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Abstract
Empirical models of trade agreements implicitly assume that withdrawal from a trade agreement has an equal and opposite trade effect as accession, i.e., symmetry. With increasing opposition to international economic cooperation, it becomes urgent to test this assumption. We analyze a quasi-natural experiment to explicitly test the symmetry assumption in the context of FTA termination using the gravity model. In 2004, Estonia joined the European Union, which mandated that it withdraws from its FTA with Ukraine. Carefully controlling for possible confounding effects of EU enlargement using a variety of methods, we isolate the FTA withdrawal effect and find strong support in favour of symmetry. Moreover, while import tariffs are part of the impact, the bulk of the effect comes from non-tariff effects of an FTA. General equilibrium estimates suggest that the FTA withdrawal led to a noticeable loss in members' welfare. (JEL: F13, F14, F15, F17)

Keywords: free trade agreement, withdrawal, gravity, welfare analysis, European Union, Estonia, Ukraine.

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1. Introduction

In recent years, the backlash against globalization became political mainstream, reversing a trend towards liberalization which lasted decades. Arguably, the year 2016 marked a turning point, when the UK voted to end its membership in the European Union while the USA engaged in a trade war with China and renegotiated existing free trade agreements (FTAs). At the same time, several far-reaching "mega-regional" agreements like the Trans-Atlantic Trade and Investment Partnership (TTIP) stalled amid fierce public opposition in different countries. Despite this sudden rise in realized disintegration, the underlying causes have been brewing before and most likely are here to stay. Already in 2011, the share of trade in world GDP as well as the number of newly signed trade agreements started to decline.[1] Simultaneously, opposition voices became louder, tying economic integration and globalization to rent-seeking and redistribution of incomes at the expense of the already less well-off (Rodrik, 2018; Maggi and Ossa, 2021). These concerns and diverging ideologies in the international arena make more and more states renege on or renegotiate their international contracts (Borzyskowski and Vabulas, 2019; Haftel and Thompson, 2018). Furthermore, there is reason to expect that changing geopolitical alliances and production issues caused by complex value chains can contribute to a scaling back of trade integration.

Understanding the effects of the withdrawal from international agreements has thus become an important research focus in international economics, which so far focused almost entirely on the *formation* rather than the *dissolution* of agreements. Indeed, past decades were marked by integration processes, and the few exceptions of downgrading economic integration come as part of a large socio-political shock such as a war or collapse of a country. However, the recent acts of de-globalization raise the question of whether the benefits countries gained during their membership remain, at least partially, after they end their membership. Does the withdrawal from an international agreement undo its benefits, or does it leave some of the acquired relationships intact?

With increasing opposition to international economic cooperation, it becomes urgent to test the implicit assumption that withdrawal has an equal and opposite trade effect to accession. We address this question by looking at a quasi-natural experiment of withdrawing from an international agreement that occurred for reasons exogenous to the concerned countries' bilateral relationship.

With the Eastern Enlargement of the European Union (EU) in 2004,[2] the new member states joined the European Customs Union with its centralized competence

1. See World Bank (2022) and World Trade Organization (2022), respectively. Ironically, the number of new trade agreements in force surged dramatically in 2021, as the United Kingdom individually signed free trade agreements which it previously had as a member of the European Union after Brexit.

2. See Gateva (2016, ch. 2) for a discussion of the 2004 "A10" Enlargement Process, whereby A10 refers to the 10 new EU members. Similarly, A8 refers to 8 of the ten countries that belong to the ex-Eastern block, the remaining two being Cyprus and Malta.

for trade agreements. In other words, member states replaced their earlier national trade agreements with those of the Union on the day of accession. This caused little upset to the new members' existing trade agreements since they had been negotiated with the EU accession in mind.[3] However, there is *one* exception: Estonia, one of the new EU members, has had an FTA in force with Ukraine since 1997. Because the EU did not have an FTA with Ukraine when Estonia joined the Union, Estonia had to withdraw from this agreement as part of its EU accession process. As we argue below, this was driven by considerations exogenous to Ukraine–Estonian bilateral characteristics.

We analyze how bilateral trade between Estonia and Ukraine responded to the formation and termination of their FTA. As the withdrawal took place simultaneously with the EU accession, we are carefully controlling for EU enlargement effects to isolate the FTA withdrawal effect. We use a variety of methods, e.g., identifying the impact only relative to other new EU members. Our baseline sample is based on yearly bilateral trade data at the broad sector level for 203 countries during the period 1995–2018.[4] We estimate structural gravity equations with the Pseudo-Poisson Maximum Likelihood (PPML) estimator, and include treatment variables that separately account for an FTA creation and withdrawal effect. While the FTA was in force, bilateral trade increased by 60% compared to the pre-FTA period and 48.5% when controlling for import tariffs, which is in line with prior findings on FTA formation. Interestingly, this trade benefit disappeared swiftly after the dissolution of the FTA in 2004, with trade between Estonia and Ukraine reverting to its pre-FTA level.[5]

Interestingly, even when controlling for tariffs, the estimated FTA effect is only slightly reduced. This points to significant non-tariff effects of the FTA. Further, these estimates specifically account for the trade effect of Estonia's accession to the European Union and control for potential anticipation effects of the withdrawal.

Our finding that the FTA withdrawal undoes the FTA creation effect is even more interesting considering the nature of the FTA formation and the changes in Estonia's trade policy. First, while the FTA conclusion was, like for most FTAs, endogenously determined by expectation of bilateral trade gains, the FTA withdrawal was, as we discuss below, exogenous. It is therefore unlikely that the willingness to cooperate disappeared with the FTA. Still, we find that the negative impact of the withdrawal is large and similar to the positive impact of the FTA creation. This suggests that the symmetric withdrawal effect is likely to be found in cases where FTA creation is more of exogenous nature (e.g., as part of a larger policy package). And further, endogenous

3. For example, the "A10" states had an FTA among each other; upon accession, these agreements were "upgraded" to the EU Common Market. The A10 also had an FTA with the European Free Trade Association (EFTA); after EU accession, the countries continued to enjoy an FTA with the EFTA countries since the EU also had an FTA with them in place.

4. Estonia and Ukraine did not report trade data before 1995, which leaves us only with two pre-FTA years. As we elaborate in below, our main results do not depend on the pre-FTA period.

5. See Figure B1 in the Appendix for an illustrative graph of the FTA withdrawal effect.

FTA withdrawals, which usually go hand-in-hand with a desire to decrease the bilateral cooperation, might even have stronger negative effects. Second, as we show in Figure B2 in the Appendix, Estonia's MFN tariffs increased significantly in the preparation of becoming an EU member, and again almost doubled upon its EU accession.

Disentangling the effects by sector and direction, we find that the FTA predominantly affected trade in manufacturing goods, and that especially Estonia increased its exports to Ukraine. Still, for both countries and all sectors, the export values bounce back to the pre-FTA level after the FTA's termination. Our findings suggest that essentially *all* trade increases that stem from an FTA become undone after its withdrawal and that no FTA-created business networks and 'trading capital' as put forward in Head, Mayer, and Ries (2010) outlast the agreement.

Finally, we conduct a welfare analysis following Baier, Yotov, and Zylkin (2019), which suggests that Estonia enjoyed a large net welfare gain from the EU accession, similar in size to the other new member countries. Ukraine's welfare, on the other hand, suffered from both the FTA withdrawal and the EU enlargement, in line with the predictions in Mossay and Tabuchi (2014).

We provide several additional specifications to disentangle the FTA withdrawal effect from Estonia's simultaneous EU accession by repeating our analysis with two subsamples. One subsample includes only trade flows between Ukraine and countries that experienced the EU-accession effect along with Estonia, so we estimate the pure withdrawal effect. The other subsample narrows down the control group to Estonia's trade partners from Central and Eastern Europe that did not join the European Union during the sample period. These alternative control groups do not alter our estimates, even though they reduce the sample to countries that were all affected in the same direction by Estonia's EU accession.

Additionally, we estimate an event study using monthly trade data from the European Commission's Comext database of import flows of EU member countries in a 24-month window around Estonia's EU Accession in May 2004. The event study findings allow a more detailed look at the FTA withdrawal effect and are in line with our general findings from the yearly dataset: Compared to April 2004 before Estonia's EU accession, trade flows between Estonia and Ukraine were significantly higher than before, but decreased by around 50% directly afterwards.

Studies of disintegrating states suggest that the collapse does not fully undo the preexisting trade relationships. Djankov and Freund (2002) and Fidrmuc and Fidrmuc (2003) provide evidence that trade flows among parts of the former Soviet Union and Yugoslavia are higher than gravity theory would predict. In a similar vein, Beestermöller and Rauch (2018) and Head, Mayer, and Ries (2010) find that trade flows dissipate slowly after disintegration in the case of the fall of the Iron Curtain and decolonization, respectively. However, the deep connections within a state or a political union go beyond the ties created in trade agreements.

Empirical models of trade agreements implicitly assume that withdrawal from a trade agreement has an equal and opposite trade effect as accession, i.e. symmetry. Fajgelbaum et al. (2020) and Fetzer and Schwarz (2021) assess the implications of the

US trade wars, and Larch and Wanner (2024) analyze the effect of the US withdrawing from the Paris Agreement. A number of recent studies focus on the economic effects of Brexit. The most common approach models a counterfactual UK absent Brexit and compares it to the actual UK economy.[6] Other papers use similar techniques to construct a counterfactual Europe where the European Union with its Single Market, Currency Union, and open borders does not exist[7], or counterfactual Canada if NAFTA dissolved without replacement[8]. Due to the ex-ante or hypothetical nature of the analysis, these results rely on simulations and assumptions about the withdrawal to derive the conclusions.

Our analysis also speaks to the international cooperation literature more broadly. We have a good understanding that membership in prominent international organizations promises wide-ranging benefits to participants (Dreher, Mikosch, and Voigt, 2015). Similarly, holding prestigious positions in large International Organizations (IOs) has been linked to higher inflows of development aid (Dreher, Sturm, and Vreeland, 2009), and positions of authority in IOs make countries more cooperative at the international arena (Voeten, 2014). Similarly, FTAs lead to higher trade volumes between members (Baier and Bergstrand, 2007; Baier, Yotov, and Zylkin, 2019; Eicher, Henn, and Papageorgiou, 2012), raise the quality and variety of products available to consumers (Berlingieri, Breinlich, and Dhingra, 2018; Broda and Weinstein, 2006), spur stock markets (Moser and Rose, 2014), and increase countries' overall welfare and economic efficiency (Anderson and Yotov, 2016; Khandelwal, Schott, and Wei, 2013), especially when accounting for sector-specific heterogeneity (Ossa, 2015). We add to this literature by investigating how these benefits of international integration dissipate when member countries decide to terminate their contracts.

We proceed by describing the Estonia–Ukraine FTA in Section 2. In Section 3, we outline our estimation strategy before Section 4 presents the results of our analysis. We present extensions and robustness tests in Section 5. Section 6 concludes.

2. The Estonia–Ukraine Free Trade Agreement

Estonia is a small open economy bordered by the Baltic Sea, Russia, and Latvia. After the fall of the Soviet Union, Estonia transitioned rapidly to a market economy. Today, it is considered one of the most successful post-socialist economies (Norkus, 2007). Prior to joining the European Union in 2004, Estonia practiced a very liberal trade policy: according to the *World Trade Organization*, its average MFN tariff was only 1.68% in 2002 – and for 93% of tariff lines, Estonia granted tariff–free access on

6. See Born et al. (2019), Graziano, Handley, and Limão (2021); Oberhofer and Pfaffermayr (2021)Dhingra et al. (2017), Felbermayr, Gröschl, and Steininger (2022)

7. See Felbermayr, Gröschl, and Heiland (2022); Mayer, Vicard, and Zignago (2019)

8. See Baier, Bergstrand, and Bruno (2019)

an MFN basis. In other words, Estonian tariffs were unusually low by international standards. Additionally, Estonia had free trade agreements with the European Union, the EFTA countries, and Ukraine. These agreements were unusually comprehensive since Estonia granted tariff–free access on *all* goods to *each* FTA partner.

In May 1995, Estonia and Ukraine signed a Free Trade Agreement[9], which went into force in January 1997. It completely eliminated tariffs and quotas on *all* merchandise trade, including on agricultural products. Additionally, both sides were obligated not to introduce any new tariffs or quotas while the agreement was in force, which created considerable policy certainty. Furthermore, the agreement included important behind–the–border provisions, particularly regarding non–discrimination in public procurement (§9), competition, and intellectual property rights. The implementation of the agreement was overseen through a "Joint Committee" consisting of "equally authorized representatives" of both countries, acting on the consensus principle.

The agreement was terminated by May 1st 2004, when in the course of the EU Eastern Enlargement, Estonia, along with Cyprus, Malta, and seven other Eastern European countries (collectively known as A10-countries) joined the European Union, which before consisted of 15 countries (the "EU15"). Upon EU accession, Estonian trade policy underwent a discontinuity. Its trade policy changed overnight: while the EU accession granted single-market access to all A10 countries starting in May 2004, it also demanded that all countries adopt the common EU trade policy. This is, they enjoyed all benefits of the EU's single market but traded with all non-EU countries at the terms that were negotiated between the EU and those third countries up to May 2004. As a consequence, the Estonian MFN tariff almost doubled (reaching 4.8% by 2005). Moreover, since the EU had no trade agreement with Ukraine when the 2004 EU Eastern Enlargement took place, Estonia had to terminate its FTA with Ukraine and apply the EU agreements instead. In line with the provisions for the "denunciation" of the Estonia–Ukraine FTA (§28), Estonia provided notice of termination in October 2003. The Estonia–Ukraine dyad was hence the only one to suffer a "downgrade" of its trade relations.[10]

Figure 1 illustrates the changes in trade regimes around the EU accession wave in 2004. For the matter of illustration, we compare Estonia's trade policy to that of its southern neighbour Latvia. As Estonia and Latvia joined the EU together, they employed an identical trade regime from 2004 onwards. For example, they joined the common market with the other EU countries and started applying tariff reductions under the *Generalized Scheme of Preferences* (GSP) arrangement to Ukraine and

9. The full text of the agreement is available through the *Global Preferential Trade Agreements* database, see World Bank (1995)

10. Technically, the FTA of Bosnia and Herzegovina with Slovenia also had to be terminated due to the 2004 EU enlargement. However, the FTA came into force only in 2002 and implied a gradual tariff reduction for imports from Slovenia.

neighbouring Russia, among other countries.[11] Estonia and Latvia had longstanding FTAs in place with the *European Free Trade Association (EFTA)*, comprising Norway, Iceland, Switzerland, and Liechtenstein. Upon EU accession, this status did not change, as the EU and EFTA were themselves trading under an FTA. The only difference between Estonia and Latvia is Ukraine losing its FTA status with Estonia because there was no EU–Ukraine FTA in place at the time[12]. The change in trade policies concerning all other regions, e.g. the EU, EFTA, and Russia, was identical for Estonia and Latvia. While our main regressions leverage this specific trade policy difference in a sample of over 200 countries, we analyse the FTA withdrawal with monthly data zooming into transition in regime changes for selected comparison countries in the extension analysis in Section 5.

Overall, the EU Enlargement process shows careful sequencing to avoid disruptions of existing trade relations. All accession countries had FTAs with the EU15 and EFTA countries already in place; these trade links either were "upgraded" to the Single Market or stayed as before. For Estonia, forgoing the Ukraine FTA was an acceptable loss in economic terms: its imports from Ukraine amounted to 87 Million Euros per year on average from 1999–2003, accounting for 1.7% of total imports. It was also unavoidable. To allow an exception to the Union's common trade policy for this FTA would have been legally and administratively challenging,[13] and an EU–Ukraine FTA was not on the political agenda at the time. Because of these factors, we can think of Estonia's withdrawal from its FTA with Ukraine as a *quasi-experiment*, which occurred for reasons entirely unrelated to the bilateral Estonia-Ukraine relationship.

3. Data & Specification

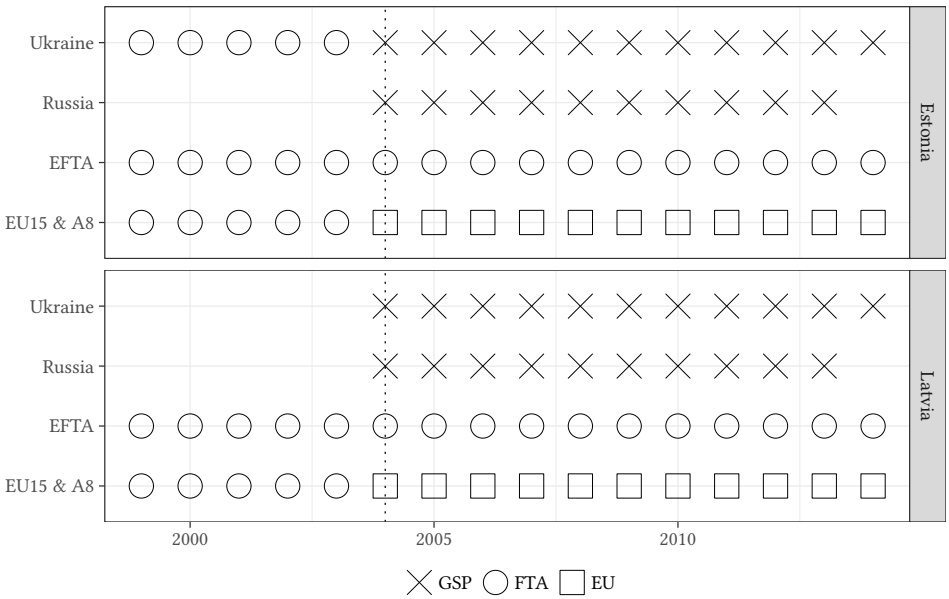
We use this quasi-experiment to estimate the causal effect of the dissolution of a free trade agreement on countries' trade volumes and welfare. We use a dyadic panel dataset based on importer-reported international and internal goods trade values from the ITPD-E Revision 2 database (Borchert et al., 2022, 2021). ITPD-E relies on UN's FAOSTA Commodity List (FCL) for international agricultural flows and UN's COMTRADE for other international flows. The dataset for our main analysis then

11. Belarus and Moldova are the other two non-EU neighbours of Ukraine by land, also eligible for GSP in 2004. Belarus had its GSP preferences suspended due to labour rights violations in 2007, while Moldova received separate preferences from 2008 as part of the FTA negotiations.

12. Interestingly, the new "Deep and Comprehensive FTA" between the EU and Ukraine, in effect since 1st January 2015, is less comprehensive in terms of tariff elimination than the earlier Estonia–Ukraine FTA. According to the WTO, various lines are exempted.

13. There are instances where members of a Customs Union can still have different FTAs. For example, Turkey and the EU are in a Customs Union but have some non-overlapping FTAs (World Bank, 2014)

FIGURE 1
Structure of Preferential Trade Regimes



Notes: This figure illustrates the change in trade policies that occurred due to the European Union's Eastern enlargement. The vertical dashed line indicates the timing of the EU Eastern Enlargement in May 2004, when 8 Eastern European countries ("A8"), including Estonia and Latvia, joined the European Union together with Cyprus and Malta. EU15 are the 15 member states of the EU prior to the enlargement. EFTA comprises the European Free Trade Association that consists of Switzerland, Norway, Iceland, and Liechtenstein.

covers 203 importers and exporters during the period from 1995 (when Estonia and Ukraine started reporting trade data) until 2018.[14]

We estimate regressions derived from the structural gravity model of international trade using the Pseudo-Poisson-Maximum-Likelihood (PPML) estimator

14. We do not include mirrored observations from the ITPD-E dataset. The ITPD-E dataset a) mirrors missing observations where possible with exporter-reported observations, and b) codes still missing observations as zero. This leads to a situation where trade flows switch from import- to export-reported data and back within a pair and over time, which we want to avoid as import- and export- reported data can have systematic differences. These differences are not taken care of by fixed effects as mirroring is applied to specific years and thus varies across dyads and time. Moreover, data mirroring leads to somewhat peculiar occurrences, like Ukraine and Estonia having zero bilateral flows before 1995 when neither country reported to UN. These zeros, which in reality are missing observations, could bias our regressions when the reporting of trade data correlates with international market integration.

(Santos Silva and Tenreyro, 2006). Our main estimations follow the structural gravity literature[15] and take the following form:

$$X_{ijs,t} = exp\left[\mu_{ist} + \pi_{jst} + \chi_{ijs} + \beta_1 FTA_{EE-UA,t} + \beta_2 Withdrawn_{EE-UA,t} + \gamma Z_{ijt}\right] + u_{ijst} \quad (1)$$

where X_{ijst} denotes bilateral trade flows from exporter i to importer j in sector s and year t. Our sector definition follows the "broad" sector categorization in the ITPD-E dataset into agricultural, fishing & forestry, mining, and manufacturing goods. Our main explanatory variables of interest are $FTA_{EE-UA,t}$ and $Withdrawn_{EE-UA,t}$. The former is an indicator variable for the Estonia-Ukraine dyad having an active FTA in the years 1997-2003. The latter identifies the post-FTA years from 2004 onwards for the same dyad. In Section 5, we leverage alternative specifications to a) estimate FTA- and withdrawal-effects by sector and b) investigating directional FTA(-withdrawal) effects following (Baier, Yotov, and Zylkin, 2019).

All estimations control for various types of formal bilateral trade relationships based on the July 2021 version of the *Economic Integration Agreements* database of Baier, Bergstrand, and Feng (2014) as denoted by Z_{ijt}. As the depth of a bilateral trade agreement affects its trade impact, we distinguish between unilateral preferences under Generalised System of Preferences, bilateral Partial Scope Agreements, Free Trade Agreements, and Customs Unions, and finally, European Union membership.

Additionally, we include an $EU_{Estonia}$ dummy that equals one from 2004 onwards for trade between other EU members and Estonia to control for the EU accession effect of Estonia (we set the European Union membership dummy to zero when EU-Estonia equals one to estimate the average accession effect for other entrants). Finally, we separately include an indicator variable for the Estonia-Ukraine dyad in 2003 and 2004 to control for anticipation effects. We cluster the standard errors u_{ijst} at the dyad-level.

Some estimations additionally control for tariff data obtained from the World Bank's WITS database for 1995-2018 at the HS 6-digit level. We map the tariffs data to the ITPD-E dataset's broad sectors.[16]

In addition to our partial equilibrium analysis, we pursue a welfare analysis of the FTA withdrawal. This welfare analysis uses the same dataset as our main regressions, although the computations require a fully balanced panel. We therefore have to drop all countries that do not report trade flows across all years in the sample period. We arrive at a dataset that reports aggregate trade flows for a sample of 85 countries for the period 1997–2018. We hence exclude the pre-FTA period for two reasons. First,

15. We provide a formal derivation of our specification in Appendix C.

16. ITPD-E provides a correspondence table to the ISIC classification for non-agricultural sectors, so we first map HS tariffs to the ISIC classification and then to the ITPD-E broad sectors. For agricultural goods, ITPD-E does not offer a mapping that allows linking to HS sectors. We therefore manually map the ITPD-E agricultural product lines to HS products.

trade data before 1997 are significantly scarcer than for later periods, which would largely diminish our sample when constructing a balanced panel. Second, it allows us to directly estimate the withdrawal effect vis-á-vis the FTA-period without separately accounting for the accession effect.

We conduct the aggregate welfare analysis using the estimate from Column (6) in Table 1 below to compute the general equilibrium changes in trade flows and welfare levels following a one-sector Armington-CES model, assuming a constant trade elasticity.[17] These welfare computations apply a fixed point algorithm to solve for deviations from a current general equilibrium using exact hat algebra. As we detail more in Appendix C, the computations estimate the *change* in a country's total real consumption levels that is moderated by the cost shifter estimated in the partial equilibrium regressions. This is, we use the coefficient β_2 from the estimation Equation 5, and let the algorithm compute how this cost shifter changed the general equilibrium between two periods.

Our main welfare results will compare the welfare (i.e. country-specific consumption) after the withdrawal with the baseline level in the year 2001.[18]. This means that the algorithm will take the differences in total expenditures and trade flows in those two years for each country, while accounting for β_2 as a cost shifter for trade between Estonia and Ukraine. Across various iterations, the algorithm first computes each country's change in wages across the two periods, while keeping everything but trade flows, prices, and total expenditures constant. Using β_2 as a cost shifter allows isolating the FTA withdrawal effect in these wage changes. Based on these wage changes, the algorithm computes the changes in price levels and total expenditures for each country, to then use these updated values to compute the wage changes, and so forth. Once the algorithm converges, it tells us how much the welfare differences across the two periods were changed by the cost shifter β_2, i.e. the effect we estimated for the FTA withdrawal.

In essence, the algorithm provides us with counterfactual trade flows and counterfactual welfare levels for a world in which Estonia would not have withdrawn from its FTA with Ukraine. We can then compare the counterfactuals to the realized and observed values to quantify how much welfare or trade levels were affected by canceling the FTA between Estonia and Ukraine. We can obtain this effect for the directly affected Estonia-Ukraine dyad and all other countries in the sample. As an extension, we conduct a second welfare analysis applying two cost shifters at the same time: 1) the FTA withdrawal effect β_2, and 2) the estimate for the EU accession effect for Estonia. Comparing the results from the "simple" and "double" cost shifter calculations allows us to directly compare the FTA withdrawal effect to the overall EU accession effect (of which the FTA withdrawal is a part).

17. We use the "ge_gravity" Stata Command provided by Thomas Zylkin, see Baier, Yotov, and Zylkin (2019). We further follow Baier, Yotov, and Zylkin (2019) in using $\theta = 4$ for the computations.

18. Our results are almost identical with 2002 or 2003 as reference years. Results are available upon request

4. Results

Table 1 provides the main set of results. Columns (1) to (5) provide results from regressions at the dyad-sector-year level, while Columns (6) and (7) show results for total trade flows at the dyad-year level. All regressions follow the specification outlined in Equation 5 and include the above mentioned time-varying control variables. Note further that all regressions include indicator variables for Estonia-Ukraine trade in the years 2003 and 2004 to account for anticipation effects.

In order to account for the depth of trade agreements and their heterogeneous impact, we control separately for five types of trade agreements, distinguishing the agreements by their depth. Indeed, the deeper the agreement, the larger and more consistent is its impact on bilateral trade.

In Column (1), we see the effect of the Estonia-Ukraine FTA on their bilateral trade values. The estimates derive from a restricted sample ending in 2003, i.e. before Estonia's EU accession and the forced termination of the FTA. This specification follows the literature on the impact of FTA creation. In line with the vast FTA literature, we find a large and statistically significant trade increase during the FTA period. On average, trade between the two countries was around 49.5% higher than before the FTA went into force.[19] Unfortunately, neither Estonia nor Ukraine reported trade data to the UN before 1995. Despite consulting several national data sources, we were not able to extend the dataset before 1995, which only leaves us with two pre-FTA years. Column (2) repeats the specification from Column (1), but additionally controls for tariffs. As expected, we find a statistically significant tariff effect which ranges between -1 to -3, which is in line with the prior literature. Interestingly, additionally controlling for tariffs slightly reduces the estimated FTA effect from 49.5% in Column (1) to 47% in Column (2). This suggests that the FTA's effect occurred largely through channels beyond tariffs, such as signaling or a trade certainty effect.

Columns (3) and (4) investigate the FTA effect across the full sample period from 1995 until 2018. These two columns add an additional FTA withdrawal indicator variable that takes the value of one for Estonia-Ukraine trade past 2004. We therefore practically compare the FTA- and the Post-FTA-Period, respectively, to trade volumes before the FTA creation. This longer time frame now also introduces variation in EU-membership due to the post-2003 EU accession rounds, allowing us to also introduce the EU dummy. Similarly, we include the indicator variable for Estonia's EU accession effect from 2004 onwards. This additional indicator variable directly controls for Estonia's accession effect, which includes any trade diversion caused away from Ukraine as Estonia gains better trade access to all EU countries. Both indicator variables have the expected effect: EU membership significantly increased bilateral trade flows for Estonia as well as all other (new) EU members.

19. According to the formula $(e^{0.402} - 1) \cdot 100\%$.

TABLE 1
Impact of Estonia-Ukraine FTA Withdrawal

	(1) Trade	(2) Trade	(3) Trade	(4) Trade	(5) Trade	(6) Trade	(7) Trade
FTA in Force	0.402**	0.385**	0.470**	0.396*			
	(0.159)	(0.160)	(0.190)	(0.213)			
FTA Withdrawn			-0.00368	-0.0320	-0.437*	-0.432***	-0.400***
			(0.398)	(0.411)	(0.252)	(0.160)	(0.133)
EU Estonia			0.455***	0.262*	0.286**	0.586***	0.387***
			(0.137)	(0.140)	(0.127)	(0.134)	(0.133)
Ln(1+Tariff)		-0.992***		-2.962***	-2.653***		-2.797***
		(0.258)		(0.427)	(0.435)		(0.472)
GSP	-0.0299	-0.0526	-0.106*	-0.148**	-0.130**	-0.185**	-0.226**
	(0.0544)	(0.0539)	(0.0617)	(0.0617)	(0.0629)	(0.0906)	(0.0917)
PSA	0.0634	0.0547	0.0570	0.00349	0.0130	0.0400	-0.0233
	(0.0411)	(0.0429)	(0.0562)	(0.0512)	(0.0530)	(0.0585)	(0.0608)
FTA	0.241***	0.214***	0.127***	0.0346	0.0435	0.151***	0.0688
	(0.0361)	(0.0425)	(0.0464)	(0.0481)	(0.0479)	(0.0527)	(0.0528)
Customs Union	0.486***	0.416***	0.468***	0.265**	0.197	0.676***	0.439***
	(0.0614)	(0.0645)	(0.118)	(0.121)	(0.134)	(0.104)	(0.100)
European Union			0.560***	0.422***	0.390***	0.567***	0.412***
			(0.0845)	(0.0820)	(0.0810)	(0.0922)	(0.0870)
EE-UA 03/04	0.864	0.870	0.571*	0.563*	0.562*	0.557	0.540
	(0.652)	(0.639)	(0.294)	(0.312)	(0.310)	(0.359)	(0.354)
Observations	471,634	310,158	1,748,752	1,134,984	1,074,580	158,752	128,929
Imp (× Sec) × Year FE	✓	✓	✓	✓	✓	✓	✓
Exp (× Sec) × Year FE	✓	✓	✓	✓	✓	✓	✓
Imp × Exp (× Sec) FE	✓	✓	✓	✓	✓	✓	✓
Sample Composition	Sectors	Sectors	Sectors	Sectors	Sectors	Aggregate	Aggregate
Sample Years	1995-2003	1995-2003	1995-2018	1995-2018	1997-2018	1997-2018	1997-2018

Notes: Results from PPML estimations. The dependent variable is trade values in levels. The main explanatory variables are dummies that indicate either the conclusion or withdrawal of the FTA between Estonia and Ukraine. All regressions include exporter[-sector]-year, importer[-sector]-year as well as exporter-importer[-sector] fixed effects, and further control for other trade agreements (GSP, PSA, FTA, Customs Union, European Union). All regressions further control for an indicator variable for Estonia-Ukraine trade in 2003 and 2004 to account for anticipation effects of the withdrawal.
Standard errors clustered at dyad–level in parentheses, $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Our variables of interest *FTA in force* and *FTA withdrawn* therefore capture the full FTA effect net of any simultaneous EU accession effects. Again, we estimate these specifications with and without controlling for tariffs. The results suggest that EU-Ukraine trade returned to pre-FTA levels after withdrawing the FTA. The significantly positive FTA effect in the full sample period is slightly larger than in Columns (1) and (2). At the same time, the indicator variable for FTA withdrawal returns coefficients close to zero. Hence, with the FTA withdrawal, Estonia-Ukraine trade resembles the same volumes as before they signed the FTA. Additionally controlling for tariffs reduces the estimated FTA effect from 60% in Column (3) to 49% in Column (2). The relatively larger impact of tariffs within total FTA effect in the full sample period is consistent with the tariff changes: the partners faced larger import tariffs after the withdrawal than before the FTA.

Our results for the effect of the FTA conclusion fall into the upper part of the range suggested by earlier studies, which find an average positive FTA-effect on trade between 26% and 58% (Baier, Yotov, and Zylkin, 2019; Baier and Bergstrand, 2007). We think of two possible explanations for this relatively large effect. First, as we discussed in Section 2, the Estonia-Ukraine FTA was very comprehensive by covering all goods without exceptions, setting zero tariffs and no transition period. This is in contrast to FTAs commonly having exceptions from duty-free trade in some key sectors and long transition periods. Gnutzmann-Mkrtchyan and Henn (2018) find that a complete elimination of tariffs across the board can have significant additional trade effects beyond tariff reduction effects. Second, Ukraine constituted an internationally rather closed country during the late 1990s and early 2000s. Hence, the free-trade regime with Estonia likely had a large effect on Ukrainian consumers as well as exporters, who faced high tariffs for imports from and exports to most other countries.

As our pre-FTA period includes only two years, we have to ensure that the results are not driven by trade in this short pre-FTA period. To do that, Columns (5)-(7) focus on the 1997-2018 period, in effect dropping the pre-FTA years. One can view Column (5) as mirroring Column (2). We again compare the FTA period to a non-FTA period. However this time, the FTA period is the reference period for the time after the FTA withdrawal. Reassuringly, the estimated effect qualitatively mirrors the results in Columns (1)-(4). The negative coefficient for the withdrawal indicator variable suggests a decrease in trade volumes between Estonia and Ukraine of around 35% upon exiting from the FTA.

These estimates point towards a fully symmetric impact of the withdrawal, as the decrease in trade volumes after the FTA's withdrawal completely undoes the trade creation effect of the FTA conclusion. To see this, assume a pre-FTA trade value of X_0. Our FTA conclusion estimate in Column (4) suggests that during the FTA period, trade between Estonia and Ukraine was 49% higher, i.e. at a level of around $1.49 \cdot X_0$. Our estimate for the FTA withdrawal in Column (5) suggests a trade decrease of 35% compared to the FTA-period. This would translate into a trade value of $0.65 \cdot 1.49X_0 = 0.97X_0$, implying that bilateral trade is 0.03% lower than

before Estonia and Ukraine signed their FTA. Thus the results in columns (4) and (5) are consistent with each other while using different reference periods.

The last two columns are analogous to Column (5), yet use aggregate instead of sectoral trade flows. The samples are further limited to fully balanced panels, which will be required to use these estimates for our General Equilibrium welfare analysis below. Column (6) estimates the compound withdrawal effect, while Column (7) controls for tariffs to only consider the non-tariff withdrawal effects in the FTA-Withdrawal estimate. Also at the aggregate level, the withdrawal effect revolves around a $33 - 35\%$ trade decrease, depending on whether we control for tariffs or not. It is reassuring that the results in Column (7) are similar to the analogous Column (5), despite including aggregate flows sample and lower number of countries.

We use the estimate from Column (6) as the baseline for computing trade changes due to the FTA withdrawal in the welfare analysis below. We do so to capture the total welfare impact resulting from tariff- and non-tariff cost changes of the withdrawal.[20]

We interpret our finding as evidence that no FTA-created "trading capital" is left behind when two countries terminate their international economic cooperation. This sheds new light on prior findings in the literature. Among others, Djankov and Freund (2002) and Fidrmuc and Fidrmuc (2003) find evidence that countries that once were politically united share a lasting trade surplus with each other. Similarly, Beestermöller and Rauch (2018) and Head et al. (2010) show that the bilateral trade surplus from political allies or colonies only dissipates slowly after these relationships were ended. For the case of Estonia and Ukraine, we find that all the trade surplus from the temporary FTA is lost upon its termination. And while the FTA was in force for a relatively short period of 8 years rather than several decades, this period is sufficient to acquire business relationships and for most of the FTA benefits to be realised (Egger et al., 2022; Trefler, 2004). Lasting trade connections require more than preferential trade access to bilateral shipments. Instead, the soft powers inherent to political cooperation or control mechanisms are responsible for a sustained preference for bilateral trade, something that low-scale cooperation via abandoned tariffs cannot achieve.

Welfare. Our main results demonstrate that the FTA between Estonia and Ukraine significantly increased trade between the two countries but that the termination of the FTA has undone this effect. To extend these findings, we proceed by analyzing how the FTA withdrawal impacted both countries' welfare levels. This is particularly interesting for the case of Estonia, which gave up its preferential terms of trade with Ukraine for better access to the much bigger markets of the European Union. To quantify the welfare effects on Ukraine and Estonia as well as related third countries, we conduct a General Equilibrium (GE) welfare analysis.

20. The results of a welfare analysis based on the estimate from Column (7) are very similar as the estimated coefficients are almost identical. Results available upon request.

TABLE 2
Welfare Changes from FTA Withdrawal and EU Accession, in Percent

(A) Welfare Changes from FTA Withdrawal

Country	Welfare Change
Latvia	0.003
Iceland	0.002
Russia	0.001
Lithuania	0.001
Moldova	0.001
Ukraine	-0.0190
Estonia	-0.172

(B) Welfare Changes from FTA Withdrawal and EU accession

Country	Welfare Change
Slovakia	13.960
Estonia	12.733
Malta	12.067
Ukraine	-0.158
Iceland	-0.343
Russia	-0.571
Croatia	-0.720

Notes: General Equilibrium calculations based on PPML estimates. Numbers show the computed welfare difference (in percent) based on a one-sector Armington-CES model, using our estimates from Table 1, Column (6) as cost shifters. Both tables use the year 2001 as the baseline year to calculate changes using exact hat algebra. Panel (a) uses the estimate for the FTA withdrawal effect as the only cost shifter. Panel (b) includes our estimate for Estonia's simultaneous EU accession effect as a second cost shifter.

We compute two scenarios. First, we only consider the effect of withdrawing the FTA between Estonia and Ukraine on the world economy. In the second scenario, we additionally include the effect of the EU accession by Estonia and the remaining "A10" countries in our computation. We present the results of both scenarios in Table 2. For both GE computations, we run the regression as depicted in Table 1, Column (6) above. This regression uses aggregate trade data and focuses on the period after the FTA was in place. As outlined in Section 3 above, we reduce the sample composition in this regression to arrive at a strictly balanced panel.

Panel (a) shows how the FTA withdrawal affected the welfare levels of the main affected countries. Unsurprisingly, Estonia and Ukraine face the biggest welfare loss from the FTA withdrawal. According to our estimations, Estonia suffered the biggest welfare loss from the FTA withdrawal. The withdrawal of the FTA, everything else

equal, reduced Estonia's welfare by about 0.17% relative to its level in 2001.[21] For Ukraine, the welfare effect is also significantly negative, but at a much smaller scale. Our results suggest that Ukraine's welfare decreased by about 0.019% due to the FTA termination. On the other hand, several third countries benefited from the FTA withdrawal, likely due to the undone trade diversion effects of the FTA. However, these welfare gains are rather small on average, with Latvia benefiting the most with a welfare increase of around 0.003%.

In Panel (b), we also include the EU's eastern expansion in our GE computations. To do so, we include two cost shifters in the computation of the welfare effects: $i)$ the estimated FTA withdrawal effect and $ii)$ the estimated trade effect of Estonia's EU accession. These results give us a more complete picture of the overall welfare effects, as the FTA withdrawal occurred simultaneously with Estonia joining the European Union, along with nine other countries. Whereas the FTA withdrawal with Ukraine certainly hurt Estonia, the country at the same time benefited from the accession to the EU.

Despite having been forced to withdraw from the FTA with Ukraine, Estonia largely benefited from joining the EU. Estonia's overall welfare effect when taking into account the FTA withdrawal *and* the EU accession at the same time was a 12.7% increase. According to our estimates, only Slovakia benefited more from joining the EU, at 14.0%. For Ukraine however, the welfare loss is strongly exacerbated when also taking Estonia's EU accession into account. The trade diversion effect from the EU expansion seems to have affected Ukraine's welfare more than the FTA withdrawal alone. Yet, the trade diversion effect was even more severe for other countries: Croatia lost most, with a 0.72% welfare decrease. Russia and Iceland also suffered bigger welfare losses than Ukraine, with a decrease of 0.57% and 0.34%, respectively. To conclude, while the FTA withdrawal had sizeable negative welfare effects on Estonia and Ukraine, and slightly benefited other countries via trade diversion, this effect is dwarfed by the effects of the simultaneous EU expansion.

5. Extensions and Robustness

The main results presented in the previous section outline a sizeable negative effect on the trade between Estonia and Ukraine due to Estonia's withdrawal from their bilateral FTA in 2004. This trade reduction significantly decreased both countries' welfare. In this section, we provide a number of extensions to our estimations, and address potential concerns that could bias our findings.

We begin in Table 3 by investigating heterogeneity with respect to the traded sector (Columns (1) & (2)) and the direction of trade (Columns (3) & (4)). All specifications are analogous to our specifications from Table 1, controlling for

21. The baseline year is selected in the middle of the period of the FTA activity. The results are similar for other baseline years.

TABLE 3
Heterogeneity of impact withdrawal by sector and importer

	(1) Trade	(2) Trade	(3) Trade	(4) Trade
FTA × Agriculture	-0.894			
	(0.707)			
FTA × Fishing & Forestry	-0.0855			
	(0.616)			
FTA × Mining	0.978			
	(0.833)			
FTA × Manufacturing	0.466**			
	(0.232)			
Withdrawn × Agriculture		0.899		
		(0.727)		
Withdrawn × Fishing & Forestry		0.0608		
		(0.535)		
Withdrawn × Mining		-1.015		
		(0.867)		
Withdrawn × Manufacturing		-0.500*		
		(0.265)		
Withdrawn	-0.0215		-0.0210	
	(0.404)		(0.406)	
FTA imp=EE			0.289	
			(0.259)	
FTA imp=UA			0.585*	
			(0.313)	
Withdrawn imp=EE				-0.315
				(0.192)
Withdrawn imp=UA				-0.622**
				(0.280)
Ln(1+Tariff)	-2.962***	-2.653***	-2.962***	-2.653***
Observations	1,134,984	1,074,580	1,134,984	1,074,580
Imp × Sector × Year FE	✓	✓	✓	✓
Exp × Sector × Year FE	✓	✓	✓	✓
Imp × Exp FE × Sector	✓	✓	✓	✓
Sample	1995-2018	1997-2018	1995-2018	1997-2018

Notes: Results from PPML estimations. The dependent variable is trade values in levels. The main explanatory variables are dummies that indicate either the conclusion or withdrawal of the FTA between Estonia and Ukraine. All regressions include exporter-sector-year, importer-sector-year as well as exporter-importer-sector fixed effects, and further control for other trade agreements (GSP, PSA, FTA, Customs Union, European Union and EU-Estonia membership). All regressions control for an indicator variable for Estonia-Ukraine trade in 2003 and 2004 to account for anticipation effects of the withdrawal. Standard errors clustered at dyad–level in parentheses, $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

bilateral tariffs, different types of trade agreements, and specifically for Estonia's EU accession. Column (1) uses the full sample, while Column (2) focuses on the period after the FTA was concluded. Column (1) interacts the FTA conclusion variable with indicators for the four sectors in the ITPD-E dataset: Agriculture, Fishing and Forestry ("F & F"), Mining, and Manufacturing, while controlling for the composite withdrawal effect. The results suggest that only manufacturing trade between Estonia and Ukraine benefited from the FTA, while primary sector flows did not increase significantly. In Column (2) we focus on the period after the FTA came into force and interact the FTA withdrawal effect with the sector indicators. There is no significant difference between the estimates using the full sample with pre-FTA years as reference period and the post-1997 sample estimates for either sector. Hence, as for the pooled estimations in Table 1, there remains no "institutional memory" from the FTA after its conclusion, also at the sectoral level.

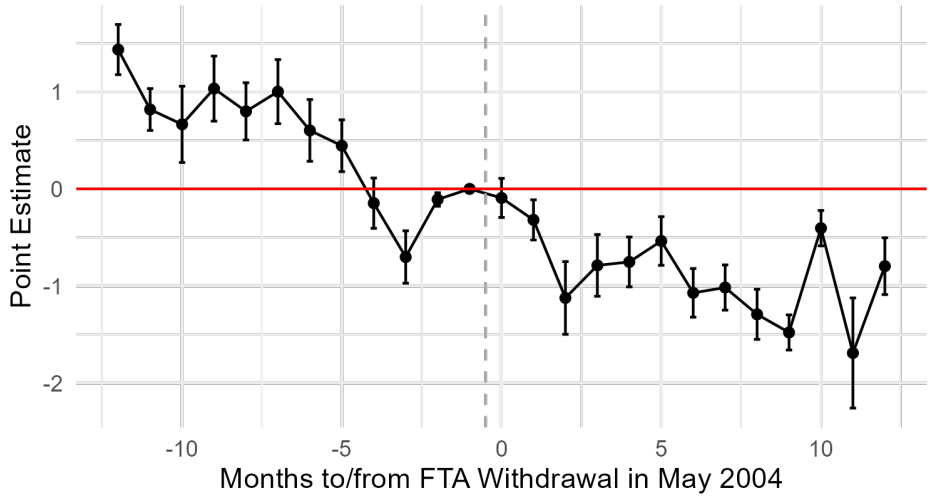
Columns (3) & (4) again observe pooled effects across sectors, but investigate whether there are differences with respect to the direction of trade. To do so, we code directional FTA conclusion and FTA withdrawal variables. These take the value of one only for directional Estonia-Ukraine and Ukraine-Estonia trade flows. The results in Column (3) suggest that mainly Estonian exports to Ukraine benefited from the FTA. Estonian shipments to Ukraine increased by around 79% during the FTA. The estimated effect for imports of Estonia from Ukraine, while having a positive and large coefficient, is not significant. This could potentially be due to the short pre-FTA period, as slicing the reference period further into directional trade reduces the available variation.

Looking at directional effects of FTA withdrawal confirms the earlier findings. This is, Estonia exports *significantly less* to Ukraine after the FTA was withdrawn. Note again that this effect is net of the trade diversion effects of Estonia joining the European Union, as all our regressions separately control for this effect. This exercise shows that Estonia, being an internationally rather open country, reacted significantly to the cost decreases due to the FTA with Ukraine. After the FTA was withdrawn, Estonia's outward multilateral resistances make it difficult for Ukrainian importers to import from Estonia.

Column (4) excludes the pre-FTA period and estimates the effect of withdrawal with the FTA period serving as the reference period. Similar to our baseline regression, the magnitude of the coefficients indicates undoing of the FTA effect by the withdrawal. Again, the effect is significant for imports of Ukraine from Estonia, but not vice versa, and the withdrawal impact is similar to the FTA effect in Column (3).

As a second extension, we zoom into the time around the FTA withdrawal. Leveraging data from the European Commission's Comext database, we observe monthly imports of EU member countries. This allows us to compare monthly shipments around the FTA withdrawal from Ukraine to Estonia, compared to flows from/to other countries. The Comext database only reports imports of EU countries. We hence do not observe shipments from Estonia to Ukraine. We focus on a 12-month window before and after the withdrawal, i.e., we estimate an event study for monthly

FIGURE 2
Event Study: FTA Withdrawal



Notes: Event study plot around the FTA Withdrawal. The Figure displays point estimates from PPML regressions. The dependent variable is trade value, the treatment variable is an interaction of event time and the Estonia-Ukraine dyad. The reference month is April 2004. All regressions include dyad- and month fixed effects. Importers in the sample are Estonia, Latvia, and Lithuania, exporters are Ukraine, Belarus, Bulgaria, Moldova, Romania, and Russia. Lines depict 95% confidence intervals.

trade flows between May 2003 and April 2005. Because the Comext database provides a somewhat selective sample of EU-importers, we reduce the dataset dimension to importers and exporters that are comparable to our countries of interest. Our dataset therefore consists of Estonia and its two Baltic neighbors Latvia and Lithuania as importers, and Ukraine together with the non-EU Eastern European countries Belarus, Bulgaria, Moldova, Romania, and Russia.[22]

Figure 2 displays the results. The figure displays point estimates and 95% confidence intervals for the FTA withdrawal effect. The comparison month is April 2004, one month before the FTA was withdrawn. The results show significant anticipation effects. In the months before January 2004, trade flows between Estonia and Ukraine were still significantly higher than after the FTA withdrawal. However, already around January 2004, the trade flows decrease significantly. Still, after the FTA was withdrawn, exports from Ukraine to Estonia decrease even more compared to just before the withdrawal. From July 2004 onwards, exports from Ukraine to Estonia were around 60% lower than in April 2004, just before the FTA withdrawal

22. Note that Bulgaria and Romania joined the EU Common Market in 2007, i.e., after the period we observe in the event study.

came into effect. Note again that these effects are net of trade diversion/creation effects from Estonia joining the EU. All importers in the sample joined the EU at the same time as Estonia. Similarly, all exporters were non-EU countries during the sample period.

As a final exercise, we conduct a number of robustness tests for our main results in Table 4. The results are robust across alternative samples and specifications. In Column (1), we exclude observations after 2012 to account for the conflict erupting in Eastern Ukraine. Column (2) uses the full sample again, but includes a four-year-lag of the withdrawal variable. This exercise is meant to test for a recovery of Estonia-Ukraine trade relationships over time. However, the withdrawal estimate remains around zero, hence no indication of a recovery of the trade relationships.

The FTA withdrawal took place simultaneous to the 2004 EU accession round, which itself significantly affected bilateral trade flows, in particular for Estonia. Therefore, it is important for us to take sufficient measures to estimate the FTA withdrawal effect net of the general EU accession effects. In our baseline regressions we control separately for the impact of EU membership for Estonia specifically and for other new members. In Columns (3)-(4), we go further and limit the control groups of countries to net out any EU membership effects by the sample composition itself. In Column (3), we only include other "A10" countries that joined the European Union together with Estonia and Ukraine. Thus, we look at Estonia-Ukraine trade relative to Ukraine's trade with other new EU members. In Column (4), we trim the sample of control countries to Eastern European countries that, as Ukraine, did not join the EU in 2004. Here, we assess Estonia-Ukraine trade relative to Estonia's trade with Eastern European states that are not members of the European Union and hence should, in theory, observe the same trade diversion effect as the Estonia-Ukraine dyad. Reassuringly, the results from the different control group samples are in line with our main specifications in Table 1 despite the drastic reduction in sample size.

Column (5) is analogous to Column (4) of Table 1 but includes weighted average tariffs instead of simple average tariffs. Simple average tariffs assign excessive weight to products with small import values that may be irrelevant for the overall impact. Weighted average tariffs correct this issue by assigning weights proportional to products' import shares. However, the drawback of weighted import tariffs is that they assign too little weight to products with very high tariffs, and hence low trade values. In particular, prohibitively high tariffs would even receive a weight of zero. Still, our results are qualitatively unaffected by the use of weighted tariffs: the coefficient on the variable of interest becomes larger in absolute terms and more significant.[23]

Finally, Column (6) investigates whether the tariff elasticity changes across the two periods before and after the FTA between Estonia and Ukraine. For this, we

23. We find this throughout our specifications when using weighted instead of simple average import tariffs (available upon request).

TABLE 4
Robustness analysis

	(1) Trade	(2) Trade	(3) Trade	(4) Trade	(5) Trade	(6) Trade
FTA	0.424**	0.408**	0.373*	0.863***	0.476**	
	(0.206)	(0.207)	(0.223)	(0.144)	(0.190)	
Withdrawn	0.0437	0.0433	-0.107	-0.108	0.00421	
	(0.381)	(0.322)	(0.257)	(0.245)	(0.400)	
EU Estonia	0.211	0.262*			0.404***	0.429***
	(0.134)	(0.140)			(0.139)	(0.085)
Ln(1+tariff)	-2.781***	-2.962***	-7.248***	-2.300		
	(0.390)	(0.427)	(1.214)	(1.667)		
Ln(1+weighted tariff)					-1.269***	-1.489***
					(0.233)	(0.095)
Ln(1+tariff$_{UA,EE,95-97}$)						-7.892***
						(3.078)
Ln(1+tariff$_{UA,EE,05-18}$)						-3.5922***
						(1.188)
Ln(1+tariff$_{RoW}$)						-1.489***
						(0.095)
EE-UA 03/04	0.507	0.523	0.481*	0.399***	0.569**	0.315**
	(0.323)	(0.387)	(0.287)	(0.067)	(0.284)	(0.136)
FTA Withdrawn$_{t-4}$		-0.0997				
		(0.208)				
Observations	790,085	1,134,984	10,513	1,723	1,147,790	16,395,027
Imp (× Sec) × Year FE	✓	✓	✓	✓	✓	✓
Exp (× Sec) × Year FE	✓	✓	✓	✓	✓	✓
Imp × Exp (× Sec) FE	✓	✓	✓	✓	✓	✓
Sample Years	1995-2012	1995-2018	1995-2018	1995-2018	1995-2018	1995-2018
Sample Restriction	No	No	A10	Eastern	No	Trading Sectors

Notes: Results from PPML estimations. The main explanatory variables are dummies that indicate either the conclusion or withdrawal of the FTA between Estonia and Ukraine. All regressions include exporter-sector-year, importer-sector-year as well as exporter-importer-sector fixed effects, and further control for other trade agreements (GSP, PSA, FTA, Customs Union, European Union). The product-level regressions in Column (6) accordingly use product instead of sector fixed effects. All regressions further control for an indicator variable for Estonia-Ukraine trade in 2003 and 2004 to account for anticipation effects of the withdrawal. "A10" refers to the sample restriction to only include the countries that joined the European Union in 2004 as a control group. "Eastern" refers to the sample restriction to only include Eastern European countries that did not join the European Union until the end of our sample period. These countries are Albania, Belarus, Bosnia and Herzegovina, Macedonia, Moldova.
Standard errors clustered at dyad–level in parentheses, $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

turn the analysis to the product level.[24] We separately include variables for Estonia-Ukraine tariffs before the FTA came into power as well as for the period after the FTA was withdrawn, while still controlling for tariffs of all other dyads. Indeed, we find that the tariff effect becomes significantly smaller in the post-FTA period; the estimated coefficient declines from -7.89 before the FTA to -3.59 after the FTA. This suggests that the conclusion of the FTA was probably endogenous to the high pre-FTA tariff elasticity. After Estonia joined the EU, tariffs seemed to have a lower trade-reducing effect.

6. Conclusion

This paper studies the trade effects of FTA withdrawal by drawing on a unique case of withdrawal from a trade agreement that we argue could be called quasi-random. When Estonia joined the European Union, it needed to withdraw from its FTA with Ukraine as part of the *acquis* of joining the Union. Since Estonia-Ukraine trade was relatively small compared to the potential gains from EU membership, this was a trade-off worth accepting for Estonia. Hence, the withdrawal is plausibly exogenous and not related to any Estonia-Ukraine-specific shocks.

We estimate PPML regressions based on the structural gravity model of international trade, comparing the FTA period between Estonia and Ukraine to the period before and after the FTA was in force. Across various specifications and sample adjustments, we find robust evidence that trade between the two countries was significantly higher during the FTA was in place, but rapidly converged back to the pre-FTA levels once the FTA was withdrawn. Based on our robustness exercises that isolate the withdrawal effect from the EU accession effects, we can rule out that this reversal of trade preferences was caused by Estonia joining the European Union. What is more, General Equilibrium calculations suggest that overall, Estonia's welfare increased significantly from the EU accession and was only slightly dampened by the FTA withdrawal, whereas Ukraine suffered both from losing the FTA and general trade diversion effects. We interpret our findings as evidence that all trading capital acquired during an FTA is undone once countries withdraw from their agreement. This extends the findings in, among others, Djankov and Freund (2002); Fidrmuc and Fidrmuc (2003); Head et al. (2010) and Beestermöller and Rauch (2018) who provide evidence that countries retain improved trading connections after the end of a period of political unity. It seems that not "trading capital" from years of free trade with each other allows for sustained trade preferences, but other institutional or cultural factors inherent to common national borders or colonial relationships must be driving this effect.

24. To ease the computation, we restrict the sample to products where the total trade of Estonia & Ukraine over our sample time frame was at least one million USD. This amounts to 97 products according to ITPD-E classification in total.

It is worth noting that, while the FTA was in force for a relatively short period of 8 years, this period is sufficient to acquire business relationships and for most of the FTA benefits to realise (Egger, Larch, and Yotov, 2022). We find that these benefits were reversed following the withdrawal. Future research should look at the remnants of benefits and trading capital that is accumulated over longer periods. Are these relationships and benefits more stable to trade preference changes?

Our findings are relevant in the light of the current trend of disintegration. The past years have seen significant efforts to reverse globalization and undoing of trade agreements, with Brexit being only the most prominent recent example.

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Appendix

A. Descriptives

TABLE A1
Descriptives, PPML Main Sample, 1995–2018

Statistic	N	Mean	St. Dev.	Min	Max
Trade Value (USD)	1,765,642	143,211,787.000	2,470,972,548.000	0.000	497,327,742,957.000
FTA in force	2,652,221	0.00002	0.005	0	1
FTA withdrawn	2,652,221	0.00005	0.007	0	1
Ln(tariff)	1,669,455	0.064	0.075	0.000	1.097
GSP	2,652,221	0.135	0.342	0	1
PTA	2,652,221	0.051	0.219	0	1
FTA	2,652,221	0.054	0.227	0	1
Customs Union	2,652,221	0.016	0.124	0	1
European Union	2,652,221	0.018	0.134	0	1
EU_Estonia	2,652,221	0.001	0.035	0	1

Notes: Descriptive statistics for data used in main PPML Regressions. Trade values are taken from the ITPD-E dataset and represent total yearly dyadic trade values.

TABLE A2
Descriptives Comext Dataset

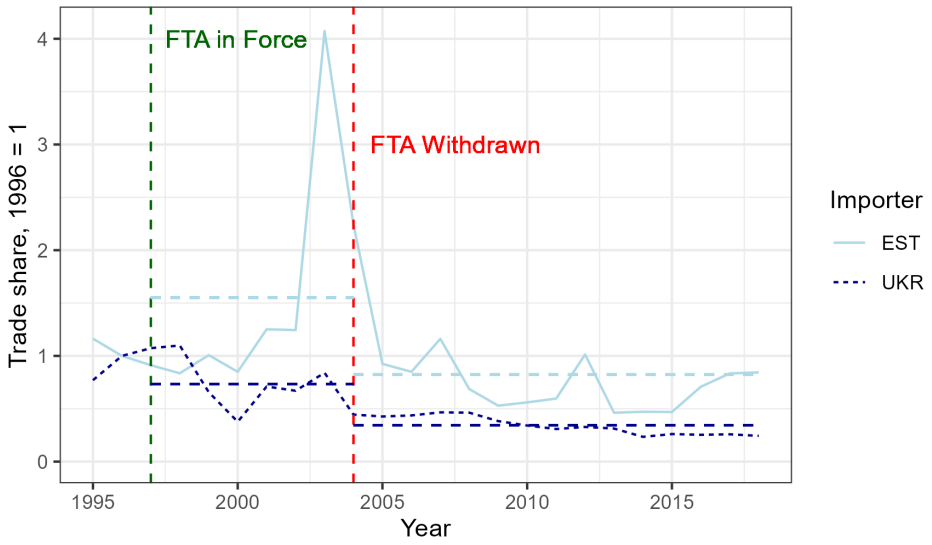
		Monthly Import Volumes			
Importer	N	Mean	St. Dev.	Min	Max
EE all	19,943	7.133	20.919	0.00000	259.859
LV all	17,852	6.783	19.767	0.000	284.512
LT all	1,151	60.513	147.924	0.00000	899.012

		Monthly Export Volumes			
Exporter	N	Mean	St. Dev.	Min	Max
UA all	768	124.191	217.338	1.049	921.533
BG all	384	0.811	0.626	0.104	3.946
BY all	384	16.692	12.206	0.879	54.146
RO all	384	0.861	1.059	0.015	6.301
RU all	768	2,097.967	3,824.823	14.704	14,869.330

Notes: Descriptive Statistics for Comext-Data used in OLS Tetrad Regressions. Numbers represent total monthly import values in Euro and are displayed by reporting Country (Importer). The first four rows display aggregate imports for each importer in the sample, the last four rows show import flows for each importer and exporter in the sample, respectively.

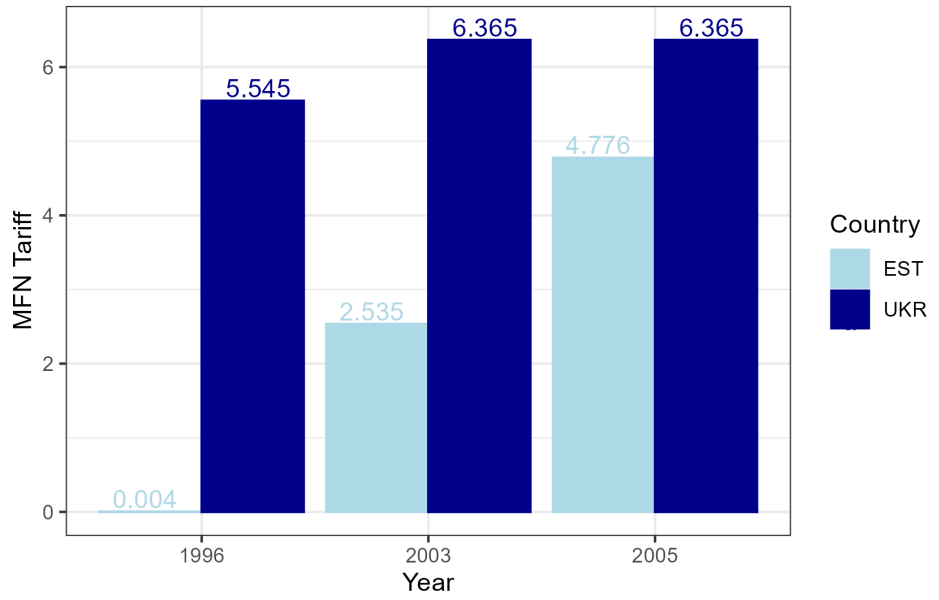
B. Additional Figures

FIGURE B1
Estonia-Ukraine Trade over Time



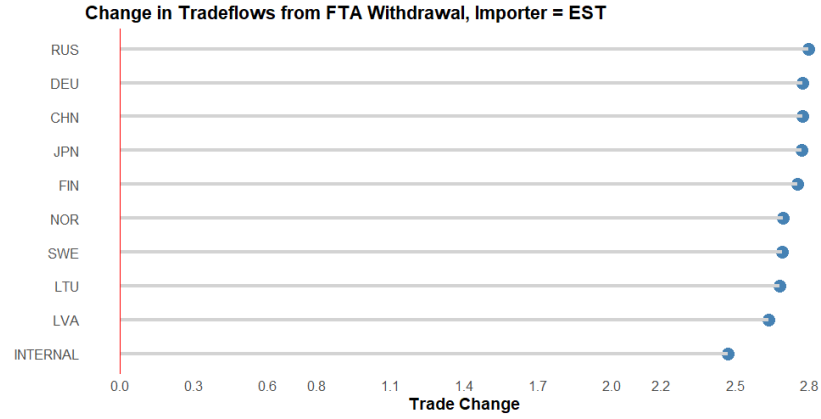
Notes: This graph shows the share of Estonia's imports from Ukraine (lightblue) and Ukrain's imports from Estonia (darkblue) with respect to both countries' overall imports. Trade shares are indexed with 1996 as the reference year. Values are based on the data from the ITPD-E dataset.

FIGURE B2
Estonia & Ukraine MFN Changes

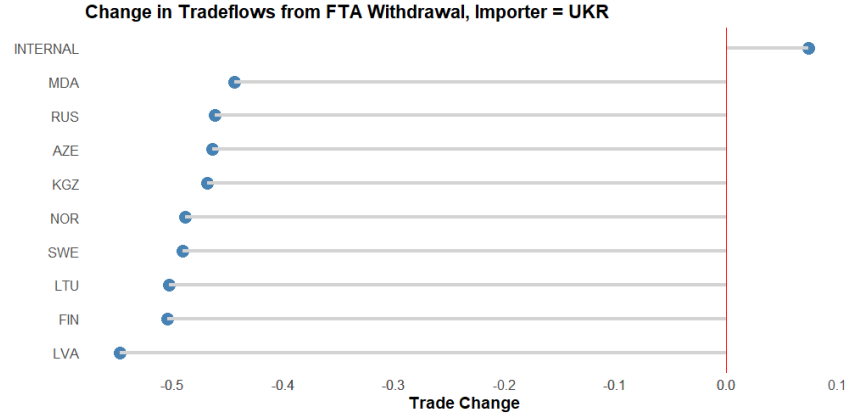


Notes: This graph illustrates the changes in Estonia's and Ukraine's MFN tariffs over time. Evidently, Estonia started with almost zero MFN tariffs, slightly increased these tariffs while planning to join the European Union, and then adopted the higher EU MFN tariffs in 2004. Ukraine, on the other hand, reported significantly higher MFN tariffs over the full sample period. Values are based on data from the World Bank WITS database.

FIGURE B3
Trade Changes from FTA Withdrawal



(A) Estonia



(B) Ukraine

Notes: Graph shows the estimated changes in export flows Estonia and Ukraine, respectively, to various trading partners in percent. "INTERNAL" refers to a change in internal trade. The vertical red line indicates an estimated change of zero percent. Calculated based on General Equilibrium estimations.

C. *Derivation of Estimation Specifications*

We follow the nomenclature introduced in Baier and Bergstrand (2007) and Baier, Yotov, and Zylkin (2019) and describe trade flows $X_{ij,t}$ between origin i and destination j in year t as:

$$X_{ij,t} = \frac{A_{i,t} w_{i,t}^{-\theta} \tau_{ij,t}^{-\theta}}{P_{j,t}^{-\theta}} E_{j,t} \tag{2}$$

In this framework, bilateral trade $X_{ij,t}$ depends on the destination country's total expenditures $E_{j,t}$, as well as the quality of production technologies $A_{i,t}$ and wages $w_{i,t}$ at origin i. Additionally, inward multilateral resistances $P_{j,t}$ account for the average import competition at destination j. All these factors vary over time but are specific to either exporter i or importer j and can therefore be controlled for by including exporter-year and importer-year fixed effects in panel regressions (Anderson and Van Wincoop, 2003). The two variables of interest, namely the formation and dissolution of Free Trade Agreements, are nested in the bilateral iceberg trade costs $\tau_{ij,t}$.

Adding $\mu_{i,t}$ and $\pi_{j,t}$ as fixed effects to account for origin-year-specific and destination-year-specific effects as well as an error term $\varepsilon_{ij,t}$ to account for unobserved heterogeneity, and re-writing Equation 2 in exponential form, we arrive at:

$$X_{ij,t} = exp\left[\mu_{i,t} + \pi_{j,t} + ln(\tau_{ij,t}^{-\theta})\right] + \varepsilon_{ij,t} \tag{3}$$

The bilateral time-varying trade cost term $\tau_{ij,t}$ can be written as:

$$ln(\tau_{ij,t}^{-\theta}) = \chi_{ij} + \beta_1 FTA_{EE-UA,t} + \beta_2 FTAWithdrawn_{EE-UA,t} + \gamma Z_{ij,t} + u_{ij,t}, \tag{4}$$

where χ_{ij} captures time-invariant dyad-specific, directional exporter-importer effects that do not vary over time (Baier and Bergstrand, 2007; Baier, Yotov, and Zylkin, 2019). $FTA_{EE-UA,t}$ is an indicator variable for the Estonia-Ukraine FTA being in force. This indicator variable takes the value of one for all Estonia-Ukraine observations in the years 1997–2003, and zero otherwise.[25] Therefore, the coefficient β_1 estimates the effect of trading under an FTA on Estonia–Ukraine shipments compared to the pre-FTA period. Similarly, the dummy variable $FTAWithdrawn_{EE-UA,t}$ takes the value of one for the Estonia–Ukraine dyad in the years after the termination of the FTA, i.e., from 2004 onwards and zero otherwise. The coefficient β_2, therefore, estimates the difference in trade-flows between the pre- and post-FTA periods. In addition, we control for the bilateral trade integration of all pairs in the sample, indicated by $Z_{ij,t}$. The controls in $Z_{ij,t}$ are indicator variables

25. As the FTA was withdrawn in May 2004, we code 2003 as the last year with an active FTA between Ukraine and Estonia. In our robustness Section below, we code the FTA as running until 2004, which does not change our results.

for the exporter being a beneficiary of a *GSP* offered by the importer, whether the two countries trade under a bilateral *PSA*, *FTA* or *CU*, or whether they are members of the European Union.

Subject to the included control variables and fixed effects, and based on the exogeneity of the FTA withdrawal to the bilateral relationship between Estonia and Ukraine at the time, we can assume that the Withdrawal dummy and the error term $u_{ij,t}$ are uncorrelated. This allows us to interpret β_2 as the causal effect of FTA Withdrawal on bilateral trade between Estonia and Ukraine. Note again that this causal interpretation requires the assumption that besides the FTA withdrawal due to Estonia's EU accession, no other shocks hit specifically the Estonia–Ukraine dyad in the years 2004 and thereafter until the end of the sample period in 2012. Summing up, we can write the main estimation equation as follows:

$$X_{ij,t} = exp\left[\mu_{i,t} + \pi_{j,t} + \chi_{ij} + \beta_1 FTA_{EE-UA,t} + \beta_2 FTAWithdrawn_{EE-UA,t} + \gamma Z_{ij,t}\right] + u_{ij,t} \tag{5}$$

General Equilibrium. The General Equilibrium (GE) estimations also take Equation 2 as the starting point. Our estimations use the "ge_gravity" Stata command developed by Thomas Zylkin, which estimates the welfare effects (in our case of FTA withdrawal) as the differential changes in a country's labor income $Y_i = w_i L_i$ across two periods. Hence, the algorithm assumes that a country's total (labor) income, the product of wages and labor, is equal to the countries total expenditures on internally and internationally produced goods:

$$Y_i = w_i L_i = \sum_j \frac{A_i W_i^{-\theta} \tau_{ij}^{-\theta}}{\sum_k A_k w_k^{-\theta} \tau_{kj}^{-\theta}} \times (w_j L_j + D_j) \tag{6}$$

Hence, a country's labor income depends on its ability to sell its goods to all other countries j. This takes into account the multilateral resistance $P_j = \sum_k A_k w_k^{-\theta} \tau_{kj}^{-\theta}$, i.e. the effective price to sell to country j given country j's access to receive goods from all other countries k. In addition, the labor income depends on each other country j's productivity $w_j L_j$ and trade deficit D_j.

When comparing these outcomes across two periods (in our case before and after the FTA withdrawal), one can express the equation as changes. Substituting $P_j = \sum_k A_k w_k^{-\theta} \tau_{kj}^{-\theta}$ to capture price levels and $\pi_{ij} = \frac{X_{ij}}{E_j}$ to resemble bilateral trade shares, one can express equilibrium changes between two periods using hats as follows:

$$Y_i \widehat{w_i} = \widehat{w_i}^{-\theta} \sum_j \frac{\pi_{ij} \cdot e^{\beta_2 \times Withdrawal_{ij}}}{\widehat{P_j}}^{-\theta} \times (Y_j \widehat{w_j} + D_j) \tag{7}$$

Note that β_2 is the estimated trade elasticity from withdrawing the FTA in Equation 5 above. By observing changes in trade flows (and overall consumption as

the aggregate over all internal and international trade flows) between two periods, one can therefore calculate counterfactual trade- and welfare values by calculating $\widehat{w_i}$ according to Equation 7 for all countries i, and then calculating how this changes the P_j and E_j for all other countries. Doing this iteratively until the results converge to fixed values, one can derive the welfare change from the FTA withdrawal by isolating the change in total expenditures $\widehat{E_i}$ for each country that was caused by the withdrawal, holding everything else constant.