.6 | 21 |
| 40 | Rubber and articles | 7614 | 155 | 3.06 | 6.54 | 51 | 4.32 | 11 |
| 42 | Leather articles | 6768 | 141 | 1.43 | 3.03 | 19 | 3.74 | 9 |
| 43 | Furskins and articles | 2115 | 44 | 0.39 | 0.8 | 6 | 0.11 | 1 |
| 44 | Wood and articles | 7520 | 153 | 5.87 | 10.31 | 63 | 8.13 | 14 |

Table 17 - Continued

| Product code | Product label | Observations | Active partners | Ukraine's export to world | | | Ukraine's export to Canada | |
|---|---|---|---|---|---|---|---|---|
| | | | | mean | sd | max | mean | max |
| 48 | Paper and paperboard | 7661 | 157 | 4.39 | 9.07 | 65 | 3.94 | 10 |
| 49 | Printed books and media | 8037 | 165 | 1.32 | 2.37 | 19 | 3.43 | 7 |
| 52 | Cotton | 3008 | 62 | 1.24 | 3.62 | 32 | 0.21 | 1 |
| 55 | Man-made staple fibres | 2867 | 60 | 1.65 | 3.78 | 32 | 0.17 | 4 |
| 56 | Wadding and nonwovens | 6063 | 125 | 1.26 | 3.01 | 24 | 0.91 | 3 |
| 57 | Carpets and floor cov. | 3948 | 82 | 0.43 | 0.93 | 8 | 0.83 | 3 |
| 58 | Special woven fabrics | 3854 | 81 | 1.26 | 2.73 | 19 | 0.19 | 2 |
| 59 | Impregnated textiles | 5734 | 120 | 0.86 | 1.88 | 15 | 0.6 | 2 |
| 60 | Knitted or crocheted fabrics | 2397 | 51 | 1.29 | 3.18 | 24 | 0.15 | 2 |
| 61 | Knitted apparel | 6721 | 140 | 5.1 | 12.61 | 87 | 11.51 | 31 |
| 62 | Non-knitted apparel | 7332 | 150 | 6.33 | 13.63 | 95 | 13.6 | 34 |
| 63 | Textile made-up articles | 7520 | 153 | 2.13 | 4.79 | 43 | 5.83 | 13 |
| 64 | Footwear | 4700 | 98 | 1.49 | 3.09 | 21 | 1.91 | 8 |
| 65 | Headgear | 6204 | 130 | 0.49 | 0.95 | 7 | 1.17 | 3 |
| 66 | Umbrellas and sticks | 3055 | 64 | 0.45 | 0.92 | 6 | 1.04 | 4 |
| 68 | Stone and plaster articles | 7332 | 152 | 2.29 | 4.83 | 36 | 3.17 | 10 |
| 69 | Ceramic products | 5969 | 122 | 1.45 | 3.02 | 22 | 2.53 | 6 |
| 70 | Glass and glassware | 6956 | 143 | 2.25 | 4.9 | 39 | 4.15 | 9 |
| 71 | Precious stones and metals | 4465 | 93 | 0.73 | 1.58 | 12 | 0.7 | 4 |
| 72 | Iron and steel | 7755 | 161 | 4.58 | 9.3 | 69 | 5.04 | 11 |

Table 17 - Continued

| Product code | Product label | Observations | Active partners | Ukraine's export to world | | | Ukraine's export to Canada | |
|---|---|---|---|---|---|---|---|---|
| | | | | mean | sd | max | mean | max |
| 73 | Articles of iron or steel | 8507 | 173 | 7.78 | 14.67 | 100 | 15.49 | 27 |
| 74 | Copper and articles | 5687 | 118 | 1.16 | 2.83 | 24 | 1.55 | 5 |
| 76 | Aluminum and articles | 7050 | 144 | 1.67 | 3.38 | 22 | 3.04 | 7 |
| 82 | Tools and cutlery | 7473 | 153 | 3.38 | 7.98 | 60 | 4.96 | 11 |
| 83 | Misc. metal articles | 7661 | 156 | 2.99 | 5.73 | 35 | 6.4 | 13 |
| 84 | Machinery and equipment | 9212 | 185 | 16.19 | 35.57 | 300 | 27.51 | 51 |
| 85 | Electrical equipment | 9118 | 185 | 12.16 | 25.2 | 192 | 17.45 | 37 |
| 86 | Railway locomotives | 4512 | 96 | 0.88 | 1.74 | 20 | 0.64 | 2 |
| 87 | Vehicles | 7238 | 151 | 2.74 | 5.82 | 42 | 6.83 | 16 |
| 88 | Aircraft and spacecraft | 6157 | 129 | 0.54 | 1.14 | 8 | 0.96 | 4 |
| 89 | Ships and boats | 5029 | 103 | 0.64 | 1.11 | 7 | 1.57 | 5 |
| 90 | Optical instruments | 9118 | 184 | 5.4 | 10.44 | 80 | 9.47 | 21 |
| 91 | Clocks and watches | 4794 | 100 | 0.54 | 1.66 | 22 | 0.51 | 5 |
| 94 | Furniture | 7379 | 151 | 5.21 | 8.88 | 46 | 12.64 | 22 |
| 95 | Toys and games | 6439 | 133 | 1.6 | 3.11 | 27 | 3.6 | 8 |
| 97 | Works of art | 3478 | 71 | 0.2 | 0.53 | 5 | 0.32 | 2 |

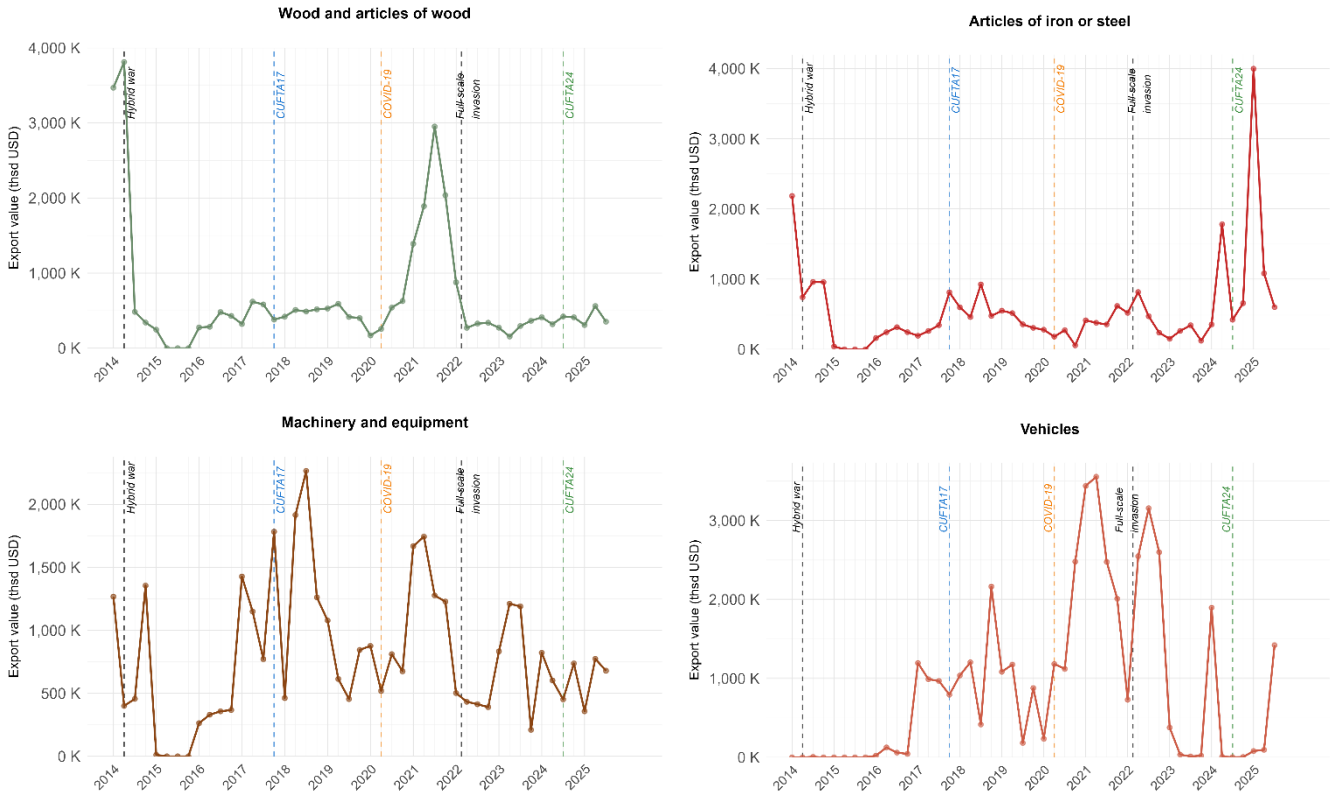



Figure 11. Ukraine's export to Canada by sector, quarterly data, HS2, USD thsd (as reported by Ukraine)

Source: own calculations based on UN Comtrade data

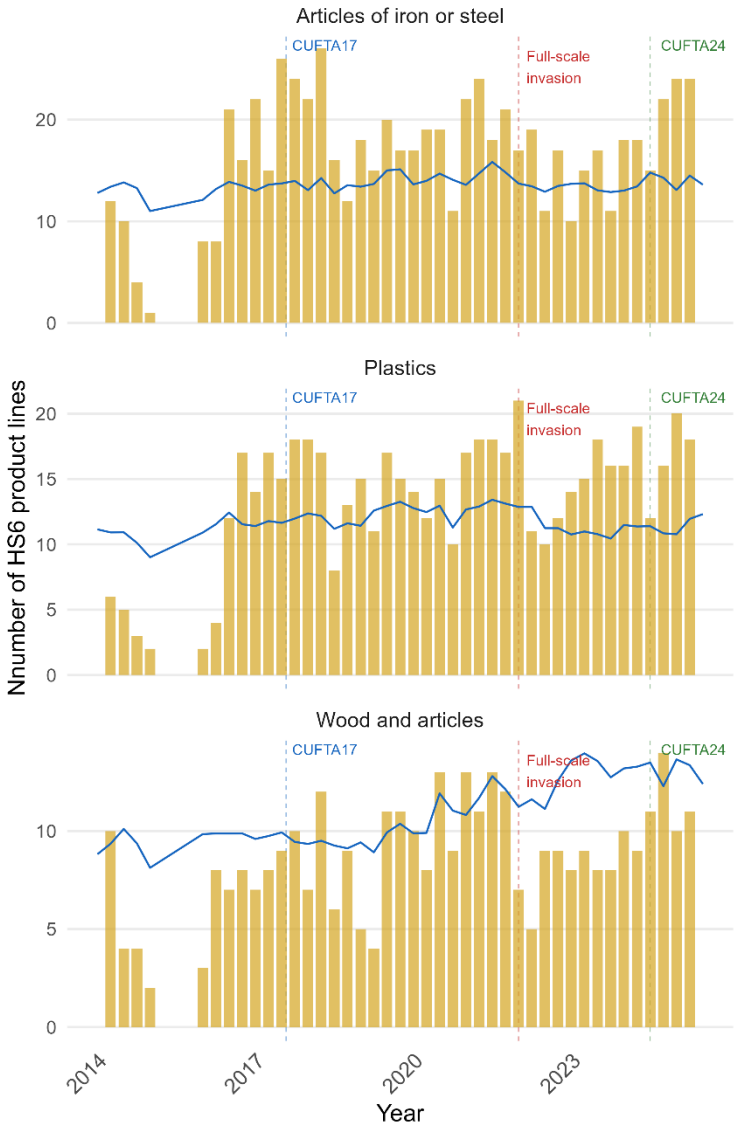



Figure 12. Dynamics of the number of HS6 product categories of Ukraine's export of selected industrial sectors to Canada: Articles of iron and steel; Plastics; Wood and articles

Source: own calculations based on UN Comtrade data

# APPENDIX B

## ESTIMATION RESULTS

Table 18. Intensive margin regression results (quarter FE)

| | Intensive margin | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS87 | HS02 | HS73 | HS39 | HS44 | HS32 |
| CUFTA17 | 2.821*** | -2.049*** | -0.857. | -0.102 | 0.043 | 3.682*** |
| | (0.302) | (0.521) | (0.439) | (0.424) | (0.463) | (0.482) |
| CUFTA24 | -1.302*** | 1.878*** | 1.061*** | 1.187*** | -0.585*** | -3.664*** |
| | (0.167) | (0.146) | (0.060) | (0.186) | (0.073) | (0.400) |
| FTA | 0.240 | -0.373 | 0.366 | -0.174 | 0.153 | 0.578. |
| | (0.453) | (0.887) | (0.339) | (0.305) | (0.257) | (0.347) |
| Distance (log) | -1.242*** | -0.824** | -1.204*** | -1.429*** | -2.067*** | -1.988*** |
| | (0.246) | (0.300) | (0.233) | (0.193) | (0.203) | (0.407) |
| GDP (importer) (log) | 0.742*** | 0.459*** | 1.032*** | 0.822*** | 0.779*** | 1.060*** |
| | (0.115) | (0.083) | (0.107) | (0.091) | (0.071) | (0.169) |
| Common border | 1.428** | 0.294 | 1.085*** | 1.771*** | 0.505 | 0.045 |
| | (0.439) | (0.584) | (0.304) | (0.304) | (0.375) | (0.364) |
| Common legislation | 0.378 | 0.334 | 0.079 | 0.370. | -0.268 | -0.309 |
| | (0.292) | (0.618) | (0.206) | (0.218) | (0.286) | (0.281) |
| Common colonizer | 0.997* | 1.018. | 1.814*** | 1.508*** | 0.203 | 1.484** |
| | (0.408) | (0.586) | (0.494) | (0.393) | (0.566) | (0.521) |
| COVID | — | — | — | — | — | — |
| Interstate war | -2.318*** | -12.585*** | -4.009*** | -2.570*** | -5.473*** | -2.320*** |
| | (0.438) | (0.772) | (0.251) | (0.319) | (0.357) | (0.362) |
| Observations | 6644 | 6380 | 7964 | 7480 | 6732 | 6204 |
| Pseudo $R^2$ | 0.632 | 0.305 | 0.79 | 0.806 | 0.814 | 0.725 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18 - Continued

| | Intensive margin | | | | |
|---|---|---|---|---|---|
| Variable | HS84 | HS90 | HS83 | HS56 | HS59 |
| CUFTA17 | -0.699* | 0.612** | -0.071 | -2.552*** | -1.616* |
| | (0.345) | (0.216) | (0.440) | (0.442) | (0.721) |
| CUFTA24 | -0.170 | -0.965*** | 1.832*** | 1.392*** | 0.880*** |
| | (0.132) | (0.126) | (0.127) | (0.182) | (0.265) |
| FTA | 0.038 | -0.028 | 1.387*** | -0.438 | 2.635*** |
| | (0.324) | (0.286) | (0.365) | (0.442) | (0.771) |
| Distance (log) | -0.907*** | -0.682*** | -0.588** | -1.782*** | 0.199 |
| | (0.180) | (0.155) | (0.216) | (0.383) | (0.359) |
| GDP (importer) (log) | 0.988*** | 0.763*** | 0.723*** | 0.854*** | 0.521** |
| | (0.099) | (0.067) | (0.157) | (0.131) | (0.173) |
| Common border | 1.762*** | 1.535*** | 1.880*** | 1.001* | 1.656** |
| | (0.378) | (0.388) | (0.398) | (0.405) | (0.607) |
| Common legislation | 0.432 | 0.055 | 0.396. | 0.579 | 0.474 |
| | (0.277) | (0.273) | (0.238) | (0.387) | (0.372) |
| Common colonizer | 1.907*** | 1.265** | 1.520** | 1.659** | 2.149*** |
| | (0.454) | (0.418) | (0.533) | (0.638) | (0.647) |
| COVID | — | — | — | — | — |
| Interstate war | -2.851*** | -3.159*** | -4.093*** | -6.190*** | -3.038*** |
| | (0.384) | (0.370) | (0.397) | (0.284) | (0.512) |
| Observations | 8140 | 8096 | 6864 | 5500 | 5280 |
| Pseudo $R^2$ | 0.786 | 0.638 | 0.741 | 0.607 | 0.56 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18 - Continued

| | Intensive margin | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS19 | HS64 | HS69 | HS70 | HS89 | HS82 |
| CUFTA17 | -0.075 | 4.293** | 1.592** | 2.713*** | 0.113 | 1.012*** |
| | (0.323) | (1.558) | (0.547) | (0.491) | (0.292) | (0.301) |
| CUFTA24 | 0.374*** | -1.330*** | -4.602*** | -0.857*** | 0.780** | 0.436 |
| | (0.112) | (0.091) | (0.185) | (0.105) | (0.241) | (0.276) |
| FTA | 0.765* | 2.183** | 1.639* | 2.164*** | 0.539 | 0.506 |
| | (0.381) | (0.834) | (0.722) | (0.248) | (0.876) | (0.474) |
| Distance (log) | -0.812** | -3.090*** | -0.620 | -1.927*** | 0.051 | -0.869** |
| | (0.308) | (0.931) | (0.490) | (0.260) | (0.585) | (0.331) |
| GDP (importer) (log) | 0.485*** | 0.593*** | 1.018*** | 0.643*** | 0.137 | 0.916*** |
| | (0.123) | (0.173) | (0.141) | (0.088) | (0.158) | (0.147) |
| Common border | 0.785* | 1.338. | 2.988*** | 0.674. | 1.350. | 2.176*** |
| | (0.361) | (0.721) | (0.396) | (0.406) | (0.690) | (0.452) |
| Common legislation | 0.400 | 0.179 | 0.495 | 0.123 | 0.238 | 0.378 |
| | (0.276) | (0.438) | (0.351) | (0.302) | (0.403) | (0.307) |
| Common colonizer | 1.849** | -1.760* | 2.360*** | 0.298 | -1.717*** | 1.846** |
| | (0.584) | (0.688) | (0.632) | (0.302) | (0.501) | (0.615) |
| COVID | — | — | — | — | — | — |
| Interstate war | -13.438*** | -5.515*** | -3.175*** | -3.610*** | -1.385. | -2.923*** |
| | (0.408) | (0.455) | (0.291) | (0.361) | (0.740) | (0.517) |
| Observations | 6820 | 4312 | 5368 | 6292 | 4532 | 6732 |
| Pseudo $R^2$ | 0.641 | 0.83 | 0.848 | 0.808 | 0.207 | 0.711 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18 - Continued

| | Intensive margin | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS86 | HS07 | HS10 | HS12 | HS66 | HS22 |
| CUFTA17 | 1.479*** | -2.298*** | -4.400*** | -1.678*** | 0.985 | 0.724 |
| | (0.440) | (0.418) | (0.368) | (0.401) | (1.021) | (0.609) |
| CUFTA24 | -1.782*** | 1.658*** | -1.444*** | -0.638*** | 1.201*** | -0.074 |
| | (0.272) | (0.147) | (0.165) | (0.134) | (0.286) | (0.147) |
| FTA | 0.951* | -1.324* | -0.814. | 0.023 | 0.754 | 0.273 |
| | (0.393) | (0.539) | (0.490) | (0.374) | (0.652) | (0.467) |
| Distance (log) | -0.869* | -1.132*** | -0.880*** | -2.133*** | -1.027. | -1.578*** |
| | (0.370) | (0.268) | (0.226) | (0.270) | (0.588) | (0.345) |
| GDP (importer) (log) | 0.849*** | 0.568*** | 0.689*** | 0.796*** | -0.058 | 0.503*** |
| | (0.223) | (0.094) | (0.092) | (0.105) | (0.165) | (0.152) |
| Common border | 1.886** | 0.903** | -0.492 | -0.652 | 0.673 | 0.248 |
| | (0.719) | (0.327) | (0.634) | (0.457) | (0.686) | (0.545) |
| Common legislation | 0.372 | -0.293 | 1.001** | 0.556 | -0.029 | 0.071 |
| | (0.447) | (0.356) | (0.360) | (0.383) | (0.494) | (0.327) |
| Common colonizer | 1.810* | 0.744* | -1.701** | -0.594 | -0.655 | 1.741** |
| | (0.783) | (0.339) | (0.580) | (0.633) | (0.635) | (0.592) |
| COVID | — | — | — | — | — | — |
| War | -3.955*** | -11.506*** | -27.433*** | -28.269*** | -2.061* | -7.606*** |
| | (0.658) | (0.411) | (0.617) | (0.403) | (0.906) | (0.472) |
| Observations | 4224 | 6556 | 6820 | 5324 | 2816 | 7172 |
| Pseudo $R^2$ | 0.6 | 0.406 | 0.477 | 0.58 | 0.34 | 0.633 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 19. Extensive margin regression results (quarter FE)

| | Extensive margin | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS87 | HS02 | HS73 | HS39 | HS44 | HS32 |
| CUFTA17 | 1.686*** | -0.747** | 1.081*** | 1.088*** | 1.096*** | 1.488*** |
| | (0.308) | (0.284) | (0.194) | (0.174) | (0.244) | (0.298) |
| CUFTA24 | -0.326*** | 0.387*** | 0.291*** | 0.144** | 0.240*** | 0.036 |
| | (0.076) | (0.090) | (0.047) | (0.045) | (0.042) | (0.074) |
| FTA | 0.550* | 0.347 | 0.559*** | 0.653*** | 0.476** | 0.657** |
| | (0.241) | (0.435) | (0.159) | (0.154) | (0.166) | (0.223) |
| Distance (log) | -0.809*** | -0.237 | -0.856*** | -0.795*** | -1.294*** | -0.895*** |
| | (0.185) | (0.288) | (0.096) | (0.095) | (0.122) | (0.131) |
| GDP (importer) (log) | 0.343*** | 0.057 | 0.357*** | 0.320*** | 0.393*** | 0.287*** |
| | (0.078) | (0.066) | (0.052) | (0.047) | (0.039) | (0.084) |
| Common border | 0.508. | 0.090 | 0.312. | 0.374* | -0.106 | 0.608* |
| | (0.283) | (0.371) | (0.173) | (0.158) | (0.184) | (0.244) |
| Common legislation | 0.034 | 0.018 | -0.147 | -0.093 | -0.229. | -0.154 |
| | (0.183) | (0.205) | (0.114) | (0.106) | (0.118) | (0.169) |
| Colony | 0.908** | 0.001 | 0.885*** | 0.785*** | 0.373. | 0.870** |
| | (0.317) | (0.282) | (0.233) | (0.198) | (0.222) | (0.318) |
| COVID | — | — | — | — | — | — |
| Interstate war | -3.090*** | -2.341*** | -2.634*** | -2.484*** | -3.842*** | -2.371*** |
| | (0.224) | (0.315) | (0.155) | (0.140) | (0.166) | (0.262) |
| Observations | 6644 | 6380 | 7964 | 7480 | 6732 | 6204 |
| Pseudo $R^2$ | 0.463 | 0.079 | 0.669 | 0.666 | 0.693 | 0.517 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 19 - Continued

| | Extensive margin | | | | |
|---|---|---|---|---|---|
| Variable | HS84 | HS90 | HS83 | HS56 | HS59 |
| CUFTA17 | 0.821*** | 0.244 | 1.459*** | 0.987** | 1.161*** |
| | (0.195) | (0.159) | (0.283) | (0.305) | (0.242) |
| CUFTA24 | 0.228*** | 0.183*** | 0.389*** | 0.541*** | 0.347*** |
| | (0.053) | (0.044) | (0.048) | (0.086) | (0.073) |
| FTA | 0.497** | 0.312. | 0.817*** | 0.749*** | 0.952*** |
| | (0.176) | (0.181) | (0.191) | (0.226) | (0.207) |
| Distance (log) | -0.823*** | -0.556*** | -0.830*** | -1.128*** | -0.942*** |
| | (0.111) | (0.109) | (0.111) | (0.168) | (0.157) |
| GDP (importer) (log) | 0.394*** | 0.430*** | 0.343*** | 0.381*** | 0.301*** |
| | (0.061) | (0.050) | (0.066) | (0.100) | (0.083) |
| Common border | 0.564** | 0.652** | 0.388* | 0.702** | 0.706** |
| | (0.219) | (0.227) | (0.177) | (0.266) | (0.236) |
| Common legislation | -0.035 | -0.113 | -0.094 | -0.059 | -0.055 |
| | (0.147) | (0.141) | (0.124) | (0.180) | (0.171) |
| Colony | 1.063*** | 1.118*** | 0.792** | 0.708* | 0.611. |
| | (0.289) | (0.269) | (0.258) | (0.341) | (0.323) |
| COVID | — | — | — | — | — |
| Interstate war | -2.603*** | -2.703*** | -2.631*** | -2.797*** | -3.081*** |
| | (0.184) | (0.186) | (0.162) | (0.237) | (0.195) |
| Observations | 8140 | 8096 | 6864 | 5500 | 5280 |
| Pseudo $R^2$ | 0.726 | 0.591 | 0.585 | 0.531 | 0.462 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country |

Notes: . p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 19 - Continued

| | Extensive margin | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS18 | HS64 | HS69 | HS70 | HS89 | HS82 |
| CUFTA17 | 1.110*** | 1.798*** | 1.727*** | 1.743*** | 1.746*** | 1.011** |
| | (0.196) | (0.441) | (0.452) | (0.441) | (0.325) | (0.371) |
| CUFTA24 | 0.095* | -0.643*** | -0.440*** | 0.567*** | 0.499*** | 0.412*** |
| | (0.048) | (0.105) | (0.086) | (0.067) | (0.057) | (0.078) |
| FTA | 0.153 | 0.754* | 0.987*** | 0.824** | 0.748* | 0.494. |
| | (0.178) | (0.302) | (0.283) | (0.251) | (0.349) | (0.267) |
| Distance (log) | -0.500*** | -0.842*** | -0.829*** | -1.067*** | -0.894** | -0.828*** |
| | (0.116) | (0.216) | (0.167) | (0.157) | (0.274) | (0.170) |
| GDP (importer) (log) | 0.124* | 0.370*** | 0.313*** | 0.367*** | 0.272*** | 0.277* |
| | (0.048) | (0.094) | (0.093) | (0.091) | (0.059) | (0.110) |
| Common border | -0.035 | 0.813** | 0.551* | 0.353 | 0.123 | 0.612* |
| | (0.206) | (0.289) | (0.260) | (0.237) | (0.239) | (0.310) |
| Common legislation | -0.021 | 0.066 | -0.123 | -0.089 | -0.297. | -0.127 |
| | (0.128) | (0.215) | (0.174) | (0.170) | (0.162) | (0.206) |
| Colony | 0.840*** | 0.966* | 0.977** | 0.865* | 0.022 | 0.890* |
| | (0.182) | (0.378) | (0.337) | (0.340) | (0.279) | (0.393) |
| COVID | — | — | — | — | — | — |
| Interstate war | -2.692*** | -4.087*** | -1.969*** | -2.253*** | -3.190*** | -2.421*** |
| | (0.199) | (0.272) | (0.286) | (0.254) | (0.211) | (0.299) |
| Observations | 6864 | 4312 | 5368 | 6292 | 4532 | 6732 |
| Pseudo $R^2$ | 0.207 | 0.438 | 0.502 | 0.58 | 0.318 | 0.483 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 19 - Continued

| | Extensive margin | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS86 | HS06 | HS10 | HS12 | HS22 | HS66 |
| CUFTA17 | 0.729** | 1.484*** | -0.266* | 0.994*** | 1.052*** | 2.717*** |
| | (0.238) | (0.334) | (0.127) | (0.203) | (0.193) | (0.692) |
| CUFTA24 | -0.377*** | -0.989*** | 0.544*** | 0.048 | 0.166** | -0.088 |
| | (0.096) | (0.144) | (0.047) | (0.049) | (0.054) | (0.159) |
| FTA | 0.778** | 0.115 | -0.387* | -0.012 | 0.449. | 0.610 |
| | (0.242) | (0.387) | (0.165) | (0.158) | (0.249) | (0.406) |
| Distance (log) | -0.853*** | -0.900*** | -0.954*** | -1.277*** | -0.403* | -0.804* |
| | (0.178) | (0.225) | (0.103) | (0.121) | (0.171) | (0.317) |
| GDP (importer) (log) | 0.381** | 0.259 | 0.322*** | 0.325*** | 0.251*** | 0.031 |
| | (0.119) | (0.197) | (0.032) | (0.047) | (0.055) | (0.116) |
| Common border | 0.226 | 0.704 | -0.044 | -0.068 | -0.002 | 0.733. |
| | (0.411) | (0.432) | (0.261) | (0.212) | (0.251) | (0.397) |
| Common legislation | -0.103 | -0.215 | -0.082 | -0.060 | -0.461*** | -0.198 |
| | (0.257) | (0.303) | (0.134) | (0.135) | (0.139) | (0.286) |
| Colony | 1.221** | 0.527 | -0.122 | 0.152 | 0.871*** | 0.035 |
| | (0.411) | (0.614) | (0.245) | (0.205) | (0.209) | (0.456) |
| COVID | — | — | — | — | — | — |
| Interstate war | -1.644** | -2.451*** | -15.088*** | -16.625*** | -2.199*** | -2.309*** |
| | (0.512) | (0.548) | (0.263) | (0.233) | (0.238) | (0.489) |
| Observations | 4224 | 1980 | 6820 | 5324 | 7172 | 2816 |
| Pseudo $R^2$ | 0.339 | 0.192 | 0.3 | 0.41 | 0.32 | 0.22 |
| Quarter FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The model employs PPML method. Standard errors are given in parentheses

Table 20. Intensive margin regression results (pooled PPML)

| | Intensive margin (pooled PPML) | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS87 | HS02 | HS73 | HS39 | HS44 | HS32 |
| CUFTA17 | 2.716*** | -1.983*** | -0.850* | -0.012 | 0.097 | 3.586*** |
| | (0.323) | (0.501) | (0.423) | (0.409) | (0.467) | (0.514) |
| CUFTA24 | -1.538*** | 2.227*** | 0.963*** | 0.873*** | -0.517*** | -4.729*** |
| | (0.029) | (0.033) | (0.027) | (0.052) | (0.016) | (0.032) |
| FTA | 0.265 | -0.383 | 0.373 | -0.163 | 0.143 | 0.638. |
| | (0.448) | (0.876) | (0.340) | (0.304) | (0.259) | (0.359) |
| Distance (log) | -1.214*** | -0.833** | -1.200*** | -1.421*** | -2.084*** | -1.940*** |
| | (0.250) | (0.295) | (0.235) | (0.194) | (0.210) | (0.421) |
| GDP (importer) (log) | 0.742*** | 0.465*** | 1.031*** | 0.831*** | 0.781*** | 1.049*** |
| | (0.121) | (0.084) | (0.107) | (0.095) | (0.073) | (0.175) |
| Common border | 1.484** | 0.246 | 1.094*** | 1.810*** | 0.480 | 0.140 |
| | (0.484) | (0.594) | (0.307) | (0.320) | (0.391) | (0.410) |
| Common legislation | 0.412 | 0.326 | 0.083 | 0.398. | -0.287 | -0.258 |
| | (0.326) | (0.608) | (0.213) | (0.234) | (0.298) | (0.300) |
| Colony | 0.981* | 1.053. | 1.810*** | 1.518*** | 0.213 | 1.422** |
| | (0.413) | (0.580) | (0.492) | (0.398) | (0.569) | (0.521) |
| COVID | -0.200 | -0.086 | -0.129 | 0.382* | 0.029 | 0.198 |
| | (0.123) | (0.147) | (0.108) | (0.151) | (0.074) | (0.131) |
| Interstate war | -2.611*** | -12.234*** | -4.050*** | -2.809*** | -5.305*** | -3.191*** |
| | (0.544) | (0.709) | (0.250) | (0.351) | (0.409) | (0.350) |
| Observations | 6644 | 6380 | 7964 | 7480 | 6732 | 6204 |
| Pseudo $R^2$ | 0.604 | 0.272 | 0.775 | 0.783 | 0.802 | 0.637 |
| Quarter FE | No | No | No | No | No | No |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Table 20 - Continued

| | Intensive margin (pooled PPML) | | | | |
|---|---|---|---|---|---|
| Variable | HS84 | HS90 | HS83 | HS56 | HS59 |
| CUFTA17 | -0.744* | 0.576** | -0.022 | -2.486*** | -1.642* |
| | (0.329) | (0.198) | (0.438) | (0.432) | (0.709) |
| CUFTA24 | -0.519*** | -1.209*** | 1.988*** | 1.412*** | 0.260*** |
| | (0.054) | (0.040) | (0.047) | (0.062) | (0.035) |
| FTA | 0.072 | -0.011 | 1.365*** | -0.442 | 2.665*** |
| | (0.325) | (0.287) | (0.366) | (0.438) | (0.774) |
| Distance (log) | -0.876*** | -0.666*** | -0.613** | -1.789*** | 0.221 |
| | (0.185) | (0.159) | (0.213) | (0.380) | (0.362) |
| GDP (importer) (log) | 0.989*** | 0.762*** | 0.718*** | 0.860*** | 0.514** |
| | (0.103) | (0.069) | (0.152) | (0.131) | (0.175) |
| Common border | 1.851*** | 1.585*** | 1.811*** | 1.000* | 1.726** |
| | (0.434) | (0.423) | (0.367) | (0.414) | (0.634) |
| Common legislation | 0.482 | 0.083 | 0.354 | 0.580 | 0.505 |
| | (0.307) | (0.294) | (0.230) | (0.380) | (0.389) |
| Colony | 1.878*** | 1.241** | 1.530** | 1.674** | 2.103*** |
| | (0.449) | (0.415) | (0.528) | (0.640) | (0.630) |
| COVID | 0.104 | 0.006 | 0.018 | 0.251 | -0.095 |
| | (0.191) | (0.156) | (0.174) | (0.205) | (0.144) |
| Interstate war | -3.301*** | -3.483*** | -3.798*** | -6.197*** | -3.505*** |
| | (0.508) | (0.464) | (0.330) | (0.243) | (0.510) |
| Observations | 8140 | 8096 | 6864 | 5500 | 5280 |
| Pseudo $R^2$ | 0.76 | 0.613 | 0.725 | 0.597 | 0.514 |
| Quarter FE | No | No | No | No | No |
| Clustered SE | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 20 - Continued

| | Intensive margin (pooled PPML) | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS19 | HS64 | HS69 | HS70 | HS89 | HS82 |
| CUFTA17 | -0.125 | 4.141** | 1.536** | 2.780*** | 0.201 | 1.066*** |
| | (0.325) | (1.475) | (0.530) | (0.478) | (0.303) | (0.299) |
| CUFTA24 | 0.770*** | -1.360*** | -4.600*** | -0.784*** | 0.052 | 0.455*** |
| | (0.030) | (0.029) | (0.045) | (0.024) | (0.065) | (0.028) |
| FTA | 0.758* | 2.189** | 1.684* | 2.155*** | 0.542 | 0.489 |
| | (0.381) | (0.818) | (0.716) | (0.249) | (0.875) | (0.467) |
| Distance (log) | -0.817** | -2.997*** | -0.583 | -1.948*** | 0.057 | -0.887** |
| | (0.309) | (0.886) | (0.489) | (0.260) | (0.585) | (0.329) |
| GDP (importer) (log) | 0.488*** | 0.591*** | 1.035*** | 0.646*** | 0.137 | 0.914*** |
| | (0.122) | (0.171) | (0.142) | (0.090) | (0.161) | (0.142) |
| Common border | 0.770* | 1.399* | 3.089*** | 0.652 | 1.408. | 2.132*** |
| | (0.354) | (0.704) | (0.389) | (0.402) | (0.734) | (0.405) |
| Common legislation | 0.394 | 0.214 | 0.553 | 0.111 | 0.266 | 0.351 |
| | (0.278) | (0.428) | (0.364) | (0.311) | (0.426) | (0.334) |
| Colony | 1.863** | -1.724* | 2.397*** | 0.304 | -1.741*** | 1.852** |
| | (0.581) | (0.671) | (0.625) | (0.299) | (0.506) | (0.613) |
| COVID | 0.015 | -0.088 | 0.052 | 0.286*** | 0.318 | 0.216** |
| | (0.111) | (0.129) | (0.176) | (0.082) | (0.209) | (0.074) |
| Interstate war | -13.320*** | -5.720*** | -3.534*** | -3.505*** | -2.181** | -2.746*** |
| | (0.347) | (0.479) | (0.124) | (0.303) | (0.820) | (0.319) |
| Observations | 6820 | 4312 | 5368 | 6292 | 4532 | 6732 |
| Pseudo $R^2$ | 0.623 | 0.816 | 0.828 | 0.797 | 0.123 | 0.7 |
| Quarter FE | No | No | No | No | No | No |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are given in parentheses

Table 20 - Continued

| | Intensive margin (pooled PPML) | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS86 | HS07 | HS10 | HS12 | HS22 | HS66 |
| CUFTA17 | 1.352*** | -2.229*** | -4.318*** | -1.582*** | 0.668 | 0.972 |
| | (0.401) | (0.419) | (0.359) | (0.410) | (0.605) | (1.038) |
| CUFTA24 | -1.791*** | 1.527*** | -1.625*** | -0.490*** | 0.444*** | 1.256*** |
| | (0.110) | (0.048) | (0.037) | (0.023) | (0.039) | (0.026) |
| FTA | 0.984* | -1.322* | -0.817. | 0.010 | 0.262 | 0.751 |
| | (0.408) | (0.536) | (0.487) | (0.373) | (0.464) | (0.646) |
| Distance (log) | -0.831* | -1.130*** | -0.882*** | -2.155*** | -1.590*** | -1.033. |
| | (0.379) | (0.265) | (0.224) | (0.273) | (0.348) | (0.587) |
| GDP (importer) (log) | 0.855*** | 0.567*** | 0.692*** | 0.802*** | 0.508*** | -0.054 |
| | (0.234) | (0.092) | (0.092) | (0.105) | (0.152) | (0.161) |
| Common border | 1.982* | 0.928** | -0.500 | -0.710 | 0.221 | 0.666 |
| | (0.795) | (0.321) | (0.638) | (0.491) | (0.539) | (0.686) |
| Common legislation | 0.428 | -0.284 | 1.005** | 0.540 | 0.060 | -0.031 |
| | (0.494) | (0.355) | (0.359) | (0.386) | (0.320) | (0.492) |
| Colony | 1.806* | 0.728* | -1.690** | -0.562 | 1.765** | -0.647 |
| | (0.794) | (0.330) | (0.577) | (0.634) | (0.604) | (0.630) |
| COVID | -0.045 | -0.022 | 0.122 | -0.495*** | -0.086 | 0.175* |
| | (0.423) | (0.186) | (0.149) | (0.149) | (0.149) | (0.077) |
| Interstate war | -4.404*** | -11.786*** | -27.422*** | -28.143*** | -7.357*** | -2.027*** |
| | (0.835) | (0.344) | (0.588) | (0.455) | (0.438) | (0.973) |
| Observations | 4224 | 6556 | 6820 | 5324 | 7172 | 2816 |
| Pseudo $R^2$ | 0.542 | 0.355 | 0.455 | 0.52 | 0.6 | 0.201 |
| Quarter FE | No | No | No | No | No | No |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are given in parentheses

Table 21. Extensive margin regression results (pooled PPML)

| | Extensive margin (pooled PPML) | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS87 | HS02 | HS73 | HS39 | HS44 | HS32 |
| CUFTA17 | 1.702*** | -0.727* | 1.092*** | 1.112*** | 1.117*** | 1.532*** |
| | (0.307) | (0.287) | (0.193) | (0.173) | (0.242) | (0.296) |
| CUFTA24 | -0.379*** | 0.259*** | 0.164*** | 0.102*** | 0.224*** | 0.042** |
| | (0.014) | (0.014) | (0.008) | (0.008) | (0.007) | (0.014) |
| FTA | 0.551* | 0.347 | 0.561*** | 0.653*** | 0.476** | 0.656** |
| | (0.240) | (0.434) | (0.159) | (0.154) | (0.165) | (0.222) |
| Distance (log) | -0.809*** | -0.237 | -0.854*** | -0.796*** | -1.295*** | -0.897*** |
| | (0.185) | (0.288) | (0.096) | (0.095) | (0.121) | (0.131) |
| GDP (importer) (log) | 0.344*** | 0.057 | 0.356*** | 0.321*** | 0.394*** | 0.290*** |
| | (0.078) | (0.066) | (0.052) | (0.047) | (0.039) | (0.084) |
| Common border | 0.507. | 0.099 | 0.321. | 0.376* | -0.109 | 0.606* |
| | (0.281) | (0.373) | (0.173) | (0.156) | (0.184) | (0.242) |
| Common legislation | 0.034 | 0.020 | -0.143 | -0.091 | -0.230. | -0.154 |
| | (0.183) | (0.205) | (0.115) | (0.106) | (0.118) | (0.169) |
| Colony | 0.909** | -0.001 | 0.880*** | 0.785*** | 0.376. | 0.875** |
| | (0.317) | (0.282) | (0.233) | (0.199) | (0.222) | (0.319) |
| COVID | 0.110** | 0.170*** | 0.122*** | 0.145*** | 0.114*** | 0.209*** |
| | (0.042) | (0.044) | (0.025) | (0.025) | (0.024) | (0.042) |
| Interstate war | -3.084*** | -2.494*** | -2.751*** | -2.527*** | -3.813*** | -2.373*** |
| | (0.207) | (0.323) | (0.140) | (0.125) | (0.157) | (0.252) |
| Observations | 6644 | 6380 | 7964 | 7480 | 6732 | 6204 |
| Pseudo $R^2$ | 0.459 | 0.064 | 0.664 | 0.662 | 0.691 | 0.51 |
| Quarter FE | No | No | No | No | No | No |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are given in parentheses

Table 21 - Continued

| | Extensive margin (pooled PPML) | | | | |
|---|---|---|---|---|---|
| Variable | HS84 | HS90 | HS83 | HS56 | HS59 |
| CUFTA17 | 0.839*** | 0.273. | 1.501*** | 1.025*** | 1.184*** |
| | (0.196) | (0.158) | (0.281) | (0.304) | (0.244) |
| CUFTA24 | 0.105*** | 0.102*** | 0.371*** | 0.472*** | 0.436*** |
| | (0.009) | (0.007) | (0.010) | (0.020) | (0.016) |
| FTA | 0.499** | 0.313. | 0.815*** | 0.749*** | 0.951*** |
| | (0.175) | (0.181) | (0.191) | (0.225) | (0.207) |
| Distance (log) | -0.822*** | -0.556*** | -0.832*** | -1.128*** | -0.944*** |
| | (0.111) | (0.109) | (0.111) | (0.167) | (0.157) |
| GDP (importer) (log) | 0.394*** | 0.431*** | 0.344*** | 0.383*** | 0.303*** |
| | (0.061) | (0.049) | (0.066) | (0.100) | (0.083) |
| Common border | 0.573** | 0.657** | 0.384* | 0.707** | 0.706** |
| | (0.219) | (0.226) | (0.175) | (0.262) | (0.234) |
| Common legislation | -0.031 | -0.110 | -0.095 | -0.055 | -0.055 |
| | (0.149) | (0.142) | (0.124) | (0.180) | (0.171) |
| Colony | 1.059*** | 1.116*** | 0.797** | 0.708* | 0.615. |
| | (0.289) | (0.270) | (0.258) | (0.342) | (0.323) |
| COVID | 0.138*** | 0.148*** | 0.110*** | 0.247*** | 0.137** |
| | (0.027) | (0.023) | (0.030) | (0.056) | (0.049) |
| Interstate war | -2.701*** | -2.767*** | -2.606*** | -2.867*** | -3.094*** |
| | (0.176) | (0.170) | (0.144) | (0.208) | (0.184) |
| Observations | 8140 | 8096 | 6864 | 5500 | 5280 |
| Pseudo $R^2$ | 0.721 | 0.586 | 0.58 | 0.526 | 0.456 |
| Quarter FE | No | No | No | No | No |
| Clustered SE | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are given in parentheses

Table 21 - Continued

| | Extensive margin (pooled PPML) | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS19 | HS64 | HS69 | HS70 | HS89 | HS82 |
| CUFTA17 | 1.022*** | 1.843*** | 1.756*** | 1.773*** | 1.771*** | 1.052** |
| | (0.216) | (0.437) | (0.448) | (0.439) | (0.324) | (0.372) |
| CUFTA24 | 0.488*** | -0.713*** | -0.657*** | 0.450*** | 0.623*** | 0.320*** |
| | (0.011) | (0.021) | (0.014) | (0.013) | (0.014) | (0.016) |
| FTA | 0.368 | 0.754* | 0.990*** | 0.825** | 0.747* | 0.494. |
| | (0.242) | (0.301) | (0.283) | (0.251) | (0.347) | (0.266) |
| Distance (log) | -0.469** | -0.845*** | -0.826*** | -1.066*** | -0.897** | -0.828*** |
| | (0.162) | (0.216) | (0.167) | (0.156) | (0.273) | (0.170) |
| GDP (importer) (log) | 0.154* | 0.371*** | 0.313*** | 0.368*** | 0.275*** | 0.278* |
| | (0.060) | (0.093) | (0.094) | (0.091) | (0.059) | (0.109) |
| Common border | 0.080 | 0.810** | 0.563* | 0.360 | 0.113 | 0.612* |
| | (0.212) | (0.284) | (0.265) | (0.238) | (0.237) | (0.309) |
| Common legislation | -0.306* | 0.065 | -0.115 | -0.085 | -0.302. | -0.127 |
| | (0.137) | (0.215) | (0.179) | (0.172) | (0.161) | (0.206) |
| Colony | 0.735*** | 0.969* | 0.971** | 0.862* | 0.031 | 0.892* |
| | (0.194) | (0.379) | (0.337) | (0.341) | (0.279) | (0.393) |
| COVID | 0.180*** | 0.112 | 0.292*** | 0.187*** | 0.080. | 0.236*** |
| | (0.033) | (0.072) | (0.035) | (0.035) | (0.047) | (0.043) |
| Interstate war | -3.381*** | -4.065*** | -2.143*** | -2.353*** | -3.084*** | -2.423*** |
| | (0.189) | (0.245) | (0.294) | (0.251) | (0.193) | (0.290) |
| Observations | 6820 | 4312 | 5368 | 6292 | 4532 | 6732 |
| Pseudo $R^2$ | 0.286 | 0.434 | 0.493 | 0.575 | 0.308 | 0.478 |
| Quarter FE | No | No | No | No | No | No |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors are given in parentheses

Table 21 - Continued

| | Intensive margin (pooled PPML) | | | | | |
|---|---|---|---|---|---|---|
| Variable | HS86 | HS07 | HS10 | HS12 | HS66 | HS22 |
| CUFTA17 | 0.718** | 0.445. | -0.251. | 1.020*** | 2.771*** | 1.068*** |
| | (0.236) | (0.266) | (0.128) | (0.203) | (0.685) | (0.194) |
| CUFTA24 | -0.484*** | -0.812*** | 0.455*** | -0.064*** | -0.025 | 0.166*** |
| | (0.016) | (0.014) | (0.010) | (0.011) | (0.023) | (0.010) |
| FTA | 0.781** | 0.595 | -0.387* | -0.012 | 0.608 | 0.449. |
| | (0.243) | (0.453) | (0.164) | (0.158) | (0.401) | (0.248) |
| Distance (log) | -0.848*** | -0.189 | -0.954*** | -1.277*** | -0.814** | -0.403* |
| | (0.179) | (0.301) | (0.102) | (0.121) | (0.316) | (0.171) |
| GDP (importer) (log) | 0.379** | 0.082 | 0.322*** | 0.325*** | 0.037 | 0.251*** |
| | (0.119) | (0.074) | (0.032) | (0.047) | (0.114) | (0.055) |
| Common border | 0.240 | 0.418 | -0.041 | -0.066 | 0.719. | -0.001 |
| | (0.423) | (0.342) | (0.259) | (0.210) | (0.392) | (0.250) |
| Common legislation | -0.097 | -0.314 | -0.081 | -0.059 | -0.203 | -0.460*** |
| | (0.264) | (0.218) | (0.134) | (0.134) | (0.281) | (0.139) |
| Colony | 1.211** | -0.358 | -0.123 | 0.151 | 0.048 | 0.872*** |
| | (0.410) | (0.302) | (0.244) | (0.205) | (0.454) | (0.209) |
| COVID | 0.079 | 0.220*** | 0.038 | 0.018 | 0.268*** | 0.090** |
| | (0.049) | (0.046) | (0.037) | (0.040) | (0.075) | (0.033) |
| Interstate war | -1.805** | -2.528*** | -15.130*** | -16.654*** | -2.192*** | -2.222*** |
| | (0.572) | (0.303) | (0.263) | (0.231) | (0.467) | (0.227) |
| Observations | 4224 | 6556 | 6820 | 5324 | 2816 | 7172 |
| Pseudo $R^2$ | 0.332 | 0.12 | 0.293 | 0.405 | 0.197 | 0.314 |
| Quarter FE | No | No | No | No | No | No |
| Clustered SE | by country | by country | by country | by country | by country | by country |

Notes: . $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors are given in parentheses