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A Simple Method to Quantify the *Ex-Ante* Effects of "Deep" Trade Liberalization and "Hard" Trade Protection

Abstract

We propose a simple and flexible econometric approach to quantify ex-ante the "deep" impact of trade liberalization and the "hard" effects of protection with the empirical structural gravity model. Specifically, we argue that the difference between the estimates of border indicator variables for affected and non-affected countries can be used as a comprehensive measure of the change in bilateral trade costs in response to a hypothetical policy change. To demonstrate the effectiveness of our methods, we focus on the integration between the countries from the Central European Free Trade Agreement (CEFTA) and the European Union (EU); an important policy application that has not been studied before due to lack of data. We overcome this challenge by utilizing a new dataset on trade and production that covers all EU countries and all CEFTA members (except for Kosovo). The partial equilibrium estimates that we obtain confirm the validity of our methods, while the corresponding general equilibrium effects point to significant and heterogeneous potential gains for the CEFTA countries from joining the EU. The proposed methods can also be extended to ex-post analysis and are readily applicable to other applications, e.g. "hard" Brexit.

JEL-Codes: F100, F130, F140.

Keywords: trade costs, trade policy, structural gravity, CEFTA, EU.

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1 Introduction

Quantifying the ex-ante effects of trade liberalization, e.g., the impact of free trade agreements (FTAs) and the expansion of the European Union (EU), or trade protection, e.g., Brexit or the break up of the free trade agreement between Estonia and Ukraine due to Estonia's accession to the EU, are important but difficult tasks. The transmission channels for the impact of trade protection and trade liberalization are clear and well understood from a theoretical perspective, c.f., Arkolakis, Costinot and Rodriguez-Clare (2012). However, difficulties in such evaluation efforts arise in the empirical implementation and, more specifically, with the definition and quantification of the initial change in trade costs that triggers ripple effects in the global economy. While ex-post evaluation analysis usually allow researchers to obtain estimates of the impact of liberalization or protection efforts, e.g., the impact of NAFTA or the impact of applied tariffs, this is not the case with ex-ante studies, e.g., the formation of a new trade agreement or Brexit. Therefore, researchers have adopted one of two approaches to quantify the impact of "shallow" vs. "deep" trade liberalization efforts, e.g., the "shallow" vs. "deep" effects of FTAs, or the impact of "soft" vs. "hard" impact of protection, e.g., the "soft" vs. "hard" effects of Brexit.[1]

Policy makers and academics seem to agree on the modeling choice for the measurement of the initial trade cost changes in the "shallow" and "soft" scenarios. Specifically, these changes are captured through changes in observed trade policies, e.g., tariffs. However, it is more difficult to find appropriate measures for the initial change in trade costs in the case of "deep" and "hard" trade liberalization and protection scenarios, respectively. To this end, two popular approaches have been adopted. The first approach is to rely on additional observable trade policy measures (e.g., non-tariff trade measures, NTMs) and to add the changes in those measures to the changes in tariffs from the "soft" scenario. This approach has two drawbacks. First, data on NTMs are often scarce and patchy, and the measurement and aggregation of NTMs can be difficult, c.f., UNCTAD-WTO (2012). In addition, even if NTM data were available, the combination of changes in observable

[1] While "shallow" vs. "deep" FTAs can be distinguished by the (number) of provisions included, for example, the concept of "soft" vs. "hard" effects is a bit vague. One way to think about the difference between "soft" vs. "hard" trade protection, which is consistent with our approach in this project, is as the difference between directly observable measures that can be included explicitly in quantitative analysis vs. obstacles to trade that are not directly observable and for which data for the econometric analysis are not available.

NTMs and tariffs may still be viewed as a conservative ("soft") measure of the possible benefits from liberalization or the costs from protection.

The second approach to measure the initial trade cost change for "deep"/"hard" trade liberalization and protection scenarios has been to use estimates of the effects of existing free trade agreements. While, by design, this approach is very appropriate for ex-post evaluation, a major drawback when applied for-ex-ante analysis is that the initial shock is constructed based on limited information (often a single FTA estimate) and often based on external sample data, i.e., estimation data that are different from the data used for the counterfactuals. Even if the sample used for the counterfactuals and for the estimations were the same, and even if the researcher has the opportunity to obtain a number of ex-post FTA estimates that can be used for the counterfactual analysis, it is difficult to identify an existing FTA that would match closely to the exact FTA in question.[2]

We propose a simple and flexible econometric method that overcomes the aforementioned challenges to deliver comprehensive estimates of the ex-ante initial impact of "deep" trade liberalization and "hard" protection. Specifically, we capitalize and extend on the latest developments in the empirical structural gravity literature to estimate the effects of bilateral borders that act in addition to all other trade costs that are observable to the researcher. Thus, the border variables will account for all forces that are unobservable (or observable but not controlled for) in the econometric specification of trade costs. Then, in combination with the estimates of the observable trade policy measures (e.g., tariffs, FTAs, etc.), the difference between the flexibly selected border estimates for the affected group and the corresponding estimates for the properly selected non-affected group would offer a comprehensive account for the potential trade costs that may be eliminated with trade liberalization or generated in the case of protection.

We believe that the proposed method has four attractive features. First, the method is *simple* because it does not require specific policy data but only the construction and estimation of the effects of appropriate indicator variables, i.e., proper border variables, within a standard structural gravity model. Second, the implementation is *flexible* for two reasons: (i) because it allows to select

[2]Baier, Bergstrand and Clance (2018) and Baier, Yotov and Zylkin (2019) are examples providing evidence of heterogeneous EIA trade elasticities. As will become clear below, the approach that we propose in this paper has two advantages. First, it is significantly simpler to implement. Second, it can utilize much more information for the group of interest.

both the groups of affected and non-affected countries for the analysis among any pair or group of countries that appear in the sample subject to data availability; and (ii) because it allows for the researcher to explicitly control for all observable bilateral determinants of trade. Third, the approach is *comprehensive* because, by construction, the border estimates will account for all trade costs that have not been captured explicitly by other control variables that are observable to the researcher. Note that, in addition to the border variables, our method allows for the inclusion of tariffs, FTAs, and all other variables for which data are available. Finally, the method is implemented within the standard empirical structural gravity equation and, therefore, the partial equilibrium estimates that it delivers can be integrated within a wide class of *new quantitative trade models*, c.f., Arkolakis, Costinot and Rodriguez-Clare (2012); Costinot and Rodriguez-Clare (2014), or even complex computational general equilibrium models, such as the standard GTAP model. We demonstrate that in Section 4.2, where we obtain general equilibrium (GE) welfare effects corresponding to our partial equilibrium estimates.

To demonstrate the effectiveness of our methods we study the integration between the countries from the Central European Free Trade Agreement (CEFTA) and the European Union (EU). The integration of the CEFTA countries has been an extremely important goal for the governments of those nations but also from the perspective of the European Union, especially after the EU released a new strategy for the Western Balkans countries.[3] We offer further details on the background on CEFTA and EU accession process and status in Section 3.1. Data limitations have been the main obstacle to study the impact of the potential CEFTA integration with the EU. We overcome this challenge by being the first to utilize the new International Trade and Production Database for Estimation (ITPD-E), which was construced by Borchert et al. (2021*a*) for the U.S. International Trade Commission. The two main advantages of ITPD-E for our purposes are that (i) it covers all

[3]The economic integration process between EU and the CEFTA countries has been slowly progressing for the last 15 years. Four CEFTA countries (Albania, Montenegro, North Macedonia and Serbia) are EU candidate countries, while Bosnia and Herzegovina and Kosovo are potential candidate countries, and Moldova recently signed a bilateral free trade agreement with the EU. The recent EU strategy in 2018 provided a target accession date of 2025 for Serbia and Montenegro, with the possibility for the other Western Balkans countries to join them, but this target date may be delayed given the 2020 COVID-19 pandemic. A review of the status of accession process and challenges (Grieveson, Grubler and Holzner, 2018) finds that target date is ambitious and may be established more as an incentive for reforms in the countries. Nonetheless, there is still a possibility that in five years or so, Serbia and Montenegro will be new EU members, with the other countries to follow in the next 10 years.

CEFTA countries (except Kosovo) and all EU members as well, and (ii) that it includes consistently constructed domestic trade flows, which are crucial for the implementation of our methods. We offer further details on the dataset in Section 3.2.

Several main findings stand out from our partial equilibrium estimates. Without going into details, we note that we obtain estimates of the effects of all standard gravity variables that are readily comparable to corresponding estimates from the existing literature. This establishes the representativeness of our sample. In addition to the standard gravity covariates, we use border variables to allow for differential impact of borders on trade within EU vs. trade between EU and CEFTA. We find that, without any exception, the additional barriers to trade between CEFTA and EU are larger as compared to the barriers to trade within the EU in each of the four main sectors in our sample, including Agriculture, Mining, Manufacturing and Services. We also document significant variation in the border differential across sectors. The differences between the CEFTA-EU border and the EU-EU border are the largest in Agriculture, followed by Services, Mining, and Manufacturing.[4]

Capitalizing on the structural properties of the gravity model, we transform our border estimates into tariff-equivalent effects to find that the border tariff-equivalents that we obtain are significantly larger as compared to the existing differences in applied tariffs for each of the three goods sectors in our sample. Specifically we obtain a border tariff equivalent of 19.65% vs. 11.58% actual weighted average tariff difference in Agriculture, 10.62% border tariff equivalent vs. 1.68 actual weighted average tariff difference in Mining, and 7.92% border tariff equivalent vs. 5.22 actual weighted average tariff difference in Manufacturing. This result supports our assumption that, in addition to tariffs, there are other barriers to trade between CEFTA and EU. Comparison between the tariff data and our border differential estimates suggests that Mining and Agriculture are subject to more significant NTMs as compared to Manufacturing, where the difference between the tariffs and the

[4]We find this heterogeneity intuitive. The border between CEFTA and EU is likely to impose the most trade costs on agricultural products for two reasons: (1) most tariffs between EU and CEFTA countries have gone to zero for all industrial products, but for some agricultural products there are still import tariffs for CEFTA products into the EU and vice versa, and (2) even with low tariff barriers, the EU imposes high SPS conditions which results in traders facing long delays at the borders crossing into EU (for e.g. from Serbia into Croatia). The large border differences in services trade can be due to various unified standards within the EU, which impose barriers to services trade with outsiders. Another possible explanation is that trade in services is highly localized consumption. Finally, a possible explanation for the relatively small borders in Mining and Manufacturing is that the barriers to trade in those sectors have been decreased.

border differentials that we estimate is the smallest. In addition, we note that there is no tariff data that corresponds to the large (16.87 percent) tariff equivalent border differential that we obtain for services. This highlights another advantage of using our estimation structural gravity approach to measure border differentials.

Stimulated by the importance of the manufacturing sector for the CEFTA economies and by the potential for very heterogeneous differences in the impact of borders on trade between CEFTA and EU vs. trade within the EU in the aggregate manufacturing sector, we also obtain estimates for eleven manufacturing industries. The disaggregated estimates confirm our main finding that the CEFTA countries face significantly larger barriers to trade with the EU as compared to the barriers faced by the EU countries for trade with each other. In addition, they reveal that the differences in the borders between CEFTA and EU vs. the borders within the EU are quite heterogeneous across the eleven industries. The border gap for EU trade vs. trade between EU and CEFTA is the widest in Food (about 22% tariff equivalent), followed by Minerals (about 15% tariff equivalent), and Wood (about 10% tariff equivalent). Overall, our partial equilibrium estimates imply that CEFTA members have the potential to face significantly lower barriers to trade upon accession to the EU, which, in turn, may lead to large welfare gains from joining the EU. We explore those possibilities in counterfactual analysis with the GE structural gravity model.

We perform two general equilibrium (GE) experiments.[5] First, we simulate the impact on exports of a hypothetical harmonization of MFN tariffs by the CEFTA countries, as a bloc, to the corresponding EU rates. To perform this analysis, we use data on actual tariffs. Consistent with the possible practical implementation of such policy, the EU MFN rates will not affect the preferential tariff rates they accord to their preferential trade partners as they are not acceding into the EU but rather just adopting the MFN rates. Instead of tariffs, the second GE experiment that we perform employs our partial equilibrium border estimates to simulate a decrease of the trade costs between CEFTA and EU to the level of within EU trade barriers. The counterfactual analysis highlights the substantial difference between the "tariff" and "border" scenario. The predicted total export changes for the CEFTA countries are substantially larger when using the border estimates

[5]To perform the counterfactual analysis we rely on a standard GE gravity setting following Dekle, Eaton and Kortum (2007, 2008). For details, please see part B of the Supplementary Appendix.

to quantify the potential trade cost changes. Additionally, we are also able to predict total export changes in services in the border scenario, while without tariff data we can not obtain total export changes based on tariffs for services.

The rest of the paper is organized as follows. Section 2 presents our estimation and identification methods. Section 3 motivates the focus on the integration of the CEFTA countries in the EU (in Subsection 3.1), and describes the data and sources that we employ to perform the empirical analysis (in Subsection 3.2). Section 4 presents our empirical findings. Subsection 4.1 offers an analysis of our partial equilibrium estimates, while Subection 4.2 translates the partial equilibrium estimates into GE effects and discusses our findings. Section 5 concludes. The Supplementary Appendix includes additional empirical results and robustness estimates.

2 Estimating "Deep"/"Hard" Trade Cost Changes

This section presents our methods to estimate ex-ante comprehensive "deep"/"hard" trade cost changes in response to a hypothetical policy change. For expositional simplicity, clarity, and to facilitate the interpretation of our results in the following sections, we will focus on a specific application, i.e., the integration of CEFTA and EU.[6] Our departing point is the following econometric gravity model, which we adapt to accommodate the specific goals of our study:[7]

$$X_{ij,t} \quad = \quad \exp[\pi_{i,t} + \chi_{j,t} + GRAV_{ij,t}\eta] + \epsilon_{ij,t}. \tag{1}$$

Here, as defined earlier, $X_{ij,t}$ denotes nominal trade flows from source/exporter i to destination/importer j at time t. An important feature of the dependent variable is that, consistent with all of the underlying theoretical models that deliver the structural gravity equation, $X_{ij,t}$ in-

[6]The CEFTA consists of seven countries: Albania, Bosnia and Herzegovina, Kosovo, Moldova, Montenegro, North Macedonia and Serbia. We offer further details on the history and relationship between CEFTA and the EU in Section 3.1.

[7]As famously demonstrated by Arkolakis, Costinot and Rodriguez-Clare (2012), this empirical equation is representative of a very wide class of theoretical trade models. We refer the reader to Anderson (2011), Costinot and Rodriguez-Clare (2014), Yotov et al. (2016), and Baier, Kerr and Yotov (2018) for reviews of the theoretical foundations of the gravity model.

cludes international and *intra-national* trade flows.[8] We also note that, due to separability of the structural gravity model at the sectors level, c.f., Anderson and van Wincoop (2004) and Costinot, Donaldson and Komunjer (2012), equation (1) can be estimated at any desired level of aggregation. We capitalize on this property in the empirical analysis, where in addition to aggregate estimates we also obtain sectoral results.[9]

The exponential function, $\exp[\cdot]$, on the left-hand side of Equation (1) reflects the fact that, to obtain our main estimates, we employ the Poisson Pseudo Maximum Likelihood (PPML) estimator.[10] We favor the PPML estimator because, as demonstrated by Santos Silva and Tenreyro (2006, 2011), (i) PPML accounts for heteroskedasticity that often plagues trade data, and (ii) because, due to its multiplicative form, PPML utilizes the information contained in the zero trade flows.

The vector $\pi_{i,t}$ denotes the set of time-varying source-country dummies (i.e., exporter-time fixed effects), while the term $\chi_{j,t}$ encompasses the set of time-varying destination-country dummy variables. These directional (exporter and importer) fixed effects will control for the unobservable multilateral resistances of Anderson and van Wincoop (2003) and for the country-specific size terms in the structural gravity model. In addition, they will absorb any other observable and unobservable characteristics that vary over time for each exporter and for each importer.

$GRAV_{ij,t}$ denotes the vector of bilateral determinants of trade flows in our model. Following the existing literature, we include in this vector the standard set of time-invariant covariates that are used in gravity regressions (i.e., the log of bilateral distance ($DIST_{ij}$), and a series of indicator variables capturing whether or not two countries share a common border ($CNTG_{ij}$), a common official language ($LANG_{ij}$), and any colonial ties ($CLNY_{ij}$)). In addition, we control for the impact of free trade agreements ($FTA_{ij,t}$) as a representative and widely-used time-varying trade policy covariate. To reflect the use of intra-national trade flows, we also use an indicator variable

[8]More recent literature emphasizes the role to take into account domestic sales and frictions, see for example Coşar and Fajgelbaum (2016), Allen and Arkolakis (2014), Fajgelbaum and Redding (2014), and Ramondo, Rodríguez-Clare and Saborío-Rodríguez (2016). In structural gravity, the importance to also include domestic sales was emphasized by Yotov (2012), Bergstrand, Larch and Yotov (2015), and Heid, Larch and Yotov (2021), for example. Yotov (2021) provides a survey of the use of intra-national trade flows for structural gravity estimations.

[9]For a discussion of the challenges and approaches to estimate gravity with disaggregated data, we refer the reader to Yotov et al. (2016) and Borchert et al. (2021*b*).

[10]Sensitivity estimates, which are included in the Supplementary Appendix, demonstrate that our main results are robust to the use of the OLS estimator.

($BRDR_{ij,t}$) that takes a value of one for international trade and it is equal to zero for domestic sales. The subscript t captures the possibility that the impact of international borders can vary over time. This variable has the advantage of being exogenous by construction, and it will capture the effects of any other determinants of international relative to internal trade, which act in addition to the covariates that we control for explicitly in our specification.

Finally, and most important for our purposes, we capitalize (i) on the fact that the border variable is exogenous by construction and (ii) that it captures the impact of all possible observable and unobservable factors that impact bilateral trade in addition to that standard covariates that we already control for in order to allow for possible differential border effects within the EU vs. border effects on trade between EU and CEFTA. Specifically, we introduce $BRDR\_EU_{ij,t}$, which takes a value of one for international trade within the EU, and it is set to zero otherwise. To interpret the estimate on the new border variable as levels, we set $BRDR_{ij,t}$ to zero when $BRDR\_EU_{ij,t}$ is equal to one. Thus, the estimate on this variable would capture the impact of borders within the EU. In addition we define $BRDR\_EU\_CEFTA_{ij,t}$ as an indicator variable that takes a value of one for trade between the CEFTA members and the EU members, and it is set to zero otherwise. Once again, we set $BRDR_{ij,t}$ to zero when $BRDR\_EU\_CEFTA_{ij,t}$ is equal to one. Thus, the estimate on $BRDR\_EU\_CEFTA_{ij,t}$ would capture the impact of borders on trade between the CEFTA members and the EU. Taking into account these modeling choices, our main estimating equation becomes:

$$\begin{aligned} X_{ij,t} \;=\; & \exp[\eta_1 DIST_{ij} + \eta_2 CNTG_{ij} + \eta_3 LANG_{ij} + \eta_4 CLNY_{ij} + \eta_6 FTA_{ij,t} + \eta_7 BRDR_{ij,t}] \times \\ & \exp[\eta_8 BRDR\_EU_{ij,t} + \eta_9 BRDR\_EU\_CEFTA_{ij,t} + \pi_{i,t} + \chi_{j,t}] + \epsilon_{ij,t}. \qquad (2) \end{aligned}$$

Several features of specification (2) with respect to the definition and interpretation of the key border variables and their relation to the other covariates in our estimating equation deserve further discussion. First, we note that, by construction, the three border variables in specification (2) will capture the impact of all unobserved trade barriers that act in addition to (i) geography, which is controlled for by the distance and contiguity variables ($DIST_{ij}$ and $CNTG_{ij}$, respectively); (ii) cultural ties, which are controlled for by the language and colonial ties covariates ($LANG_{ij}$ and

$CLNY_{ij}$, respectively); and (iii) the average impact of FTAs, as the most prominent trade policy variable. Of course, one may include in the econometric model any additional determinants of bilateral trade flows for which data are available. Then, the interpretation of the border estimates would be as capturing the effects of any impediments to trade that are not explicitly accounted for in the vector of bilateral trade cost covariates.

Second, even if the border variables and their estimates are capturing/reflecting trade costs and preferences (e.g., home bias effects) that cannot be affected by trade policy, we note that what is relevant for our analysis is not the estimate of the border per se, but rather the difference between the estimates of the border effects for the group of interest, i.e., $BRDR\_EU\_CEFTA_{ij,t}$ in our case, and for the EU as reference group, i.e., $BRDR\_EU_{ij,t}$. Given the history of strong integration within the EU, we would expect that the borders for trade within the EU will be significantly smaller as compared to the borders between the EU and the CEFTA countries, and the object of interest to us will be the difference between the two border estimates. Further capitalizing on the structural properties of the gravity model, we can express this difference as a tariff-equivalent index:

$$\%\Delta t_{CEFTA,EU} = \left[\left(\frac{\exp(\hat{\eta}_{BRDR\_EU})}{\exp(\hat{\eta}_{BRDR\_EU\_CEFTA})} \right)^{\frac{1}{1-\sigma}} - 1 \right] \times 100, \tag{3}$$

where, $\hat{\eta}_{BRDR\_EU}$ and $\hat{\eta}_{BRDR\_EU\_CEFTA}$ are the estimates of the border variables $BRDR\_EU_{ij,t}$ and $BRDR\_EU\_CEFTA_{ij,t}$ from Equation (2), respectively, and σ is the elasticity of substitution.

Finally, we note that our methods allow for very flexible definitions of the border barriers, both within the group of interest and within the reference group. Therefore, these definitions can be refined further depending on the goals and institutional background behind the policy change. For example, in the case of EU-CEFTA integration, it may be appropriate to define the border for the reference group as the border between the 'old/initial' EU members and the countries from Eastern Europe (e.g., Romania and Bulgaria), which are similar to the CEFTA members across many economic indicators and are among the countries that joined the EU most recently. With respect to the treatment group of interest, one can estimate heterogeneous impact across the CEFTA members. Note that, in the case of CEFTA-EU integration, identification of the country-specific borders comes from two sources, i.e., the time dimension and the pair-dimension (due to the fact that the EU includes many members). However, in principle, the panel dimension of the data is sufficient to identify pair-specific borders too. In fact, the panel dimension would allow for the estimation of time-varying (or based on intervals) border effects. Given the methodological purpose of our paper we abstract from such refinements in our estimating specification and we focus on two variables only, which are sufficient to prove the validity of our methods.

3 Application and Data

Subsection 3.1 of this section motivates the focus on the main application for our analysis, i.e., the integration of the CEFTA countries in the EU, while Subsection 3.2 describes the data and sources that we employ to perform the empirical analysis.

3.1 CEFTA-EU Integration: Background and Relevance

The purpose of this section is to describe the importance of the integration process between the CEFTA countries and the EU and to offer some institutional background on CEFTA-EU accession process and status. The EU has expressed a strong interest to integrate the CEFTA countries with European markets and has used Union membership to encourage the integration process. The CEFTA consists of seven countries: Albania, Bosnia and Herzegovina, Kosovo, Moldova, Montenegro, North Macedonia and Serbia. Most of the CEFTA countries (except Moldova) are geographically within the EU, surrounded by Italy, Croatia, Romania, Bulgaria and Greece. Any economic or political instability in CEFTA will transmit to the EU, which is only a recent memory for the former Yugoslav countries.[11] The CEFTA countries are still recovering the aftermath of conflicts in the 1990s: the Bosnian (1992-95) and Kosovo (1998-99) wars and the skirmishes in Serbia (1999-2001) and North Macedonia (2001). Even presently, Kosovo and Serbia still have a tense relationship as Serbia does not formally recognize Kosovo's independent status. Higher trade between the countries through further integration can increase the opportunity costs of war and reduce the possibility of conflict (see Martin, Mayer and Thoenig, 2008; Vicard, 2012, for examples).

[11]Former Yugoslavia was made up of Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia, along with Croatia and Slovenia.

The CEFTA-EU integration process has been progressing slowly for the last 15 years and the CEFTA countries are at different stages of integrating their institutions to European standards. The accession process is governed by the *Acquis Communitaire* or EU acquis, which constitutes the body of EU legislation and potential members have to transpose the EU legislations into their national law. The EU acquis is composed of 35 chapters that deals with all aspects of legislation from free movement of goods (chapter 1) and workers (chapter 2) to social policy and employment (chapter 19) and science and research (chapter 25). Four CEFTA countries (Albania, Montenegro, North Macedonia and Serbia) are EU candidate countries, which means that the EU officially recognize them as potential EU members and can start accession negotiations. Montenegro and Serbia are further along the process than Albania and North Macedonia, having started negotiations on 18 (Serbia) and 33 (Montenegro) chapters out of the 35 chapters in the EU acquis, but the negotiations on only 2-3 chapters have provisionally closed. Albania and North Macedonia have candidate status but have not started negotiations on the EU acquis. North Macedonia finally resolved its long-standing name dispute in January 2019 with Greece, who was the main obstacle to beginning negotiations. The country, however, faces new challenges in its accession with Bulgaria related to issues of identity, language and history. The European Council decided in March 2020 to begin accession negotiations with Albania and North Macedonia, with Albania's negotiations pending the fulfillment of certain conditions. The negotiations have not yet started with the two countries. Bosnia and Herzegovina and Kosovo are potential candidate countries, and their accession negotiations is further along.

As the first step towards integration, the CEFTA countries have progressively bilateral trade agreements with the EU. The bilateral free trade agreements, referred to as Association and Stabilization Agreement, has been concluded with North Macedonia (2004), Albania (2009), Montenegro (2010), Serbia (2013), Bosnia and Herzegovina (2015) and Kosovo (2016). The EU has also recently concluded the Deep and Comprehensive Free Trade Area (DCFTA) with Moldova (2014). These bilateral trade agreements grant tariff-free access to most exports into the EU, with some agricultural goods still attracting either tariff rates or tariff-rate quotas. These trade agreements grant tariff-free market access into the EU but exports from the CEFTA countries still encounter border costs as they are subject to border inspections by Customs, food and health agencies and other technical inspectorates.

The EU announced a new strategy for the region in 2018, which has heightened the need to examine the effects of integration between CEFTA and the EU. The new EU strategy for the Western Balkans countries (i.e. CEFTA countries minus Moldova) provided a target accession date of 2025 for the next batch of EU expansion, but this target date may be delayed given the 2020 COVID-19 pandemic. Given the current accession status, it is likely Serbia and Montenegro will be first two CEFTA countries to join the EU, with North Macedonia possibly being the next country. There are, however, many challenges to the reforms needed in the EU acquis and Grieveson, Grubler and Holzner (2018) concludes that the target date is ambitious and serves more as an incentive for reforms.

The CEFTA countries also recognize that further integration amongst themselves can help their integration with the EU. After the EU, other CEFTA countries represent the next largest market for imports and exports for CEFTA countries. The CEFTA only covers market access for all industrial goods and most agricultural goods, but has recently expanded to include trade facilitation and services liberlization.[12] In 2017, the CEFTA countries endorsed a regional action plan to promote economic integration amongst themselves, with the view to encourage economic convergence with the EU. For example, the trade measures in the action plan adopt trade facilitation measures and data systems that conform to EU standards. Most relevant for our paper is an action to investigate the impacts of harmonizing their MFN tariff regimes with the EU's common external tariff regimes as a method to encourage more integration between CEFTA and EU.

Despite the importance and need to evaluate the benefits of integration for CEFTA countries, data availability has limited any analysis on the topic. Databases such as the WIOD or GTAP, which are widely used for general equilibrium counterfactual analysis such as the one performed here, do not contain data for the CEFTA countries. The databases generally list the CEFTA countries in regional aggregates.[13] Constructing a general equilibrium model of the CEFTA countries is also

[12]The agreement was originally signed in 1992 but the current members joined between 2006-207 as previous members (Poland, Hungary, Czech Republic, Slovakia, Slovenia, Romania and Bulgaria) left CEFTA once they acceded into the EU. Croatia was still a member in 2006 but left in 2013 when it joined the EU.

[13]The GTAP database only lists Albania as a separate country, while the rest are either in the "Rest of Europe" or "Rest of Eastern Europe" (for Moldova) regional aggregates. The WIOD database lists the CEFTA countries in the "Rest of the World" aggregate.

difficult as these countries (except Albania) do not have national input-output tables.

3.2 Data: Description and Sources

To perform the empirical analysis, we employ a newly constructed dataset, The International Trade and Production Database for Estimation (ITPD-E), which is developed and maintained by the U.S. International Trade Commission (ITC), c.f., Borchert et al. (2021*a*). The original ITPD-E consists of inter- and intra-national trade flows for 243 countries and 170 industries for the years between 2000 and 2016.[14] The inclusion of domestic trade flows in the ITPD-E is a crucial feature for the implementation of our methods. Another very important feature of the ITPD-E with respect to our purposes is that it covers all EU countries and all CEFTA economies (except for Kosovo) as well. This is an advantage over other databases, e.g., WIOD and the GTAP datasets, which are widely used for general equilibrium counterfactual analysis. However, neither WIOD nor GTAP cover the CEFTA countries. Albania is an exception.

Given the methodological purpose of our paper, and for computational and expositional purposes too, we make several choices regarding the dimensions of the ITPD subsample that we employ for our analysis. First, we focus on 2013, which is the latest year that allows most comprehensive coverage across most countries and across most sectors. In the robustness analysis, which we report in the Supplementary Appendix, we reproduce our estimates with panel data over the period 2000-2016, and the panel estimates confirm the robustness of our main findings. On the country dimension, we limit the analysis to cover one hundred and four (104) economies, which include the fifty (50) largest exporters in each ITPD-E industry as well as all EU economies and CEFTA countries.[15]

[14] Of the 170 sectors in ITPD, 26 are in Agriculture, 7 are in Mining and Energy, 120 are in Manufacturing, and 17 are in Services. For further details on ITPD, we refer the reader to Borchert et al. (2021*a*), and for its use for gravity estimations see Borchert et al. (2021*b*).

[15] The countries in our sample are: Angola (AGO), Albania (ALB), United Arab Emirates (ARE), Argentina (ARG), Australia (AUS), Austria (AUT), Azerbaijan (AZE), Belgium (BEL), Bangladesh (BGD), Bulgaria (BGR), Bahrain (BHR), Bosnia and Herzegovina (BIH), Belarus (BLR), Bolivia (BOL), Brazil (BRA), Brunei (BRN), Canada (CAN), Switzerland (CHE), Chile (CHL), China (CHN), Congo (COG), Colombia (COL), Costa Rica (CRI), Cyprus (CYP), Czech Republic (CZE), Germany (DEU), Denmark (DNK), Algeria (DZA), Ecuador (ECU), Egypt (EGY), Spain (ESP), Estonia (EST), Ethiopia (ETH), Finland (FIN), France (FRA), Gabon (GAB), United Kingdom (GBR), Ghana (GHA), Equatorial Guinea (GNQ), Greece (GRC), Hong Kong (HKG), Croatia (HRV), Hungary (HUN), Indonesia (IDN), India (IND), Ireland (IRL), Iran (IRN), Iraq (IRQ), Israel (ISR), Italy (ITA), Jordan (JOR), Japan (JPN), Kazakhstan (KAZ), Kenya (KEN), Cambodia (KHM), South Korea (KOR), Kuwait (KWT), Libya (LBY), Sri Lanka (LKA), Lithuania (LTU), Luxembourg (LUX), Latvia (LVA), Morocco (MAR), Moldova (MDA), Mexico

Finally, on the sectoral dimension, we focus the analysis on the four major sectors, which comprise each economy, including Agriculture, Mining, Manufacturing and Services. In addition, given the importance of the manufacturing sector for the CEFTA economies and for robustness, we also obtain partial estimates for eleven manufacturing sectors, which we label broadly as Chemicals, Electronics, Food, Machines, Metals, Minerals, Rubber, Textiles, Transport, Wood, and Other.

We perform the estimation (partial equilibrium) analysis with the original ITPD-E data without any adjustments.[16] In order to perform the general equilibrium (GE) counterfactual analysis in Section 4.2, we employ the original data for international trade flows from ITPD-E, and we impute missing observations for domestic trade, which are needed to balance the data for the GE analysis. To fill in the missing values for domestic trade, we proceed in three steps. First, we construct the ratio of total exports to internal sales for all of the original industries in ITPD-E for which data are available. Importantly, the original ITPD-E allows us to construct such ratios for each of the CEFTA countries in our sample for at least some of the industries within each of the main 14 sectors that we employ in our analysis (11 manufacturing sectors, plus Agriculture, Mining, and Services). Second, we construct an average ratio for each of the main 14 sectors and we use these ratios in combination with data on total exports to fill in the missing intra-national trade values at the most disaggregated industry level. Third, we aggregate the resulting balanced dataset to the 14 sectors that we employ in our analysis. Since data for services trade are very patchy in the latest years in ITPD-E, to construct domestic trade for services, we employ average data over the years 2010 to 2015 and we repeat the above steps with these data for the services sector.

We also employ several other data sets in addition to ITPD-E. Data on the standard gravity covariates for our gravity estimations come from the Dynamic Gravity Dataset (DGD) of the U.S. International Trade Commission, and we refer the reader to Gurevich and Herman (2018) for further details on DGD. In order to investigate the effect of CEFTA countries adopting the EU common

(MEX), Macedonia (MKD), Malta (MLT), Myanmar (MMR), Montenegro (MNE), Malaysia (MYS), Nigeria (NGA), Netherlands (NLD), Norway (NOR), New Zealand (NZL), Oman (OMN), Pakistan (PAK), Peru (PER), Philippines (PHL), Papua New Guinea (PNG), Poland (POL), Portugal (PRT), Qatar (QAT), Romania (ROU), Russia (RUS), Saudi Arabia (SAU), Singapore (SGP), El Salvador (SLV), Yugoslavia (SRB), Slovak Republic (SVK), Slovenia (SVN), Sweden (SWE), Thailand (THA), Turkmenistan (TKM), Trinidad and Tobago (TTO), Tunisia (TUN), Turkey (TUR), Taiwan (TWN), Ukraine (UKR), United States (USA), Venezuela (VEN), Vietnam (VNM), Yemen (YEM), South Africa (ZAF), and Zambia (ZMB).

[16] In the robustness analysis, we reproduce our main estimates after replacing all missing bilateral trade flows with zeros. These results are very similar to our main estimates.

external tariff, we make use of MFN tariff data that come from https://wits.worldbank.org/WITS/WITS/ Restricted/Login.aspx. The original tariff data are at the HS17 8-digit level for Albania, Bosnia and Herzegovina, Moldova, Montenegro, and Serbia, while the tariff data for Macedonia are at the HS17 6-digit level. We aggregate all tariff data to the HS17 6-digit level, as correspondence tables to HS07 and SITC Reve. 3 & 4 are only available at the 6-digit level. We aggregate the tariff data in two different ways: (i) unweighted by taking simple averages, (ii) weighted by total import shares of the respective sectors. We then merge SITC Rev. 3 & 4 correspondences and HS07 correspondences in order to be able to match with our mining, manufacturing, and agricultural trade flows data.

4 Empirical Analysis and Findings

This section presents our empirical findings. Subsection 4.1 offers an analysis of our partial equilibrium estimates, while Subsection 4.2 describes the results from our general equilibrium analysis.

4.1 On the Uneven Impact of EU and CEFTA Borders

The estimation results that we report and analyze in this section are based on econometric specification (2). We start with a discussion of our findings across the four main sectors in the sample, including Manufacturing, Agriculture, Mining, and Services. Then, we zoom in on the determinants of trade flows across eleven manufacturing categories, as described in the data section. Following the best estimation practices from the structural gravity literature, which we summarized in Section 2, we obtain our main results with the PPML estimator. Estimates obtained with the OLS estimator are also consistent with our main findings.[17]

Several findings stand out from the estimates for the four main sectors in our sample, which appear in Table 1. First, overall, we note that the estimates of the effects of the standard gravity covariates are readily comparable with the corresponding values from the existing literature.[18] This

[17]The corresponding OLS results can be found in Tables 3 and 4 of the Supplementary Appendix, where, as mentioned earlier, we also offer estimates that are obtained after replacing the missing values in the ITPD-E with zeroes (see Tables 5 and 6) and estimates that are based on panel data (see Tables 7 and 8).

[18]For a reference set of gravity estimates, we direct the reader to the meta analysis indexes of Head and Mayer (2014) and to the disaggregated gravity estimates of Borchert et al. (2021*b*).

establishes the representativeness of our sample. Turning to the specific covariates, we see that distance is a very significant impediment to international trade. The estimates on $DIST$ are large, negative, and significant at any conventional level for each of the four sectors. According to our results, Agriculture and Mining are the two sectors where the negative impact of distance is the strongest, while the effect of distance on Services trade is the weakest. We find this heterogeneity intuitive and we point to transportation costs as a natural explanation for it.

Consistent with most of the existing gravity literature, we obtain positive estimates of the effects of contiguity and language. In each case, the impact of these determinants of trade is positive in all sectors. However, it is not statistically significant for Mining. A possible explanation for this result is specialization in this natural resource industry. We also obtain positive and statistically significant estimates of the impact of FTAs in each sector, which attest to the important and successful positive effect of trade policies in promoting bilateral trade among FTA members and is consistent with findings from the extensive related literature. According to our estimates, FTAs have been most effective in Mining and least effective, but still important, in Services.

Next, we turn to the estimates of the impact of international borders, which are of central interest to us. We remind the reader that, by construction, our border variables are indicators that are designed to capture the impact of all observable and unobservable barriers to trade that act on international relative to internal trade, after controlling for all standard gravity covariates. Four main results stand out. First, based on the estimates of $BRDR$ from Table 1, we conclude that the average impact of borders on international relative to internal trade is very large and significant. This is consistent with the extensive literature that has studies the effects of borders and home bias in trade.[19] All BRDR estimates are negative and significant at any conventional level. Second, according to our results, the largest barriers to trade that are not captured by the standard gravity covariates are in Agriculture and in Services. We find this variation to be intuitive

[19] For analysis of the effects of borders and 'home bias' in the United States see Wolf (2000), Mayer and Head (2002), Hillberry and Hummels (2003), Millimet and Osang (2007), Head and Mayer (2010), Hillberry and Hummels (2012), Yilmazkuday (2012); for the European Union see Nitsch (2000), Chen (2004), and Head and Mayer (2010); for OECD countries Wei (1996); for China see Young (2000), Poncet (2003, 2005), Holz (2009), and Hering and Poncet (2009); for Spain see Llano and Requena (2010); for France see Mayer (2005); for Brazil see Fally, Paillacar and Terrac (2010); for Germany see Lameli et al. (2013) and Nitsch and Wolf (2013); for Canada see Agnosteva, Anderson and Yotov (2019); and Anderson, Larch and Yotov (2018) for the world.

Table 1: Sectoral Gravity Estimates CEFTA, 2013

	(1) Manufacturing	(2) Agriculture	(3) Mining	(4) Services
A. Gravity Estimates				
DIST	-0.685	-0.826	-1.185	-0.322
	(0.036)**	(0.038)**	(0.148)**	(0.087)**
CNTG	0.493	0.647	0.193	0.621
	(0.060)**	(0.070)**	(0.210)	(0.131)**
LANG	0.221	0.356	0.187	0.601
	(0.043)**	(0.055)**	(0.155)	(0.083)**
BRDR	-3.544	-5.542	-3.765	-5.656
	(0.115)**	(0.114)**	(0.464)**	(0.271)**
FTA	0.401	0.380	0.781	0.266
	(0.052)**	(0.059)**	(0.182)**	(0.119)*
BRDR_EU_CEFTA	-3.477	-5.905	-4.905	-6.591
	(0.163)**	(0.149)**	(0.472)**	(0.290)**
BRDR_EU	-2.982	-4.592	-4.231	-5.470
	(0.111)**	(0.107)**	(0.427)**	(0.266)**
B. CEFTA vs. EU Border: $BRDR\_EU\_CEFTA$-$BRDR\_EU$				
CEFTA vs. EU	-0.495	-1.313	-0.674	-1.108
	(0.132)**	(0.124)**	(0.291)**	(0.125)**
C. CEFTA vs. EU Border: Tariff Equivalents				
$\%\Delta t_{CEFTA,EU}$	-7.923	-19.650	-10.619	-16.870
	(2.020)**	(1.665)**	(4.349)**	(1.736)**
N	634838	117585	4698	29665

Notes: Panel A of this table reports gravity estimation results for the four main sectors in the sample including Manufacturing, Agriculture, Mining, and Services. All estimates are obtained with data for 2013. The data for each main sector is constructed by pooling (not summing) the data for all individual products within the corresponding main sector. The estimator is PPML and the dependent variable is nominal bilateral trade. All estimations are obtained with exporter-product and importer-product fixed effects, whose estimates are omitted for brevity. Standard errors are clustered by country pair and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$. Panel B of the table reports the difference between the estimates of the border effects for trade within the EU vs. trade between CEFTA members and the EU. Panel C transforms the differences from Panel B into tariff-equivalent trade cost changes $\%\Delta t_{CEFTA,EU} = (exp(BRDR\_EU)/exp(BRDR\_EU\_CEFTA))^{1/(1-\sigma)} - 1) \times 100$, where we set $\sigma = 7$. The standard errors in Panels B and C are constructed with the Delta method. See text for further details.

and it is consistent with localized consumption in the case of services, and more pronounced 'home bias' effects in the case of agricultural products.

Third, turning to the estimates on $BRDR\_EU\_CEFTA$ and $BRDR\_EU$, we see that, without any exception, the additional barriers to trade between CEFTA and EU are larger as compared to the barriers to trade within the EU. This is reflected in the larger (in absolute value) estimates on $BRDR\_EU\_CEFTA$ as compared to the corresponding values for $BRDR\_EU$, and is consistent with our expectations. Finally, we find that the differential in the borders between CEFTA and EU as compared to the borders within the EU varies across the four main sectors in our sample. In order to see this clearly (and also to be able to gauge whether the differences are statistically significant) in Panel B of Table 1 we report the difference between the estimates on $BRDR\_EU\_CEFTA$ and $BRDR\_EU$. In addition, following (3), in Panel C of Table 1, we calculate tariff equivalents of the border differentials.[20] Standard errors in panels B and C are constructed with the Delta method.

The estimates from panels B and C reveal several interesting results. First, the border differences for each sector are statistically significant at any conventional level. Second, the tariff equivalents of the border difference are larger as compared to the existing tariff differences for the goods sectors. This supports our assumption that, in addition to tariffs, there are other barriers to trade between CEFTA and EU. For example, in the case of Agriculture, the trade weighted average tariff for the CEFTA countries is 11.58 percent, which is significantly lower as compared to the 19.65 percent border differential tariff equivalent that we obtain from the structural gravity regressions. The corresponding numbers for Mining are 1.68 percent weighted average tariffs and 10.62 percent tariff equivalent border differential. And for Manufacturing the numbers are 5.22 percent weighted average tariffs and 7.92 percent tariff equivalent border differential. Importantly, there is no tariff data that corresponds to the large (16.87 percent) tariff equivalent border differential that we obtain for services. This highlights the advantages and importance of using our estimation structural gravity approach to measure border differentials. Third, comparison between the tariff data and our border differential estimates suggests that Mining and Agriculture are subject to more significant NTMs as compared to Manufacturing, where the difference between the tariffs and the border differentials

[20]Following the literature, we set $\sigma = 7$. This value is also close to the corresponding meta-analysis index ($\sigma = 6.13$) from Head and Mayer (2014).

that we estimate is the smallest.

Fourth, the differences between the CEFTA-EU border and the EU-EU border are the largest in Agriculture (about 20% tariff equivalent), followed by Services (about 17% tariff equivalent), Mining (about 11% tariff equivalent), and Manufacturing (about 8% tariff equivalent). We find this heterogeneity intuitive. The border between CEFTA and EU is likely to impose the most trade costs on agricultural products for two reasons: (1) most tariffs between EU and CEFTA countries have gone to zero for all industrial products, but for some agricultural products there are still import tariffs for CEFTA products into the EU and vice versa, and (2) even with low tariff barriers, the EU imposes high sanitary and phytosanitary (SPS) conditions which results in traders facing long delays at the borders crossing into EU (for e.g. from Serbia into Croatia). The large border differences in services trade can be due to various unified standards within the EU, which impose barriers to services trade with outsiders. Another possible explanation is that trade in services is highly localized consumption. Finally, a possible explanation for the relatively small borders in Mining and Manufacturing is that the barriers to trade in those sectors have been decreased.

Stimulated by the importance of the manufacturing sector for the CEFTA economies and by the potential for very heterogeneous differences in the impact of borders on trade between CEFTA and EU vs. trade within the EU within the aggregate manufacturing sector, next we obtain and present estimates for 11 disaggregated manufacturing industries. Our results appear in Table 2, where, as before, we include the PPML gravity estimates in Panel A, the differences between the CEFTA-EU and EU-EU borders in Panel B, and the tariff equivalents of the border differences are reported in Panel C of Table 2. Standard errors in panels B and C are constructed with the Delta method.

Without going into details, we note that our conclusions regarding the impact of the standard gravity variables for total manufacturing are supported by the disaggregated manufacturing estimates from Table 2. More importantly, the results in panels B and C reveal that the differences in the borders between CEFTA and EU vs. the borders within the EU are quite heterogeneous across the eleven manufacturing sectors in our sample. Overall, we confirm the finding that the CEFTA countries face larger barriers to trade with the EU as compared to the barriers faced by the EU countries for trade with each other. This is supported by the fact that nine of the eleven possible estimates in panels B and C are negative and more than half of them are statistically significant.

Table 2: Sectoral Gravity Estimates CEFTA, 2000-2016

	(1) Chemicals	(2) Electronics	(3) Food	(4) Machines	(5) Metals	(6) Minerals	(7) Other	(8) Rubber	(9) Textiles	(10) Transport	(11) Wood
A. Gravity Estimates											
DIST	-0.826	-0.603	-0.663	-0.559	-0.731	-0.912	-0.671	-0.935	-0.773	-0.444	-0.873
	(0.048)**	(0.054)**	(0.041)**	(0.046)**	(0.070)**	(0.047)**	(0.065)**	(0.051)**	(0.059)**	(0.076)**	(0.043)**
CNTG	0.399	0.302	0.854	0.530	0.448	0.626	0.609	0.546	0.345	0.825	0.798
	(0.082)**	(0.080)**	(0.082)**	(0.085)**	(0.102)**	(0.084)**	(0.128)**	(0.094)**	(0.086)**	(0.109)**	(0.077)**
LANG	0.218	0.287	0.449	0.138	0.452	0.139	0.128	0.031	0.209	-0.080	0.248
	(0.069)**	(0.066)**	(0.065)**	(0.059)*	(0.067)**	(0.070)*	(0.093)	(0.068)	(0.071)**	(0.083)	(0.068)**
BRDR	-3.087	-3.006	-5.272	-2.741	-3.534	-4.092	-3.869	-3.232	-3.242	-3.712	-4.230
	(0.157)**	(0.190)**	(0.118)**	(0.167)**	(0.226)**	(0.148)**	(0.191)**	(0.179)**	(0.157)**	(0.233)**	(0.128)**
FTA	0.348	0.271	0.393	0.458	0.561	0.345	0.496	0.520	0.315	0.705	0.555
	(0.071)**	(0.077)**	(0.059)**	(0.062)**	(0.130)**	(0.077)**	(0.098)**	(0.085)**	(0.085)**	(0.093)**	(0.071)**
BRDR_EU_CEFTA	-2.854	-2.643	-5.488	-2.276	-3.284	-4.502	-3.333	-3.109	-2.641	-2.897	-4.339
	(0.263)**	(0.319)**	(0.178)**	(0.240)**	(0.267)**	(0.194)**	(0.262)**	(0.214)**	(0.260)**	(0.546)**	(0.159)**
BRDR_EU	-2.982	-2.425	-3.982	-2.451	-2.767	-3.545	-3.200	-2.597	-2.585	-2.743	-3.737
	(0.152)**	(0.175)**	(0.117)**	(0.157)**	(0.197)**	(0.143)**	(0.188)**	(0.152)**	(0.176)**	(0.202)**	(0.129)**
B. CEFTA vs. EU Border: *BRDR_EU_CEFTA-BRDR_EU*											
CEFTA vs. EU	0.128	-0.218	-1.506	0.175	-0.516	-0.957	-0.133	-0.512	-0.056	-0.153	-0.601
	(0.229)	(0.272)	(0.153)**	(0.199)	(0.181)**	(0.154)**	(0.208)	(0.165)**	(0.223)	(0.516)	(0.117)**
C. CEFTA vs. EU Border: Tariff Equivalents											
CEFTA vs. EU	2.153	-3.570	-22.195	2.952	-8.248	-14.741	-2.191	-8.177	-0.922	-2.529	-9.539
	(3.905)	(4.377)	(1.987)**	(3.411)	(2.762)**	(2.185)**	(3.396)	(2.527)**	(3.681)	(8.386)	(1.763)**
N	61024	100591	80999	77449	46539	37020	34915	20705	64522	43567	67507

Notes: Panel A of this table reports gravity estimation results for the 11 main sectors within Manufacturing in the sample, as they appear in the column names. All estimates are obtained with data for 2013. The data for each main manufacturing sector is constructed by pooling (not summing) the data for all individual manufacturing products within the corresponding main sector. The estimator is PPML and the dependent variable is nominal bilateral trade. All estimations are obtained with exporter-product and importer-product fixed effects, whose estimates are omitted for brevity. Standard errors are clustered by country pair and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$. Panel B of the table reports the difference between the estimates of the border effects for trade within the EU vs. trade between CEFTA members and the EU for each sector. Panel C transforms the differences from Panel B into tariff-equivalent trade cost changes $\%\Delta t_{CEFTA,EU} = (exp(BRDR\_EU)/exp(BRDR\_EU\_CEFTA))^{1/(1-\sigma)} - 1) * 100$, where we set $\sigma = 7$. The standard errors in Panels B and C are constructed with the Delta method. See text for further details.

The two positive estimates that we obtain are not statistically significant and are for Chemicals and Machines. According to our estimates the border gap is the widest in Food (about 22% tariff equivalent), Minerals (about 15% tariff equivalent), and Wood (about 10% tariff equivalent). Based on the analysis in this section, we conclude that CEFTA members have the potential to face significantly lower barriers to trade upon accession to the European Union, which may lead to significant gains in terms of welfare. We use our structural gravity estimates to quantify the potential for such gains in the next section.

4.2 On the GE Effects of CEFTA-EU Harmonization

We employ the standard structural gravity general equilibrium framework following Dekle, Eaton and Kortum (2007, 2008) to perform two counterfactual experiments that quantify the total GE impact on the exports of the countries in our sample.[21] The first experiment simulates harmonization of MFN tariffs by the CEFTA countries to the EU tariff rates. To perform this analyses, we use data on actual tariffs, as described in the Data Section 3.2, in order to change the vector of trade costs for the CEFTA members. As the tariff data were available at the HS17 8-digit classification, we aggregated them up using trade shares as weights to match the level of aggregation for the GE analysis. For the counterfactual analysis we set MFN tariffs to zero for trade between EU member countries and CEFTA member countries and set the MFN import tariffs of the CEFTA members for all their other trading partners besides the EU member countries to the MFN import tariff level of the EU.

The second experiment simulates accession of the CEFTA countries to the EU in terms of the trade costs that these countries face for their trade with the EU. To perform this analysis, we rely on the estimates from Section 4.1. Specifically, we change the vector of trade costs that are faced by the CEFTA members so that the trade costs that they face with the EU are the same as the trade costs among the existing EU members. The second approach has two advantages. First, as discussed in the previous section, the differences in the border effects that we obtain should capture the impact of any existing observable and unobservable trade barriers that act differentially on trade between CEFTA and EU vs. trade within EU. Second, our results indicate that the borders

[21] A description of the framework can be found in Appenidx B of the Supplementary Appendix.

are also different between the groups in the services sector, where tariffs are not applicable. Finally, before we present and discuss our results, we note that in each of the two experiments we obtain 'full' general equilibrium effects on trade for all countries in our sample. We capitalize on the separability of the structural gravity model to obtain results for each of the sectors in our sample.

We present results for the 6 CEFTA countries, the EU countries, plus one Rest of the World aggregate (ROW). Column (1) of Table 3 gives the country abbreviation. Columns (2), (4), and (6) report the percentage changes of total exports for the tariff scenario for manufacturing, agriculture, and mining, respectively. Columns (3), (5), (7), and (8) report the percentage change of total exports for the border liberalization scenario for manufacturing, agriculture, mining, and services, respectively. The table consists of two panels: Panel A reports the results for the 6 CEFTA countries, while Panel B reports the results for the EU countries and for the ROW aggregate. To obtain the aggregated effects, we sum total trade flows over all ROW countries in the baseline and counterfactual and calculate the changes from these totals. All results in Table 3 assume an elasticity of 7, which is at the higher end of average estimates of elasticity of substitutions and therefore leads to more conservative results (see for a meta-analysis Head and Mayer (2014)).[22]

The following results stand out from our estimates in the tariff-change scenario. First, the trade effects for the CEFTA countries are typically positive. Often the trade effects are around 20-30%. Further, some CEFTA countries have lower average trade-weighted MFN tariffs as the EU countries. Hence, their tariff level increases to the level of the MFN tariff rate against all non-EU trade partners.[23] However, most trade of CEFTA member countries occurs within EU. Hence, this liberalization leads to positive total export changes. Comparing across sectors, we find quite substantial heterogeneous effects. Agriculture still has comparable high MFN tariffs around 10%, while they are below 5% in mining, and around 5% in total manufacturing. This also explains the larger effects in total export changes in agriculture, as compared to manufacturing and mining.

Besides the substantial heterogeneity across sectors, we also find substantial, but also intuitive, heterogeneity across countries. For the CEFTA countries, the initial MFN tariff rate and the initial

[22]In the Supplementary Appendix, we also provide results based on elasticity of 4, which is on the lower end of the spectrum for the elasticity of substitution in the Armington model. Typically, trade effects are not heavily influenced by changes in σ (see Anderson and van Wincoop, 2003; Yotov et al., 2016).

[23]We provide information about the MFN tariffs and initial shares of spending on domestic goods for manufacturing, agriculture, mining, and services in the Supplementary Appendix.

Table 3: Trade Effects of CEFTA ($\sigma = 7$)

Country	Manufacturing		Agriculture		Mining		Services
	Tariff	Border	Tariff	Border	Tariff	Border	Border
PANEL A: CEFTA countries							
ALB	25.17	66.94	53.13	288.90	0.81	12.90	128.95
BIH	35.23	53.77	44.37	235.07	13.59	46.12	-4.40
MDA	15.51	43.44	25.64	67.95	1.33	90.21	-0.01
MKD	29.16	54.04	56.77	125.43	22.82	95.11	283.32
MNE	35.14	57.92	71.12	88.38	2.01	4.01	87.11
SRB	31.85	45.27	46.93	96.67	4.67	45.71	116.04
PANEL B: EU countries and ROW							
AUT	0.22	0.39	1.17	3.46	-0.05	-0.22	6.80
BEL	0.02	0.04	0.17	0.45	0.00	0.01	0.06
BGR	0.92	1.70	1.90	5.27	0.44	8.50	0.30
CYP	0.12	0.21	0.37	1.01	0.00	-0.01	0.49
CZE	0.13	0.24	0.37	1.04	0.10	1.62	0.10
DEU	0.09	0.16	0.27	0.77	-0.01	0.01	0.05
DNK	0.04	0.07	0.04	0.16	0.01	0.04	0.01
ESP	0.03	0.05	0.13	0.34	0.00	0.07	0.01
EST	0.02	0.05	0.02	0.09	0.00	-0.01	0.02
FIN	0.02	0.03	0.06	0.24	0.00	0.00	0.00
FRA	0.03	0.05	0.12	0.34	0.01	0.31	0.03
GBR	0.04	0.07	0.08	0.25	0.00	0.00	0.06
GRC	0.96	1.95	2.53	7.03	0.10	2.49	0.86
HRV	4.35	7.72	19.20	62.27	1.29	13.40	0.66
HUN	0.32	0.55	1.53	4.13	0.42	9.91	0.15
IRL	0.01	0.02	0.01	0.05	0.00	0.00	0.02
ITA	0.24	0.45	0.43	1.36	-0.02	0.44	0.17
LTU	0.04	0.09	0.13	0.43	0.00	0.05	0.11
LUX	0.05	0.09	0.00	0.01	-0.03	-0.12	0.00
LVA	0.04	0.08	0.10	0.33	0.00	0.00	0.10
MLT	0.17	0.41	0.03	0.14	1.17	17.01	0.10
NLD	0.03	0.05	0.10	0.27	0.00	-0.01	0.06
POL	0.13	0.24	0.41	1.23	0.11	1.41	0.02
PRT	0.02	0.03	0.04	0.14	0.00	-0.05	0.00
ROU	0.59	1.19	1.33	3.96	1.39	28.39	-0.06
SVK	0.21	0.36	0.67	1.83	-0.03	-0.05	0.48
SVN	1.54	2.70	7.47	21.51	-0.04	1.14	3.11
SWE	0.03	0.06	0.17	0.52	0.00	0.01	0.05
ROW	0.00	-0.01	0.00	-0.03	0.00	0.00	-0.01

Notes: This table reports results for our CEFTA border and tariff scenario assuming an elasticity of substitution of 7 ($\sigma = 7$). Column (1) gives the country abbreviations, columns (2), (4), and (6) report the changes in total exports from our tariff scenario for manufacturing, agriculture, and mining, respectively. Columns (3), (5), (7), and (8) report the changes in total exports from our border scenario for manufacturing, agriculture, mining, and services, respectively.

openness explain quite well the resulting trade effects. For the EU countries and the ROW, the effects are small in all sectors. The obvious reason here is that for the EU countries trade with the CEFTA countries is only a small fraction of their overall exports.

Let us next turn to our border scenario. Note that for the border scenario we also report results for services, which we could not include in our tariff scenario, as tariff data for services are not available. We find substantial increases of total exports for all 6 CEFTA countries in manufacturing, agriculture, and mining, and these increases are larger than in the tariff scenario. This highlights that only relying on tariff data to investigate the effects of the integration between the CEFTA countries and the EU may miss a substantial part of potential effects from trade liberalization. The comprehensive measure of the change in bilateral trade costs based on differences of the border estimates can be useful to quantify these additional gains.

Comparing across sectors, we find the largest increases again in agriculture, followed by manufacturing. Besides heterogeneity across sectors, we again find substantial heterogeneity among countries. Albania, Bosnia and Herzegovina, and North Macedonia are predicted to be the countries with the largest gains. Again, gains for the EU countries and ROW are small.

For services, we also find for some CEFTA countries, namely Albania, North Macedonia, and Serbia, substantial trade effects. The reason that we do not find substantial total export increases for the other CEFTA countries is the very low level of services exports of these countries to the EU.

5 Conclusion

We introduced a simple econometric approach to quantify ex-ante the "deep" impact of trade liberalization and the "hard" effects of protection with the empirical structural gravity model, and we demonstrated the effectiveness of our methods by quantifying the partial and GE impact on trade of the integration of the CEFTA countries with EU. Our partial equilibrium estimates revealed that, even after controlling for the impact of standard proxies for trade costs (e.g., distance, language, etc.) trade borders within the EU are large and, more importantly for our purposes, that the borders between the CEFTA and the EU countries are even larger. We also observed significant heterogeneity in the border estimates across sectors. A byproduct of our analysis is that we were able to obtain ad-valorem equivalents of the trade barriers for services, which are not subject to tariffs. The GE experiments that we performed demonstrated that (i) integration with the EU will have large positive impact on the exports of the CEFTA countries, and (ii) that a simple elimination of tariffs may heavily under-predict the impact of CEFTA integration with the EU.

We hope that the simplicity and flexibility of our methods, along with their compatibility with the standard quantitative trade models, will make them useful for benchmark policy analysis. In addition to offering a comprehensive account for the impact of non-tariff barriers to trade, which is especially relevant for services trade, we see an important application of our methods for quantifying the impact of regional integration and of the impact of "borders" within countries. While tariffs are not imposed for domestic trade, there is plenty of evidence that domestic trade is not frictionless and that proper quantification of domestic trade costs is important for quantifying the effects of both international and domestic policies.

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SUPPLEMENTARY APPENDIX

A Robustness Checks and Additional Results

This appendix offers estimates that correspond to the results from Tables 1 and 2 of the main text. However, the estimates in Tables 4 and 5 are obtained with the OLS estimator, the estimates in Tables 6 and 7 are obtained after the missing values for bilateral trade with zeros, and the estimates in Tables 8 and 9 are obtained with 4-year-interval panel data over the whole period of investigation, 2000-2016. Overall, the results from this appendix support the main estimates, which are obtained with the PPML estimator and without replacing missing values with zeros.

Table 4: Sectoral Gravity Estimates CEFTA, 2013, OLS

	(1) Manufacturing	(2) Agriculture	(3) Mining	(4) Services
DIST	-1.414	-1.158	-1.301	-0.770
	(0.029)**	(0.030)**	(0.129)**	(0.098)**
CNTG	0.894	1.025	1.233	0.557
	(0.091)**	(0.075)**	(0.220)**	(0.121)**
LANG	0.832	0.708	0.532	0.647
	(0.038)**	(0.040)**	(0.167)**	(0.072)**
BRDR	-4.433	-6.742	-7.069	-6.985
	(0.227)**	(0.154)**	(0.533)**	(0.385)**
FTA	0.359	0.386	0.507	0.621
	(0.045)**	(0.044)**	(0.216)*	(0.151)**
BRDR_EU_CEFTA	-4.720	-6.805	-7.411	-7.018
	(0.241)**	(0.176)**	(0.651)**	(0.384)**
BRDR_EU	-4.039	-5.741	-7.160	-7.004
	(0.227)**	(0.155)**	(0.563)**	(0.366)**
_cons	27.610	14.160	29.717	14.517
	(0.280)**	(0.226)**	(0.909)**	(0.655)**
N	634838	106895	4698	19001
R^2	0.698	0.617	0.664	0.843

Notes: This table reports gravity estimation results for the four main sectors in the sample including Manufacturing, Agriculture, Mining, and Services, which correspond to the estimates from Table 1 of the main text. All estimates are obtained with data for 2013. The data for each main sector is constructed by pooling (not summing) the data for all individual products within the corresponding main sector. The estimator is OLS and the dependent variable is the log of nominal bilateral trade. All estimations are obtained with exporter-product and importer-product fixed effects, whose estimates are omitted for brevity. Standard errors are clustered by country pair and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$. See main text for further details.

Table 5: Sectoral Gravity Estimates CEFTA, 2013, OLS

	(1) Chemicals	(2) Electronics	(3) Food	(4) Machines	(5) Metals	(6) Minerals	(7) Other	(8) Rubber	(9) Textiles	(10) Transport	(11) Wood
DIST	-1.661	-1.289	-1.456	-1.293	-1.580	-1.487	-1.246	-1.478	-1.368	-1.151	-1.589
	(0.035)**	(0.033)**	(0.039)**	(0.029)**	(0.038)**	(0.043)**	(0.036)**	(0.038)**	(0.034)**	(0.036)**	(0.041)**
CNTG	0.675	0.800	1.073	0.600	0.764	1.431	0.952	0.926	0.866	0.829	1.028
	(0.101)**	(0.117)**	(0.100)**	(0.094)**	(0.099)**	(0.109)**	(0.115)**	(0.122)**	(0.106)**	(0.091)**	(0.105)**
LANG	0.823	0.759	0.975	0.738	0.886	0.853	0.838	0.898	0.736	0.686	1.027
	(0.045)**	(0.045)**	(0.050)**	(0.042)**	(0.048)**	(0.052)**	(0.050)**	(0.053)**	(0.046)**	(0.046)**	(0.050)**
BRDR	-3.495	-3.929	-5.725	-2.989	-3.639	-5.077	-4.121	-3.368	-3.695	-4.532	-4.855
	(0.255)**	(0.317)**	(0.245)**	(0.321)**	(0.277)**	(0.260)**	(0.330)**	(0.329)**	(0.277)**	(0.277)**	(0.241)**
FTA	0.329	0.336	0.550	0.298	0.377	0.378	0.317	0.426	0.241	0.366	0.356
	(0.054)**	(0.054)**	(0.058)**	(0.049)**	(0.056)**	(0.066)**	(0.059)**	(0.063)**	(0.055)**	(0.054)**	(0.059)**
BRDR_EU_CEFTA	-3.617	-4.369	-5.985	-3.397	-3.685	-5.793	-4.326	-3.470	-3.822	-4.720	-5.051
	(0.277)**	(0.328)**	(0.269)**	(0.336)**	(0.297)**	(0.286)**	(0.342)**	(0.347)**	(0.290)**	(0.295)**	(0.260)**
BRDR_EU	-2.919	-3.681	-4.798	-3.123	-3.254	-4.989	-3.891	-3.118	-2.954	-4.268	-4.351
	(0.255)**	(0.316)**	(0.246)**	(0.322)**	(0.278)**	(0.258)**	(0.326)**	(0.330)**	(0.277)**	(0.279)**	(0.242)**
_cons	29.736	26.471	28.937	25.794	28.770	28.034	25.404	27.676	26.078	25.686	27.988
	(0.324)**	(0.349)**	(0.336)**	(0.352)**	(0.378)**	(0.359)**	(0.353)**	(0.365)**	(0.318)**	(0.384)**	(0.386)**
N	61024	100591	80999	77449	46539	37020	34915	20705	64522	43567	67507
R^2	0.675	0.747	0.604	0.713	0.690	0.652	0.719	0.759	0.707	0.677	0.679

Notes: This table reports gravity estimation results for the 11 main sectors within Manufacturing in the sample, as they appear in the column names. The estimates in this table correspond to the estimates from Table 2 of the main text. All estimates are obtained with data for 2013. The data for each main manufacturing sector is constructed by pooling (not summing) the data for all individual manufacturing products within the corresponding main sector. The estimator is OLS and the dependent variable is the log of nominal bilateral trade. All estimations are obtained with exporter-product and importer-product fixed effects, whose estimates are omitted for brevity. Standard errors are clustered by country pair and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$. See main text for further details.

Table 6: Sectoral Gravity Estimates CEFTA, 2013, OLS

	(1) Manufacturing	(2) Agriculture	(3) Mining	(4) Services
DIST	-0.491	-0.953	-1.406	-0.467
	(0.099)**	(0.040)**	(0.156)**	(0.098)**
CNTG	0.774	0.612	0.386	0.540
	(0.185)**	(0.070)**	(0.256)	(0.138)**
LANG	0.307	0.403	0.333	0.623
	(0.066)**	(0.056)**	(0.156)*	(0.089)**
BRDR	-5.960	-5.926	-4.605	-5.808
	(0.294)**	(0.126)**	(0.445)**	(0.305)**
FTA	0.365	0.495	1.020	0.254
	(0.103)**	(0.064)**	(0.183)**	(0.123)*
BRDR_EU_CEFTA	-6.880	-6.170	-5.737	-7.375
	(0.338)**	(0.162)**	(0.463)**	(0.351)**
BRDR_EU	-5.794	-4.777	-4.932	-5.321
	(0.321)**	(0.119)**	(0.445)**	(0.289)**
_cons	29.618	16.903	36.036	15.667
	(0.581)**	(0.265)**	(0.955)**	(0.627)**
N	1291073	365939	39085	97202

Notes: This table reports gravity estimation results for the four main sectors in the sample including Manufacturing, Agriculture, Mining, and Services, which correspond to the estimates from Table 1 of the main text. All estimates are obtained with data for 2013. The data for each main sector is constructed by pooling (not summing) the data for all individual products within the corresponding main sector. The estimator is PPML and the dependent variable is the level nominal bilateral trade, where we have replaced all missing values for international trade flows with zeros. All estimations are obtained with exporter-product and importer-product fixed effects, whose estimates are omitted for brevity. Standard errors are clustered by country pair and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$. See main text for further details.

Table 7: Sectoral Gravity Estimates CEFTA, 2013, OLS

	(1) Chemicals	(2) Electronics	(3) Food	(4) Machines	(5) Metals	(6) Minerals	(7) Other	(8) Rubber	(9) Textiles	(10) Transport	(11) Wood
DIST	-0.857	-0.605	-0.721	-0.562	-0.747	-0.977	-0.670	-0.941	-0.782	-0.468	-0.904
	(0.047)**	(0.054)**	(0.041)**	(0.046)**	(0.070)**	(0.047)**	(0.066)**	(0.051)**	(0.059)**	(0.077)**	(0.044)**
CNTG	0.369	0.299	0.828	0.528	0.429	0.600	0.598	0.541	0.337	0.808	0.767
	(0.083)**	(0.080)**	(0.082)**	(0.086)**	(0.102)**	(0.085)**	(0.130)**	(0.094)**	(0.086)**	(0.110)**	(0.077)**
LANG	0.253	0.288	0.489	0.145	0.461	0.177	0.125	0.032	0.214	-0.065	0.265
	(0.070)**	(0.066)**	(0.065)**	(0.059)*	(0.067)**	(0.071)*	(0.094)	(0.068)	(0.071)**	(0.083)	(0.068)**
BRDR	-3.121	-3.007	-5.342	-2.741	-3.523	-4.099	-3.898	-3.225	-3.240	-3.687	-4.214
	(0.156)**	(0.190)**	(0.118)**	(0.169)**	(0.227)**	(0.151)**	(0.193)**	(0.179)**	(0.157)**	(0.235)**	(0.129)**
FTA	0.365	0.275	0.432	0.466	0.571	0.396	0.535	0.524	0.325	0.723	0.576
	(0.072)**	(0.077)**	(0.060)**	(0.062)**	(0.132)**	(0.080)**	(0.100)**	(0.085)**	(0.085)**	(0.094)**	(0.072)**
BRDR_EU_CEFTA	-3.010	-2.589	-5.481	-2.174	-3.180	-4.519	-3.358	-3.082	-2.591	-2.802	-4.287
	(0.247)**	(0.326)**	(0.177)**	(0.256)**	(0.281)**	(0.200)**	(0.266)**	(0.216)**	(0.263)**	(0.578)**	(0.162)**
BRDR_EU	-3.013	-2.429	-3.973	-2.459	-2.755	-3.546	-3.242	-2.593	-2.590	-2.734	-3.720
	(0.153)**	(0.175)**	(0.118)**	(0.158)**	(0.197)**	(0.148)**	(0.190)**	(0.152)**	(0.177)**	(0.203)**	(0.130)**
_cons	29.495	28.071	27.803	25.848	28.655	28.393	28.205	29.077	28.525	27.375	28.054
	(0.286)**	(0.345)**	(0.254)**	(0.296)**	(0.414)**	(0.282)**	(0.415)**	(0.310)**	(0.389)**	(0.471)**	(0.263)**
N	125674	166082	194859	151612	86680	86371	65929	33276	119184	107056	141743

Notes: This table reports gravity estimation results for the 11 main sectors within Manufacturing in the sample, as they appear in the column names. The estimates in this table correspond to the estimates from Table 2 of the main text. All estimates are obtained with data for 2013. The data for each main manufacturing sector is constructed by pooling (not summing) the data for all individual manufacturing products within the corresponding main sector. The estimator is PPML and the dependent variable is the level nominal bilateral trade, where we have replaced all missing values for international trade flows with zeros. All estimations are obtained with exporter-product and importer-product fixed effects, whose estimates are omitted for brevity. Standard errors are clustered by country pair and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$. See main text for further details.

Table 8: Sectoral Gravity Estimates CEFTA, 2000-2016

	(1) Manufacturing	(2) Agriculture	(3) Mining	(4) Services
DIST	-0.745	-0.773	-1.196	-0.456
	(0.020)**	(0.039)**	(0.115)**	(0.057)**
CNTG	0.453	0.674	0.172	0.347
	(0.032)**	(0.069)**	(0.196)	(0.083)**
LANG	0.240	0.352	0.147	0.502
	(0.027)**	(0.054)**	(0.137)	(0.064)**
BRDR	-3.132	-5.710	-3.588	-5.337
	(0.064)**	(0.111)**	(0.332)**	(0.190)**
FTA	0.364	0.485	0.565	0.272
	(0.031)**	(0.055)**	(0.154)**	(0.097)**
BRDR_EU_CEFTA	-3.257	-6.214	-4.563	-6.558
	(0.079)**	(0.143)**	(0.353)**	(0.201)**
BRDR_EU	-2.899	-4.848	-3.800	-5.216
	(0.058)**	(0.105)**	(0.384)**	(0.193)**
N	2836146	523742	20180	116229

Notes: This table reports gravity estimation results for the four main sectors in the sample including Manufacturing, Agriculture, Mining, and Services, which correspond to the estimates from Table 1 of the main text. All estimates are obtained with 4-year panel data for the period 2000-2016. The data for each main sector is constructed by pooling (not summing) the data for all individual products within the corresponding main sector. The estimator is PPML and the dependent variable is the level nominal bilateral trade, where we have replaced all missing values for international trade flows with zeros. All estimations are obtained with exporter-product-year and importer-product-year fixed effects, whose estimates are omitted for brevity. Standard errors are clustered by country pair and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$. See main text for further details.

Table 9: Sectoral Gravity Estimates CEFTA, 2000-2016

	(1) Chemicals	(2) Electronics	(3) Food	(4) Machines	(5) Metals	(6) Minerals	(7) Other	(8) Rubber	(9) Textiles	(10) Transport	(11) Wood
DIST	-0.816	-0.679	-0.710	-0.619	-0.809	-0.888	-0.693	-0.901	-0.876	-0.583	-0.967
	(0.039)**	(0.039)**	(0.040)**	(0.037)**	(0.043)**	(0.042)**	(0.055)**	(0.047)**	(0.059)**	(0.069)**	(0.046)**
CNTG	0.291	0.289	0.790	0.453	0.503	0.697	0.613	0.581	0.360	0.699	0.734
	(0.069)**	(0.076)**	(0.078)**	(0.072)**	(0.078)**	(0.074)**	(0.103)**	(0.079)**	(0.085)**	(0.094)**	(0.068)**
LANG	0.240	0.255	0.476	0.207	0.365	0.188	0.123	0.163	0.251	0.088	0.307
	(0.064)**	(0.065)**	(0.062)**	(0.057)**	(0.059)**	(0.067)**	(0.079)	(0.064)*	(0.063)**	(0.077)	(0.060)**
FTA	0.288	0.272	0.391	0.468	0.372	0.252	0.426	0.523	0.364	0.884	0.503
	(0.063)**	(0.060)**	(0.060)**	(0.060)**	(0.083)**	(0.071)**	(0.094)**	(0.080)**	(0.070)**	(0.107)**	(0.070)**
BRDR	-3.052	-2.156	-5.058	-2.347	-3.279	-3.998	-3.522	-3.110	-2.812	-2.988	-3.961
	(0.117)**	(0.131)**	(0.116)**	(0.117)**	(0.122)**	(0.127)**	(0.168)**	(0.148)**	(0.153)**	(0.212)**	(0.140)**
BRDR_EU_CEFTA	-3.035	-2.106	-5.599	-2.135	-3.025	-4.512	-3.300	-3.132	-2.246	-2.699	-4.259
	(0.202)**	(0.269)**	(0.157)**	(0.193)**	(0.179)**	(0.164)**	(0.237)**	(0.201)**	(0.212)**	(0.354)**	(0.157)**
BRDR_EU	-2.862	-2.075	-4.063	-2.473	-2.687	-3.667	-3.292	-2.787	-2.527	-2.799	-3.805
	(0.112)**	(0.135)**	(0.114)**	(0.118)**	(0.121)**	(0.128)**	(0.163)**	(0.151)**	(0.139)**	(0.170)**	(0.121)**
N	274083	448186	354770	343395	206826	166532	156181	92764	288498	191861	313050

Notes: This table reports gravity estimation results for the 11 main sectors within Manufacturing in the sample, as they appear in the column names. The estimates in this table correspond to the estimates from Table 2 of the main text. All estimates are obtained with 4-year panel data for the period 2000-2016. The data for each main manufacturing sector is constructed by pooling (not summing) the data for all individual manufacturing products within the corresponding main sector. The estimator is PPML and the dependent variable is the level nominal bilateral trade, where we have replaced all missing values for international trade flows with zeros. All estimations are obtained with exporter-product-year and importer-product-year fixed effects, whose estimates are omitted for brevity. Standard errors are clustered by country pair and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$. See main text for further details.

Table 10: MFN Tariffs and Initial Shares of Spending on Domestic Goods

Country	Manufacturing		Agriculture		Mining		Services
	MFN tariff	π_{ii}	MFN tariff	π_{ii}	MFN tariff	π_{ii}	π_{ii}
PANEL A: CEFTA countries							
ALB	3.41	0.88	6.35	0.90	0.97	0.99	0.97
BIH	7.17	0.85	5.07	0.85	3.52	0.93	0.99
MDA	3.28	0.77	12.34	0.90	0.12	0.61	0.89
MKD	5.56	0.95	14.65	0.85	4.18	0.73	0.79
MNE	5.39	0.80	15.62	0.97	0.95	0.98	0.92
SRB	7.72	0.92	17.56	0.97	1.24	0.91	0.91
PANEL B: EU countries and ROW							
AUT	3.95	0.85	9.49	0.85	0.78	0.94	0.87
BEL	3.95	0.95	9.49	0.94	0.78	0.96	0.84
BGR	3.95	0.89	9.49	0.88	0.78	0.60	0.94
CYP	3.95	0.75	9.49	0.86	0.78	1.00	0.83
CZE	3.95	0.94	9.49	0.86	0.78	0.86	0.91
DEU	3.95	0.82	9.49	0.89	0.78	0.84	0.91
DNK	3.95	0.92	9.49	0.97	0.78	0.86	0.87
ESP	3.95	0.68	9.49	0.91	0.78	0.71	0.97
EST	3.95	0.92	9.49	0.80	0.78	0.65	0.85
FIN	3.95	0.87	9.49	0.89	0.78	0.46	0.91
FRA	3.95	0.73	9.49	0.93	0.78	0.77	0.94
GBR	3.95	0.79	9.49	0.91	0.78	0.61	0.91
GRC	3.95	0.59	9.49	0.93	0.78	0.56	0.94
HRV	3.95	0.78	9.49	0.84	0.78	0.86	0.97
HUN	3.95	0.91	9.49	0.91	0.78	0.57	0.86
IRL	3.95	0.97	9.49	0.96	0.78	0.26	0.71
ITA	3.95	0.65	9.49	0.91	0.78	0.68	0.96
LTU	3.95	0.94	9.49	0.89	0.78	0.24	0.89
LUX	3.95	0.95	9.49	0.89	0.78	0.91	0.90
LVA	3.95	0.89	9.49	0.83	0.78	0.77	0.88
MLT	3.95	0.94	9.49	0.97	0.78	0.69	0.83
NLD	3.95	0.95	9.49	0.97	0.78	0.95	0.89
POL	3.95	0.80	9.49	0.93	0.78	0.64	0.94
PRT	3.95	0.82	9.49	0.88	0.78	0.75	0.94
ROU	3.95	0.84	9.49	0.90	0.78	0.82	0.93
SVK	3.95	0.92	9.49	0.77	0.78	0.79	0.89
SVN	3.95	0.90	9.49	0.77	0.78	0.81	0.89
SWE	3.95	0.87	9.49	0.83	0.78	0.62	0.90
ROW		0.87		0.90		0.73	0.87

Notes: This table reports trade-weighted averages of MFN tariffs as well as initial shares of spending on domestic goods. Column (1) gives the country abbreviations, columns (2), (4), and (6) give the initial level of MFN tariffs for manufacturing, agriculture, and mining, respectively. Columns (3), (5), (7), and (8) give the initial share of spending on domestic goods for manufacturing, agriculture, mining, and services, respectively.

Table 11: Trade Effects of CEFTA ($\sigma = 4$)

Country	Manufacturing		Agriculture		Mining		Services
	Tariff	Border	Tariff	Border	Tariff	Border	Border
PANEL A: CEFTA countries							
ALB	24.58	65.04	51.40	271.47	0.84	14.26	133.31
BIH	33.71	53.24	43.95	226.50	12.43	46.82	-3.96
MDA	15.36	42.51	25.44	69.18	1.75	91.26	-0.01
MKD	28.25	53.41	54.68	125.42	20.42	94.42	274.55
MNE	32.45	55.28	61.75	78.47	1.77	4.66	88.18
SRB	30.41	44.68	45.39	97.23	4.36	46.65	116.98
PANEL B: EU countries and ROW							
AUT	0.22	0.39	1.12	3.35	-0.05	-0.23	6.59
BEL	0.02	0.04	0.17	0.45	0.00	0.01	0.06
BGR	0.92	1.73	1.92	5.40	0.39	8.62	0.32
CYP	0.12	0.22	0.36	1.02	0.00	-0.01	0.50
CZE	0.13	0.24	0.37	1.04	0.09	1.64	0.11
DEU	0.09	0.16	0.27	0.77	-0.01	0.02	0.06
DNK	0.04	0.07	0.04	0.16	0.01	0.04	0.01
ESP	0.03	0.05	0.13	0.35	0.00	0.07	0.01
EST	0.02	0.05	0.01	0.08	0.00	-0.01	0.02
FIN	0.02	0.03	0.06	0.24	0.00	0.00	0.01
FRA	0.03	0.05	0.12	0.33	0.01	0.34	0.03
GBR	0.04	0.08	0.08	0.25	0.00	0.00	0.06
GRC	0.98	2.02	2.52	7.08	0.09	2.60	0.89
HRV	4.26	7.78	19.11	61.56	1.17	13.32	0.68
HUN	0.32	0.57	1.52	4.19	0.42	9.97	0.16
IRL	0.01	0.02	0.01	0.05	0.00	0.00	0.02
ITA	0.23	0.45	0.43	1.34	-0.02	0.44	0.18
LTU	0.04	0.09	0.13	0.43	0.00	0.06	0.11
LUX	0.05	0.09	0.00	0.00	-0.03	-0.12	0.00
LVA	0.04	0.08	0.10	0.32	0.00	0.01	0.10
MLT	0.17	0.42	0.03	0.13	1.06	15.91	0.10
NLD	0.03	0.05	0.10	0.28	0.00	-0.01	0.06
POL	0.14	0.25	0.42	1.27	0.10	1.44	0.02
PRT	0.02	0.03	0.04	0.13	0.00	-0.05	0.00
ROU	0.59	1.20	1.33	4.00	1.39	28.72	-0.05
SVK	0.20	0.36	0.65	1.81	-0.03	-0.05	0.50
SVN	1.51	2.71	7.23	21.05	-0.05	1.13	3.06
SWE	0.03	0.06	0.16	0.50	0.00	0.01	0.06
ROW	0.00	-0.01	0.00	-0.03	0.00	0.00	-0.01

Notes: This table reports results for our CEFTA border and tariff scenario assuming an elasticity of substitution of 4 ($\sigma = 4$). Column (1) gives the country abbreviations, columns (2), (4), and (6) report the changes in total exports from our tariff scenario for manufacturing, agriculture, and mining, respectively. Columns (3), (5), (7), and (8) report the changes in total exports from our border scenario for manufacturing, agriculture, mining, and services, respectively.

B Theoretical Framework for Counterfactual Analysis

For our counterfactual analysis we apply the structural gravity framework formulated in changes (Dekle, Eaton and Kortum, 2007, 2008). Start with the following expression for trade flows:

$$X_{ij} = \left(\frac{\gamma_i p_i t_{ij}}{P_j}\right)^{1-\sigma} E_j.$$

The price index is given by:

$$P_j^{1-\sigma} = \sum_i \left(\gamma_i p_i t_{ij}\right)^{1-\sigma}.$$

Using this expression for $P_j^{1-\sigma}$, we can re-write the expression for trade flows as follows:

$$X_{ij} = \frac{\left(\gamma_i p_i t_{ij}\right)^{1-\sigma}}{\sum_l \left(\gamma_l p_l t_{lj}\right)^{1-\sigma}} E_j.$$

Dekle, Eaton and Kortum (2007, 2008) use country i's share in country j's spending

$$\pi_{ij} = \frac{X_{ij}}{E_j} = \frac{\left(\gamma_i p_i t_{ij}\right)^{1-\sigma}}{\sum_l \left(\gamma_l p_l t_{lj}\right)^{1-\sigma}}.$$

Assuming that the γ's are constant, the change of π_{ij} is then given by:

$$\widehat{\pi}_{ij} = \frac{\left(\widehat{p}_i \widehat{t}_{ij}\right)^{1-\sigma}}{\sum_l \pi_{lj} \left(\widehat{p}_l \widehat{t}_{lj}\right)^{1-\sigma}}.$$

Market clearance implies $Y_i = \sum_j X_{ij}$. Hence, we can write Y_i as:

$$Y_i = \sum_j \frac{\left(\gamma_i p_i t_{ij}\right)^{1-\sigma}}{\sum_l \left(\gamma_l p_l t_{lj}\right)^{1-\sigma}} E_j = \sum_j \pi_{ij} E_j.$$

The counterfactual value of Y_i , Y_i^{CFL}, can then be written as:

$$Y_i^{CFL} = \sum_j \pi_{ij}^{CFL} E_j^{CFL}.$$

The change in Y_i is then given by:

$$Y_i^{BLN} \widehat{Y}_i = \sum_j \frac{\pi_{ij}^{BLN} \left(\widehat{p}_i \widehat{t}_{ij}\right)^{1-\sigma}}{\sum_l \pi_{lj}^{BLN} \left(\widehat{p}_l \widehat{t}_{lj}\right)^{1-\sigma}} E_j^{BLN} \widehat{E}_j.$$

Further, due to the endowment economy, we have $E_i = \phi_i Y_i = \phi_i p_i Q_i$. Hence, $\widehat{Y}_j = \widehat{p}_j$ and $\widehat{E}_j = \widehat{Y}_j$ Using this in the last expression, we end up with:

$$Y_i^{BLN}\widehat{Y}_i = \sum_j \frac{\pi_{ij}^{BLN}\left(\widehat{Y}_i\widehat{t}_{ij}\right)^{1-\sigma}}{\sum_l \pi_{lj}^{BLN}\left(\widehat{Y}_l\widehat{t}_{lj}\right)^{1-\sigma}} E_j^{BLN}\widehat{Y}_j.$$

This system needs only data on national outputs (Y_i), expenditures (E_i) and trade shares (π_{ij}), and knowledge about σ. Or, one can use trade flows data (X_{ij}) only, and utilize the relationships $Y_i = \sum_j X_{ij}$ and $E_j = \sum_i X_{ij}$ to calculate outputs and expenditures. In any case, knowledge about γ_j is not necessary. The change in t_{ij}, $\widehat{t}_{ij}$, are exogenous, i.e. they form the basis of our counterfactual experiment. Hence, we are left with one equation and the unknown $\widehat{Y}_i$.

In order to implement it, we simplify a bit:

$$\begin{aligned} Y_i^{BLN}\widehat{Y}_i &= \sum_j \frac{\pi_{ij}^{BLN}\left(\widehat{Y}_i\widehat{t}_{ij}\right)^{1-\sigma}}{\sum_l \pi_{lj}^{BLN}\left(\widehat{Y}_l\widehat{t}_{lj}\right)^{1-\sigma}} E_j^{BLN}\widehat{Y}_j \Rightarrow \\ 1 &= \sum_j \frac{\pi_{ij}^{BLN}\left(\widehat{Y}_i\widehat{t}_{ij}\right)^{1-\sigma}}{\sum_l \pi_{lj}^{BLN}\left(\widehat{Y}_l\widehat{t}_{lj}\right)^{1-\sigma}} \frac{E_j^{BLN}\widehat{Y}_j}{Y_i^{BLN}\widehat{Y}_i}. \end{aligned}$$

Having $\widehat{Y}_i$, we can calculate the remaining changes $\widehat{E}_j$, $\widehat{p}_j$, $\widehat{\pi}_{ij}$, and $\widehat{X}_{ij}$:

$$\begin{aligned} \widehat{E}_j &= \widehat{Y}_j, \\ \widehat{p}_j &= \widehat{Y}_j, \\ \widehat{\pi}_{ij} &= \frac{\left(\widehat{p}_i\widehat{t}_{ij}\right)^{1-\sigma}}{\sum_l \pi_{lj}\left(\widehat{p}_l\widehat{t}_{lj}\right)^{1-\sigma}}, \\ \widehat{X}_{ij} &= \widehat{\pi}_{ij}\widehat{E}_j. \end{aligned}$$

Real GDP changes (welfare) are given by:

$$W_j = \left(\widehat{\pi}_{jj}\right)^{\frac{1}{1-\sigma}}.$$