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A decade of Eurasian integration: An ex-post non-parametric assessment of the Eurasian economic union

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ABSTRACT

This paper provides a sound *ex-post* evaluation of the impact of the Eurasian integration on member countries' bilateral trade after a decade of implementation. We overcome the main limitations of current empirical analyses on the effects of trade agreements, namely the aggregation of tariff and non-tariff barriers and the likely self-selection bias, by applying a non-parametric method specifically designed to fully exploit time-series cross-sectional data. We thus compare the trade flows of the member countries in the Eurasian agreement with the exporter-importer pairs located in the Eurasian continent, which are most similar in terms of pre-treatment trends and features. Our results confirm the previous literature about the lack of a significant impact of the Eurasian customs union but find more positive net effects of the more recent integration steps. Our results ask for additional efforts to complete the Eurasian integration and let its member countries fully benefit from its hoped-for long-term effects.

1. Introduction

In the last decade, despite the economic crisis, the process of international trade integration has remained strong, at both a regional and bilateral level, with an increasing number of preferential trade agreements (PTAs) being negotiated and implemented (UNCTAD, 2015). Although in principle, multilateral trade liberalization is more efficient because it is not discriminatory and does not imply trade diversion,[1] many countries consider PTAs[2] as a viable alternative for promoting trade integration (WTO, 2017). Eurasian integration has followed this general trend. On the eve of the process, none of the partner countries was a member of the WTO.[3] However, they

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[1] As highlighted by Viner (1950), in the case of customs unions, PTAs divert trade flows outside the bloc (because of the price discrimination induced by the common external trade policy), substituting them with less efficient supply coming duty-free from other members of the bloc. This implies welfare losses because consumers have to pay more for goods supplied by less efficient local producers.

[2] With the generic term PTAs, we include various degrees of interdependence among the partner economies, mostly free trade areas (FTAs) and customs unions (CUs) and, recently, deeper and more comprehensive forms of trade integration, encompassing further economic and political integration.

[3] After a long process of negotiations that lasted over 18 years, the Russian Federation became a member of the WTO in 2012; Kazakhstan in 2015, whereas Belarus is still completing its accession process.

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reached a consensus on the gradual implementation of a regional trade integration process, starting with a customs union agreement in 1995, then gradually deepening their trade integration while expanding the list of participating countries. In 2000, an agreement on the Eurasian Economic Community was signed by five countries (Kazakhstan, Russia, Belarus, the Kyrgyz Republic, Tajikistan), three of which (Kazakhstan, Russia, Belarus) further agreed to establish a Eurasian Customs Union (EACU) in 2010, by adopting a unified customs tariff and a unified commodity nomenclature. In 2015 EACU was transformed into the Eurasian Economic Union (EAEU), including two more countries - Armenia and the Kyrgyz Republic. The EAEU was modeled as a supra-national union of sovereign States largely inspired by the European Union and implying the free movement of goods, services, capital, and labor, as well as the implementation of coordinated policies in several economic sectors. The final aim is to establish a Eurasian single market with the potential to become a single integrated market of 180 million people acting as a possible bridge between the European Union and the New Chinese Silk Road initiative. Further proposals for the future establishment of a common currency have also been put forward.

Several efforts have been put in place to assess the effects of this regional trade integration process empirically (Michalopoulos and Tarr, 1997; Tochitskaya, 2010; Shepotylo, 2012; Shymulo-Tapiola, 2012; Isakova and Plekhanov, 2012; Popescu, 2014; Vinokurov et al., 2015; Eurasian Development Bank, 2015; Tarr, 2016; Isakova et al., 2016; Adarov, 2018). However, these efforts have been plagued by the lack of substantive progress in implementing the planned waves of trade integration by the participating countries and by the difficulties of computing the net impacts of the complex structure of tariff and non-tariff barriers actually in place in the Eurasian region. After a decade of Eurasian integration (and after five years of EAEU implementation), and in light of the growing political tensions in the area, it is worth investigating again the actual impacts of the Eurasian trade integration, focusing on the effects of trade creation among participating countries, paving the way for further investigations on possible broader effects on partner and third economies. This is still a controversial issue as previous analyses generally argued a weak impact of EACU on internal trade flows, mainly related to the expansion of Russian exports in the common area, and discounted severe data limitations in quantifying the added value of EAEU in fostering regional trade. This is because the majority of studies investigating the Eurasian integration process have been conducted in the early stages of regional integration. In contrast, the more recent attempts experienced difficulties in identifying the trade effects of the progress made in promoting trade facilitation and reducing the trade obstacles due to non-tariff measures.

This study aims to overcome these empirical difficulties by adopting a new econometric approach able to estimate the average causal impact of the trade integration process in the presence of multiple treated units. This allows us to provide a sound ex-post assessment of the trade benefits of the Eurasian trade integration process for participating countries by estimating the net effect of trade integration without the need to provide ad hoc assessments of the trade effects of each specific tariff scheme and/or non-tariff measure. To the best of our knowledge, there has been no such sound impact assessment of the effect of Eurasian integration on trade yet. The reason is twofold: first, only now, after more than ten years of Eurasian integration, we can make a reasonable assessment about *ex-post* impacts, especially for the EAEU, which represents the most critical step for Eurasian preferential trade integration going beyond static tariff reductions. Second, it is difficult to overcome the empirical issue of constructing appropriate trade preference measures for different commodities and/or countries (Cipollina and Salvatici, 2011) and get rid of the likely self-selection bias, especially for treatments that have comprehensive and long-lasting effects on outcomes, such as in the case of EAEU (Baier and Bergstrand, 2009; Montalbano and Nenci 2014; Saia 2017). Since national tariff schedules often have thousands of tariff lines, characterized by large variations in tariff rates, it is challenging to compare sectors/countries in the context of trade policy, and outcomes are highly dependent on the aggregation level and methods used for identification.[4]

As for self-selection in trade agreements, since partner countries generally sign trade agreements to increase bilateral trade, it is not immediately apparent whether trade flow outcomes are the effects of or the causes of PTAs. Since Persson's seminal work (2001), the trade literature has acknowledged that standard log-linear gravity estimates could not adequately take into account non-linearity and self-selection bias. A common way to overcome this bias is to rely on matching techniques (Chintrakarn 2008; Baier and Bergstrand 2009; Magrini et al., 2017) and, more recently, on non-linear Poisson pseudo-maximum likelihood (PPML)[5] controlling for self-selection bias by means of bilateral pair fixed effects (Weidner and Zylkin, 2021). However, this latter strand of the literature also has its limitations, mainly due to the inability to fully consider time-variant unobservables. In this work, we apply the mean balancing (MB) approach, which overcomes the main limitations depicted above for an empirical evaluation of the effects of FTAs. MB is a weighting-based approach that builds upon the synthetic control method (SCM) by forming a 'synthetic control' unit whose pre-treatment history closely matches that of the average of the treated units. This method shares with other matching and reweighting methods the ability to overcome the issue of finding an appropriate overall measure to synthetize both tariff and non-tariff barriers since it focuses more directly on outcome changes induced by the treatment. At the same time, MB allows the treatment to have a long-lasting effect on the outcome and, unlike SCM, it allows the estimation of the average treatment effect on the treated (ATT) in the presence of multiple treated units and improves feasibility and stability with reduced user discretion. We apply this technique for quite a long time-span (1998–2019), covering trade relations across partner countries before and after the inception of the EAEU, thus building a credible counterfactual scenario.

Our results confirm the previous literature about the lack of a significant impact of EACU on aggregate and negative impacts specifically for Kazakhstan. However, we find mixed but overall positive net effects for EAEU where internal bilateral trade flows have

[4] Figure A1 in Appendix A shows the difficulties in capturing a single measure of aggregate trade preferences, even when we simply refer to the changes in tariff schemes at two-digit HS classification by country.

[5] PPML is considered superior to the traditional Ordinary Least Squares (OLS) estimator for the gravity equation. This is because it effectively addresses both heteroskedasticity and zero bilateral trade flows (Santos Silva and Tenreyro, 2006).

gained momentum in recent years for all countries, including Kazakhstan and the newcomers. Although we cannot exclude that the registered increase in trade within the EAEU could be (at least partially) compensated by trade diversion with third countries, our results are robust and sound in response to several robustness tests. The article consists of five sections. Section 2 describes the Eurasian integration process, Section 3 presents the literature review, Section 4 describes the MB method and data sources, Section 5 shows the empirical results, and Section 6 offers some robustness checks. Section 7 concludes the paper.

2. The Eurasian integration process

In 1995 the leaders of Belarus, Kazakhstan, the Kyrgyz Republic, and the Russian Federation signed a first agreement on the creation of a Customs Union. This agreement concerned the elimination of obstacles to free economic interactions between the economic parties, fair competition and, basically, the adoption of the Russian tariff as the common external tariff. However, this Customs Union was not duly implemented at that time as the Commonwealth of Independent States (CIS) offered duty free access to each member, and the common external tariff was applied by the Central Asian members on an "a la carte" basis (Michalopoulos and Tarr, 1997; Tarr, 2016).[6] This integration effort became known as the Eurasian Economic Community (EurAsEC) in 2000 (where also Tajikistan was added)[7] and entered legally into force on May 30, 2001 after it was ratified by all the member states. For all the reasons above, this first attempt at Eurasian trade integration did not lead to the hoped-for trade integration among Eurasian countries. However, the signing of bilateral agreements between the member states (Russia and Kazakhstan and Russia and Belarus) slightly increased their level of integration. Within the framework of the EurAsEC, on October 6, 2007, Belarus, Kazakhstan, and Russia signed a new agreement on the creation of a Customs Union. However, also the effectiveness of this new wave of Eurasian trade integration was weak until 2009, when Russia, Kazakhstan and Belarus signed the Eurasian Customs Union (EACU), which started to operate on January 1, 2010. The main follow-up of this agreement was the implementation in July 2011 of a unified customs tariff that was added to the internal duty-free trade. The Customs Union had a considerable impact on the trade policy of Kazakhstan and Belarus, whereas Russia could leave 82% of its custom tariffs unchanged. Kazakhstan's tariff schedule underwent the most significant changes, which affected more than half of its tariff lines (Isakova et al., 2016): 10% of these were lowered, and 45% were increased.

In October 2011, the Commonwealth of Independent States Free Trade Zone Agreement (CISFTA) was also signed by Russia, Ukraine, Belarus, Kazakhstan, the Kyrgyz Republic, Tajikistan, Moldova, and Armenia. Russia, Belarus, and Ukraine promptly ratified the treaty. Kazakhstan, Armenia, and Moldova completed the ratification process at the end of 2012, Uzbekistan in December 2013, and the Kyrgyz Republic and Tajikistan ratified the treaty in January 2014 and December 2015, respectively. In 2012 the countries of EACU launched a Single Economic Space (EACU-SES), which, in 2015, was transformed into the Eurasian Economic Union (EAEU) and was extended to two additional partners: Armenia and the Kyrgyz Republic. The new agreement seeks to achieve the so-called "four freedoms", i.e., common regulations for the internal movement of goods, services, capital, and labor. Further aims of the EAEU, largely inspired by the EU integration process, were the promotion of common monetary and fiscal policies, that is, the maximum possible degree of economic integration. Fig. 1 summarizes the main steps towards the Eurasian integration depicted above.

Unfortunately, as documented in the specialized literature (Vinokurov et al., 2015; Tarr, 2016), non-tariff barriers remained a serious issue in the EAEU. Among these, the need for testing and certification of products, as well as compliance with production standards, has the greatest impact. The reason is that the EAEU (and the EACU before it) has formal responsibility for SPS controls mainly affecting agriculture and food products. Other barriers are price controls, including additional taxes and fees in the country of destination (particularly those related to the payment of VAT). In addition, there are restrictive pre-shipment inspections and other formalities, conditional trade safeguards, financial measures in the form of regulation of the terms of import charges in the country of destination, or conditions for obtaining and using credit to finance imports. Last but not least, the annexation of Crimea and the conflict in eastern Ukraine contributed to weaken the customs union, as the participating countries did not act as a single trading bloc towards the Western partners (Tarr, 2016).

3. Literature review

The literature on the impact of preferential trade agreements (PTAs) on countries' trade flows is extensive (for a review see, *inter alia*, Baier and Bergstrand, 2007; Cipollina and Salvatici, 2010; Limão, 2016; Baccini et al., 2017; Cheong and Tang, 2018). Most of the empirical literature agrees in finding positive effects of PTAs on trade flows among members, primarily when they address far more than tariff reductions, as in the case of "deep" PTAs (Baier and Bergstrand 2007, 2009; Fugazza and Nicita, 2013; Limão, 2016; Baccini et al., 2017; Jagdambe and Kannan, 2020). Some works highlight trade diversion effects on non-member countries (see Carrére 2006; Lee and Shin 2006; Romalis 2007; Mattoo et al., 2017; Pfaffermayr, 2020). A few studies suggest a minimal impact (Hoekman and Nicita 2011; Kohl 2014). Others consider evidence to be inconclusive (Calvo-Pardo et al., 2009; Freund, 2010).

The literature on the Eurasian case is more limited. Most of it consists of ex-ante computable general equilibrium assessments (De

[6] In that period, the former USSR countries were still involved in peacefully settling possible contradictions and conflicts associated with disintegration, a process often referred to in the literature as "civilized divorce".

[7] Uzbekistan signed a protocol on the accession in January 2006. However, it withdrew its participation in October 2008.

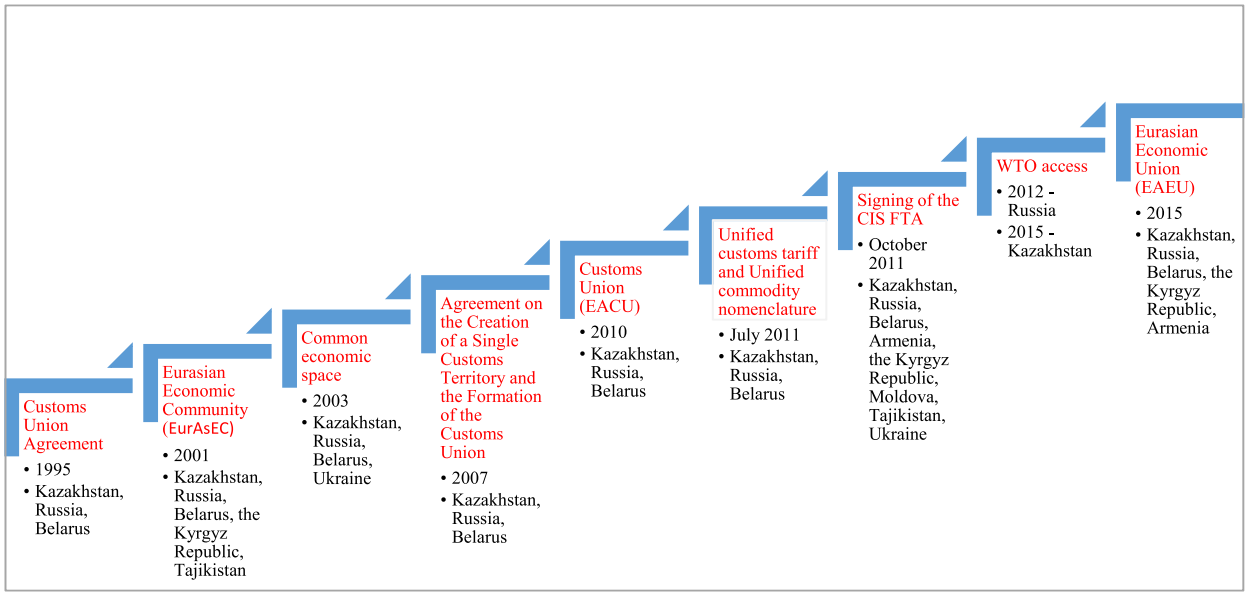

Fig. 1. Main steps in the Eurasian integration process.
Source: Authors' elaborations

Souza, 2011; World Bank, 2012),[8] along with some very preliminary *ex-post* empirical studies (EBRD, 2012; Isakova et al., 2016; Tarr, 2016; Kirkham, 2016; Vinokurov, 2017; Bayramov et al., 2019). These preliminary studies agree on the likely positive effects of EACU for Russia, because of the similarity of its pre-treatment tariff structure with the new common external trade policy of the EACU, and the likely negative effects for Kazakhstan, because of its more liberal pre-treatment trade regime. A first careful *ex-post* impact assessment of the effects of the EACU on participating countries' trade flows was carried out by Adarov (2018). By using a SCM approach and data until 2015, he found that the net trade impact of Eurasian integration was overwhelmingly positive for Belarus, generally positive for Russia, and mixed for Kazakhstan. He also highlights that the trade creation effect was mainly associated with the EACU's establishment in 2010.

The heterogeneous outcomes of the above-mentioned empirical studies are usually linked to the heterogeneity of samples, time periods, model specifications and PTA characteristics (Foster et al., 2011). In terms of applied techniques, the gravity model is by far the most popular. Many gravity applications have been traditionally applied to evaluate the impact of PTAs on trade flows, such as, *inter alia*, to study the influence of FTAs in Mediterranean countries (Márquez-Ramos and Martínez-Zarzoso, 2014; Kahouli and Maktouf, 2015), the impact of the ASEAN – China Free Trade Area (Yang and Martinez-Zarzoso, 2014), the 'Belt-and-Road' initiatives (Jing et al., 2020), Malaysia and OIC Member Countries (Abidin et al., 2013), the Comprehensive and Progressive Trans-Pacific Partnership (Shepherd, 2019), and the Korea-Australia Free Trade Agreement (Quansah and Ahn, 2017). All these studies have in common the use of a gravity approach to assess the impact of trade agreements on trade flows.

The traditional gravity model is based on the assumption that trade flows between two countries are positively related to the relative size of the partners' economies and negatively related to their distance apart, net to multilateral resistance (Head and Mayer, 2014). In this framework, the effect of trade agreements is usually estimated by including dummy variables to check for the presence of PTAs and assess the extent to which PTA partners trade more than would be otherwise predicted by using standard bilateral trade determinants.[9] This is a workable solution, but unsatisfactory for several reasons, including possible nonlinearities in relations between FTAs, trade flows and the other covariates. Other possible biases are due to the likely self-selection traditionally associated with FTA treatment, namely countries joining an FTA are unlikely to be randomly chosen, but rather share the same characteristics used by the gravity equations to explain trade flows. Various non-parametric methods have been applied so far to solve this self-selection issue (Persson, 2001; Baier and Bergstrand, 2009; Montalbano and Nenci, 2014; Magrini et al., 2017). As stated above, a common drawback of this specific strand of the literature is the inability to allow the effect of unobservable bias to change over time. Thus, assessing the trade effects of PTAs using the MB approach, we are able to take into account the long-lasting effect of treatment on outcome and provide a throughout event analysis. This represents an innovative and viable alternative to previous ways of addressing self-selection

[8] A related study by Adarov and Ghodsi (2021) - using the gravity model of trade forecasts the impact of the 2019 EAEU–Iran trade agreement on mutual trade between the EAEU countries and Iran at the aggregate and sectoral levels. Their analysis indicates that tariff reductions stipulated in the agreement are likely to yield mutual benefits for the trading partners involved.

[9] An associated branch of the empirical literature estimates trade elasticities to actual tariff schedules within a gravity setup (Magrini et al., 2017; Fontagné et al., 2022). While theoretically consistent, this approach is not without its challenges, including the aggregation problem of tariffs across diverse goods, the potential endogeneity between trade flows and trade policies, and the likely bias induces by omitting non-tariff barriers.

bias in trade literature (Hannan, 2017; Saia 2017; Adarov, 2018).

4. Methodology and data

4.1. Methodology

As an alternative approach to both log-linear gravity equation and standard matching techniques, we have employed the mean balancing (MB) approach proposed by Hazlett and Xu (2018). This method transparently builds the counterfactual scenario of treated exporter-importer pairs relying on minimum modeling assumptions. MB is based on a generalized DID setting in which all exporter-importer pairs under consideration begin as untreated, and then a subset of exporter-importer pairs undergoes a treatment that begins at a given time. This setting allows the treatment to have a long-lasting effect on the outcome, as long as we make a direct comparison between potential outcomes under the two treatment histories. This approach builds upon the SCM – a weighting-based approach that finds weights on control units that form a 'synthetic control' unit, whose pre-treatment history closely matches that of a single treated unit (Abadie et al., 2010). MB accommodates multiple treated units, and assigns weights to control exporter-importer pairs by seeking balance on the first P principal components of the features (pre-treatment periods of the dependent variable and pre-treatment covariates), where P is chosen automatically by a method that minimizes the worst-case bias. MB never fits a model directly, hence the risk of an erroneous extrapolation based on estimated model parameters is minimized. The ATT, in each post-treatment period ($t > T_0$), is obtained by taking the difference between the average of post-treatment outcomes of treated exporter-importer pairs and the 'synthetic' control, as follows:

$$\widehat{ATT}_t = \frac{1}{N^{TR}} \sum_{j \in G} \sum_{i \in G} Y_{ijt} - \sum_{j \in H} \sum_{i \in H} w_{ij} Y_{ijt}, T_0 < t \leq T,$$

where N^{TR} is the number of treated pairs, G is the set of countries in the treated group, H is the set of countries in the control group, Y_{ijt} is the log of export flows (expressed in thousands of US dollars) from country i to country j at time t, w_{ij} is the control weight. The weights w_{ij} are non-negative and their sum is equal to one. MB relies on minimum assumptions: (1) among exporter-importer pairs with the same pre-treatment histories, the exporter-importer pair that receives the treatment is independent of potential outcomes of the untreated exporter-importer pairs in the post-treatment periods (Abadie et al., 2010); (2) each unit's expected post-treatment outcomes are approximately linear; (3) there exists a set of non-negative weights $\{w_{ij}\}_H$ for the control units such that $\sum_{j \in H} \sum_{i \in H} w_{ij} = 1$ and the pre-treatment outcomes are balanced between the treatment and reweighted control group. Standard errors are estimated via a bootstrap procedure only when the number of treated units is "sufficiently large" (e.g., $N^{TR} \geq 5$).

MB inherits the same useful properties as the SCM in coping with time-varying confounding by explicitly using the pre-treatment outcome data. In the case of many pre-intervention periods and a good covariate balancing, it can be shown that MB, just as the SCM, provides an unbiased estimator of the treatment effect for the treated (Abadie, 2021). MB offers additional advantages over SCM by (1) allowing the estimation of the ATT in presence of multiple treated units, (2) providing standard errors of estimates in the presence of several treated units, and (3) improving feasibility and stability with reduced user discretion.[10]

4.2. Data and sample selection

Our chosen unit of analysis is the exporter-importer pair, and our chosen outcome is the export flows (in logs) from country i to country j. To build up a sound counterfactual, we model the synthetic cohort by using standard gravity variables, i.e. the economic size of trading countries as measured by their respective GDP values, and trade frictions as measured by their bilateral geographical distance.[11] Although the average cost of shipping has declined over time, according to the gravity framework, geographical distance remains a robust predictor of trade frictions between pairs of countries (Rickard, 2020). The reason is twofold: i) the general decline in the absolute cost of shipping does not imply that the marginal cost per percentage increase in distance should also decline over time (Frankel et al., 1997); ii) distance is not only related to shipping costs but also to a more general 'cultural unfamiliarity' with more distant economies (Linemann, 1966).

We further integrate the above set of gravity variables by checking for the degree of participation of the countries involved in bilateral trade in global value chains (GVCs).[12] The choice to check for participation in GVCs is motivated by the increased relevance of international fragmentation of production in driving trade flows, especially regional flows, since 1990 (World Bank, 2020), and the

[10] For instance, MB exploits each pre-treatment value of the outcome variables to select the weights, while with SCM the user can arbitrarily select the pre-treatment periods to consider.

[11] It is worth noting here that the use of the gravity variables for selection of observables is not equivalent to the use of a gravity approach for assessing the effect of PTAs. The use of gravity variables here is designed to improve balancing by detecting sources of nonrandom selection bias provided by the theory, whereas the comparison in trade outcomes follows an entirely nonparametric procedure in which covariate balancing is the core assumption to be made.

[12] The EORA database (https://worldmrio.com/) provides a balanced global MRIO for 186 countries and 25 harmonized sectors in the period 1990–2015 (Lenzen et al., 2013).

empirical evidence of the so-called 'chain effect' in driving bilateral trade flows across countries, especially when addressing regional trade agreements (Blanchard et al., 2016; Ruta, 2017; Balié et al., 2019). Lastly, to control for the indirect world trade effects in the form of "overall resistance" or weighted average trade costs (the so-called "multilateral trade resistance" - MTR, identified in Anderson and van Wincoop, 2003), i.e., assuming conditional independence at the bilateral level, we follow Baier and Bergstrand (2009) and Saia (2017) and provide a linear approximation of MTR by using standard measures of *informational frictions,* such as common language,[13] adjacency, common past colonial relations and common legal origins. As a robustness test, in Section 6 we also proxy the MTR terms by using a time-varying measure of "remoteness".

Data on trade flows have been obtained from the United Nations COMTRADE database, accessed via the World Integrated Trade Solution (WITS). GDP data were taken from World Development Indicators of the World Bank. Common language, distance and adjacency variables were obtained from the CEPII Gravity Database. GVC data are computed using the methodology proposed by Borin and Mancini (2016, 2019) from the EORA dataset. GVC participation is measured as the sum of both backward participation (i.e. the use of foreign inputs for exports) and forward participation (i.e. the supply of domestic inputs for other countries' exports), and is computed as percentages of countries' exports (Borin and Mancini, 2016, 2019). Summary statistics of the variables used in our empirical analysis are presented in Table 1.

We present here our two main empirical analyses, along with a set of robustness tests. The first analysis is focused on the potential impact on trade of the Eurasian Customs Union (EACU), which came into force in 2010 for three member countries: Russia, Kazakhstan and Belarus. The second analysis is focused on the EAEU, in this case 2015 is considered as the treatment year for five countries: Russia, Kazakhstan, Belarus, Armenia and the Kyrgyz Republic.[14]

In choosing the set of potential control exporter-importer pairs (the so-called 'donor pool'), Abadie and Gardeazabal (2003) proposed the use of selection criteria that can only select exporter-importer pairs that can be potentially considered as a valid counterfactual for the treated exporter-importer pairs. This highly reduces the risk of overfitting (Abadie, 2021). Thus, we considered in our analysis only exporter-importer pairs located in the Eurasian continent as they better resemble treated countries and minimize the risk of spurious matching. However, we excluded those exporter-importer pairs that did not trade with each other in at least one year between 1998 and 2008. We then excluded all countries already belonging to a CU, such as the European Union countries, Turkey, Switzerland and Gulf Cooperation Council countries. This was designed to minimize selection bias in evaluating the impact on trade flows of joining a CU (and subsequently also a common market). We also excluded from the control group all exporter-importer pairs involving Azerbaijan, Georgia, Moldova, Tajikistan, Ukraine, Uzbekistan and Turkmenistan (i.e., the former Soviet Republics that are members of the Commonwealth of Independent States (CIS) FTA which did not join EACU/EAEU).[15] Since these countries are likely subject to trade diversion, we did not consider them as a valid counterfactual.[16] Lastly, we excluded all exporter-importer pairs involving Syria because of the Syrian civil war, which began in March 2011, and North Korea because of a lack of trade data. The final sample is made up of 720 exporter-importer pairs, 20 of which are treated (all potential combinations between the five countries belonging to EAEU), observed annually over the period 1998–2019 (Table A1 in Appendix A reports the list of countries included in the final sample). The period considered has sufficient coverage before and after the inception of the EAEU to build a credible counterfactual scenario.

5. Results

We begin the empirical analysis by employing a plain vanilla PPML for aggregate gravity analysis, controlling for both bilateral pair fixed effects and time fixed effects.[17] This is done alternately, excluding (panel A) and including (panel B) exporter-importer pairs that did not engage in trade with each other in at least one year between 1998 and 2008. The initial estimates are presented in Table B1 in Appendix B, revealing that in all specifications with both bilateral and time effects, the various waves of Eurasian integration exhibit a null or even negative relationship with export flows among member countries. However, these results warrant caution. Due to the distinct feature of the Eurasian integration process, which lacks country-time variability, this empirical setting is inadequate for controlling country-time fixed effects and, consequently, for addressing multilateral resistance. Fig. 2 presents aggregate estimates of export flows using our weighting-based MB approach. This approach enables better control for self-selection in a non-parametric setting, providing a more effective understanding of the dynamics of trade flow adjustments to trade policy changes in a comprehensive event analysis.

We start with the aggregate estimates of the exporter-importer pairs of Russia, Kazakhstan and Belarus (6), which created the EACU in 2010 (Panel A). We then report the aggregate estimates of all exporter-importer pairs involving Armenia and the Kyrgyz Republic

[13] Language is a dummy variable that takes the value of 1 if 20% of the population in i and j countries speak the same language.

[14] We excluded from the second empirical analysis all the exporter-importer pairs considered as treated since 2010, as the EACU potentially had an impact on their bilateral trade flows. Nevertheless, as the impact of the EACU appears very limited (see Panel A of Fig. 2), Figure B1 in Appendix B reports the estimates obtained by considering the six exporter-importer pairs of Russia, Kazakhstan and Belarus as treated by the EAEU in 2015.

[15] Georgia was part of the CISFTA until 2009 (in 2008 there was a war between Russia and Georgia), while Turkmenistan is an associate member. For more details on the implementation of the CISFTA, see Dragneva and de Kort (2007).

[16] For a robustness test on trade diversion, see Section 6.

[17] Pair fixed effects account for the impact of time-invariant bilateral trade costs, encompassing constant factors influencing the signing of trade agreements. They also guard against potential "reverse causality" bias between trade flows and tariffs. Time effects control for all unobservable factors concurrent with the agreements.

Table 1
Descriptive statistics.

Variable	Mean	Std. Dev.	Min	Max
Ln exports from country *i* to country *j*	7.60	6.53	−6.91	18.90
Ln GDP country *i or j*	11.35	2.03	6.96	16.48
Ln Distance	8.29	0.80	4.71	9.43
GVC share country *i or j*	0.44	0.13	0.19	0.88
Common language (1 = yes)	0.11	0.32	0	1
Common legal origins (1 = yes)	0.28	0.45	0	1
Common past colonial relationship (1 = yes)	0.11	0.32	0	1
Adjacency (1 = yes)	0.07	0.25	0	1
Number of exporter-importer pairs – years			15,928	
Number of exporter-importer pairs			724	

(14) as these countries joined the EACU/EAEU in 2015 (Panel B). For the first set of exporter-importer pairs the begin of treatment is set up to 2009, while for the latter group of pairs the begin of treatment is set up to 2014. We have used 2009 and 2014 instead of 2010 and 2015 as treatment start years to take into account potential anticipatory effects. Both panels show the average values of treated exporter-importer pairs versus the 'synthetic control' unit.[18]

As shown in both panels of Fig. 2, the balance in the pre-treatment values of the outcome variable is nearly perfect. Moreover, Table 2 shows that the pre-treatment averages of the additional covariates are also quite well matched for aggregate analyses. Indeed, by comparing the figures reported in the 'Treated' and 'Balanced controls' columns, it clearly emerges that the MB algorithm managed to reach a good covariate balancing between treated and control exporter-importer pairs. This is clearly a good sign for the robustness of our empirical analysis. Thus, we are confident that the synthetic provides a meaningful counterfactual to disentangle the effects on trade flows of joining EACU and EAEU for partner countries. From this perspective, we can confirm, as highlighted by previous literature, that the short-term effects of the EACU on member countries' overall bilateral trade flows are far from being substantial. As Panel A shows, the changes to post-treatment bilateral trade flows of EACU members are, on average, higher than those of the non-member donor pool of countries that are included in our synthetic control but, in any case, not statistically different from zero, as shown on the right side of Fig. 2. This means that the EACU did not boost intra-area trade. This is not unexpected, since tariffs across member countries were already zero before the formation of the CU (bilateral FTAs were in place well before 2010), and the main effects on intra-area trade could be attributed, if any, mainly to trade diversion effects determined by the new common external tariff towards the rest of the world (which was only applied in July 2011). Furthermore, assuming that the common external tariff was largely based on the prevailing Russian duties, we cannot expect these trade diversion effects to be relevant for Russia (the leading trading partner in the area). These were potentially high for Kazakhstan, the member country characterized pre-EACU by a more open trade regime with non-member countries.[19]

The empirical analysis regarding the EAEU needs to be examined with due caution, for several reasons. First, at the time of the implementation of the EAEU, both Russia and Kazakhstan also joined the WTO. Since WTO commitments prevail over those of CUs (regional agreements are allowed only if they do not raise further obstacles to multilateral liberalization), this implied a parallel fall in the CET rate under the EAEU to a level not exceeding the bound MFN rate. This resulted in a general reduction in duties applied by EAEU member countries to all their WTO partners outside the bloc (e.g. Kazakhstan went back to its pre-EACU customs barriers of 2007). This relaxation of CET under the EAEU induced a parallel reduction in previous likely trade diversion effects, thus lowering intra-area trade flows. However, the implementation of the EACU came along with the extension of the agreement to two non-EACU but WTO members, namely Armenia and the Kyrgyz Republic. In the latter cases, CET under EAEU implied a rise in tariffs applied to third countries and possibly more intra-area trade for them.[20] Finally, the implementation of the EAEU also implies a reduction in the so-called non-tariff barriers (NTBs).[21] The debate about the best identification of NTBs is endless (Berden and Francois, 2015; Ghodsi and Stehrer, 2019). However, in this case, by taking advantage of the Eurasian Single Market's gradual implementation, we can separately identify the effects of NTBs from the common tariff schedule by looking at the changes in trade flows associated with the shift from the EACU to the EAEU in 2015, net of self-selection. In this case, the implementation of further stages of integration in the various chapters of the single market should ideally foster trade flows among bloc countries. Our aggregate analysis provides the net comprehensive effect on intra-EAEU trade flows of all these interacting factors. The subsequent focus by country pair will complement our analysis with a more granular picture of bilateral empirical evidence.

As panel B in Fig. 2 shows, the net effect of the EAEU is mixed: at the start of the process changes in post-treatment bilateral trade flows for EAEU countries were, on average, very similar to those of the synthetic control, before gaining momentum in more recent years. We ought to stress here that although these differences are not statistically significant (see the right side of Fig. 2), the gradual

[18] Table A2 in Appendix A displays the weights of each control exporter-importer pair for both analyses.

[19] It worth noting that in 2008–2010 there was a noticeable and sharp decline in mutual trade among partner countries, the effect of the 2008–2009 crisis. Due allowance is made for this general trend in our analysis.

[20] In 2011, Armenia and the Kyrgyz Republic also ratified CISFTA. However, CISFTA is essentially the extension to these newcomers of a FTA and does not overlap with the added level of integration granted by EAEU we are assessing in our empirical exercise.

[21] The term 'non-tariff barriers' (NTBs) is used here in preference to 'non-tariff measures' (NTMs). The choice is motivated by the focus here on their anti-trade role rather than on their more general economic effects (Ferrantino, 2006).

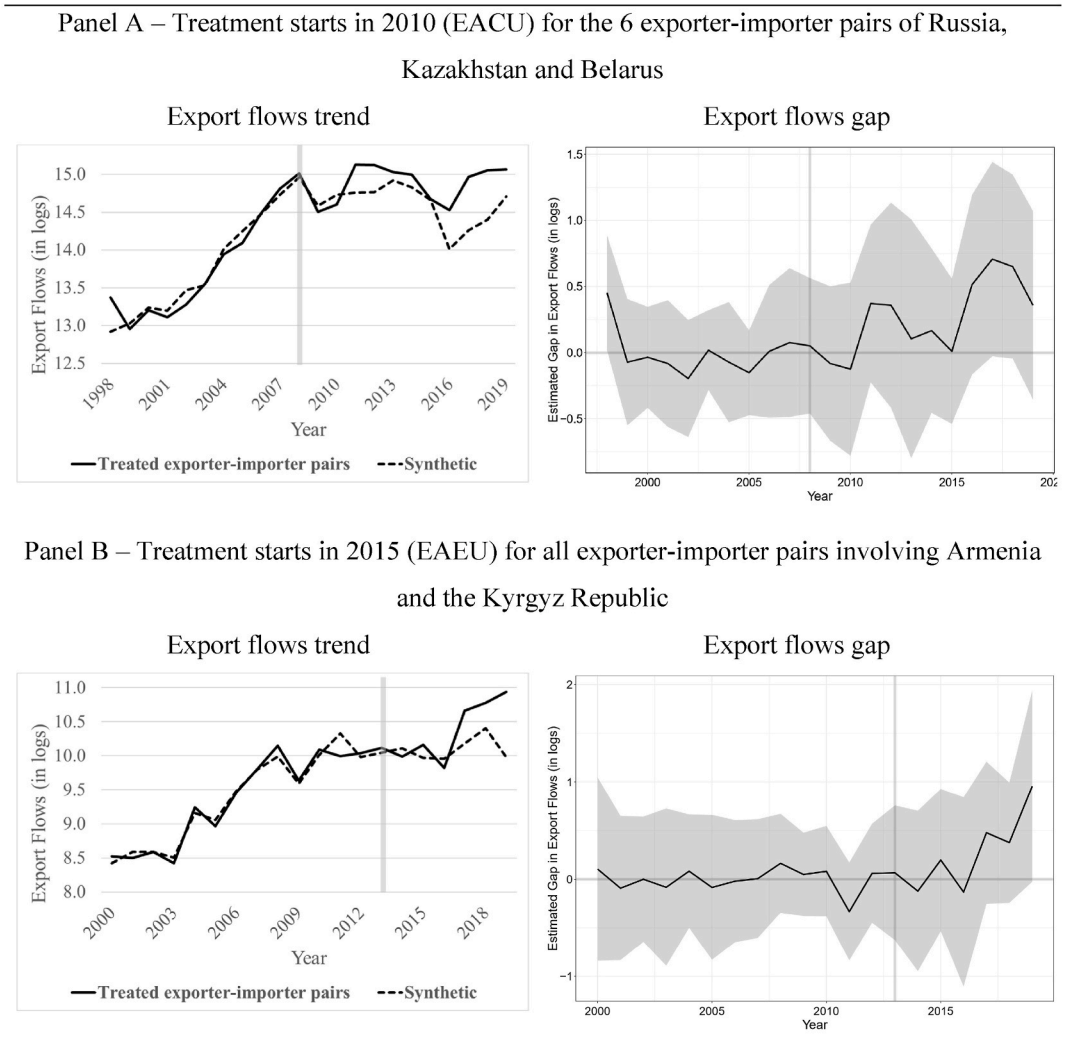

Fig. 2. Actual and synthetic counterfactual export flows in logs
Notes: Standard errors are estimated via a bootstrap procedure. 95% confidence bands are displayed.

Table 2
Covariate balancing over the whole pre-treatment period.

	Exporter-importer pairs treated in 2010			Exporter-importer pairs treated in 2015		
	Treated	Balanced controls with MB	Controls without MB	Treated	Balanced controls with MB	Controls without MB
Average GDP of the exporter/importer in logs	11.24	11.68	11.92	9.82	10.47	11.96
Average Distance in logs	7.42	7.46	8.29	7.68	7.88	8.27
Average GVC share of the exporter/importer	0.54	0.55	0.43	0.48	0.48	0.46
Same language dummy	1	0.91	0.16	0.43	0.34	0.14
Past colonial relationship dummy	1	0.89	0.10	1	0.81	0.11
Common legal origin dummy	0.33	0.38	0.25	0.71	0.60	0.25
Adjacency dummy	0.67	0.36	0.07	0.14	0.15	0.07

implementation of a common regulatory framework within the EAEU - including the reduction of many possible NTBs within the framework of the Single Market - has the potential to support the transition of member countries to more effective Eurasian economic integration. This is also consistent with conclusions reached in previous studies.

A separate analysis of individual treatment effects of the EACU carried out via MB is reported in Fig. 3. For every single estimate we

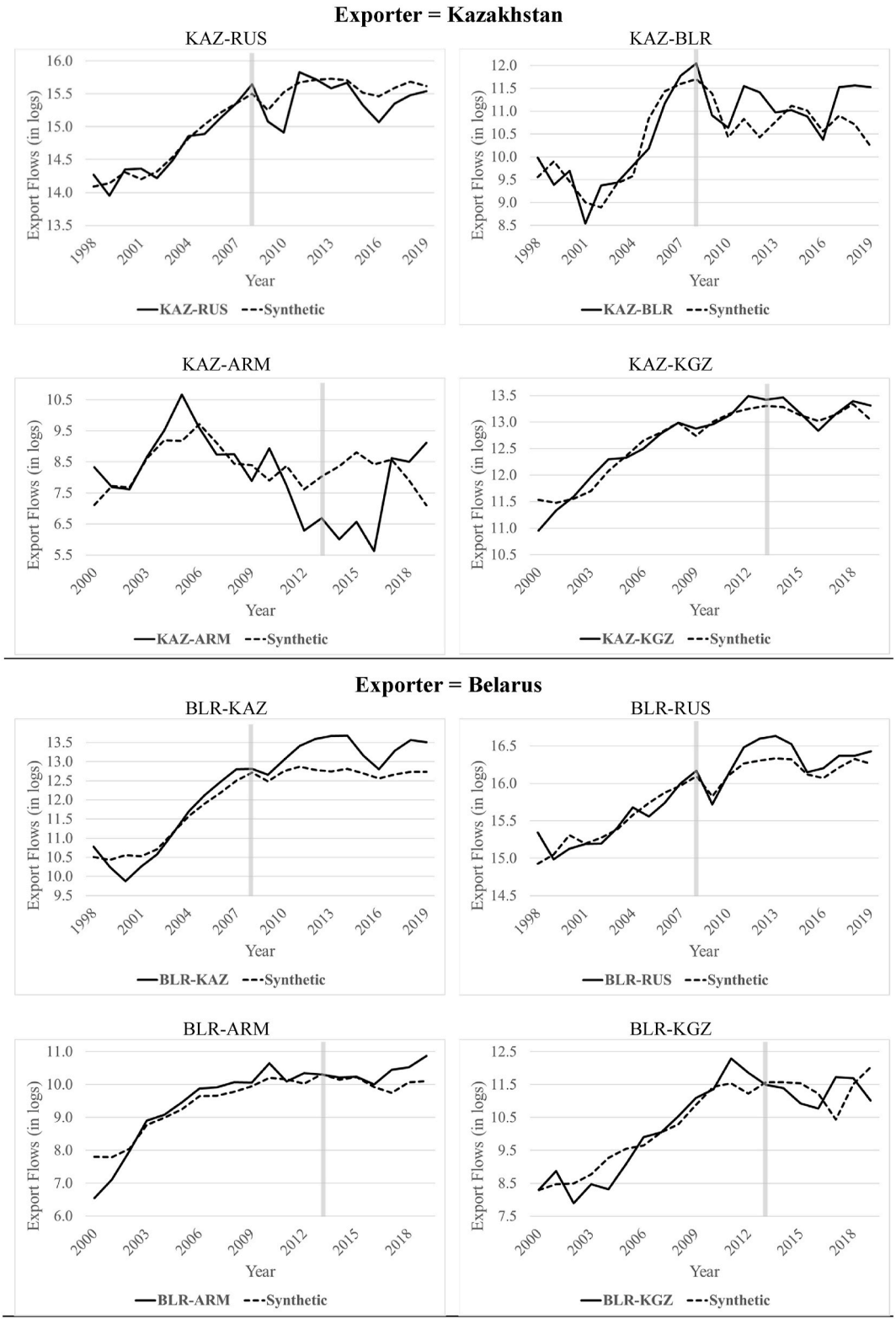

Fig. 3. Actual and synthetic export flows in logs for each exporter-importer pair.

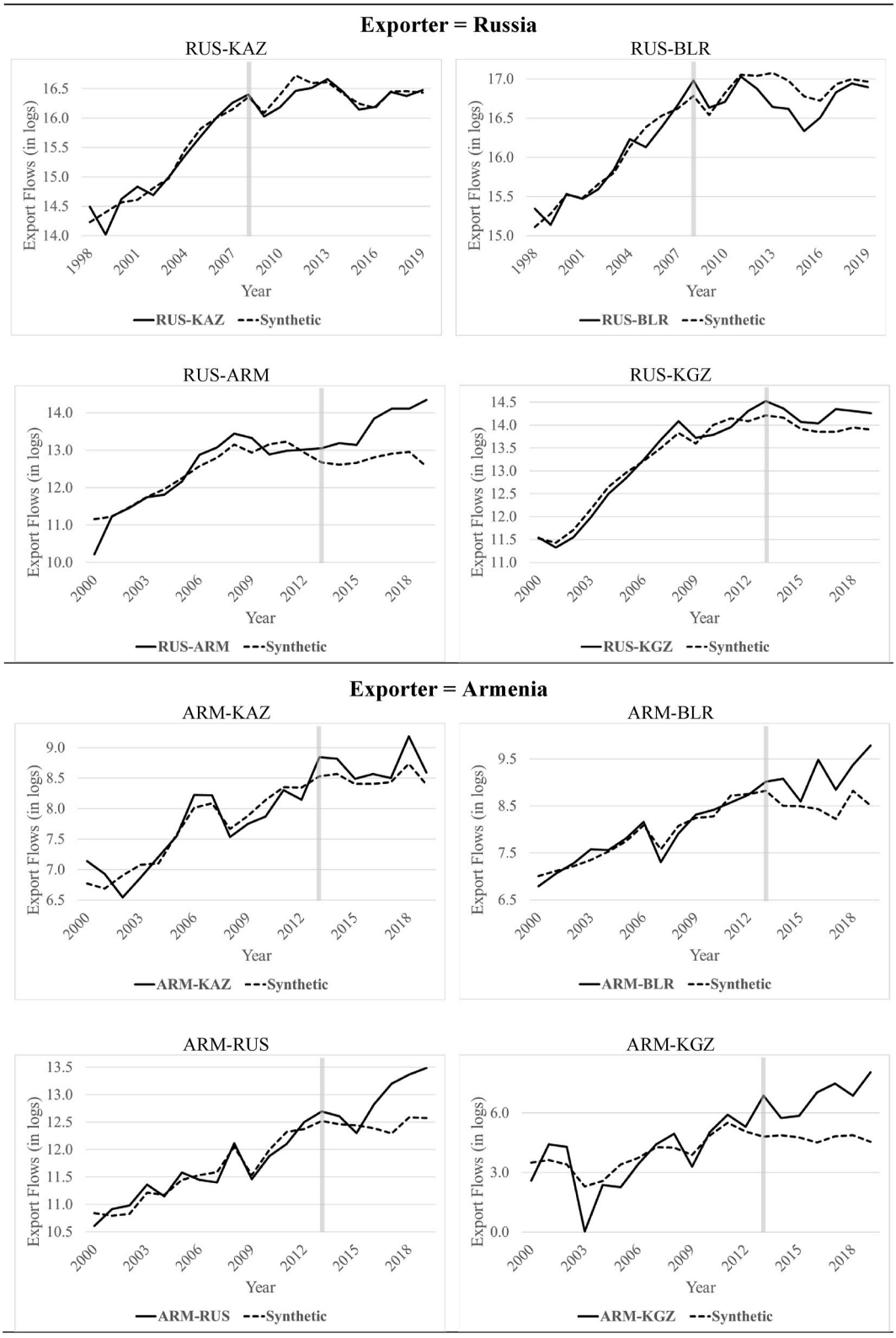

Fig. 3. (*continued*).

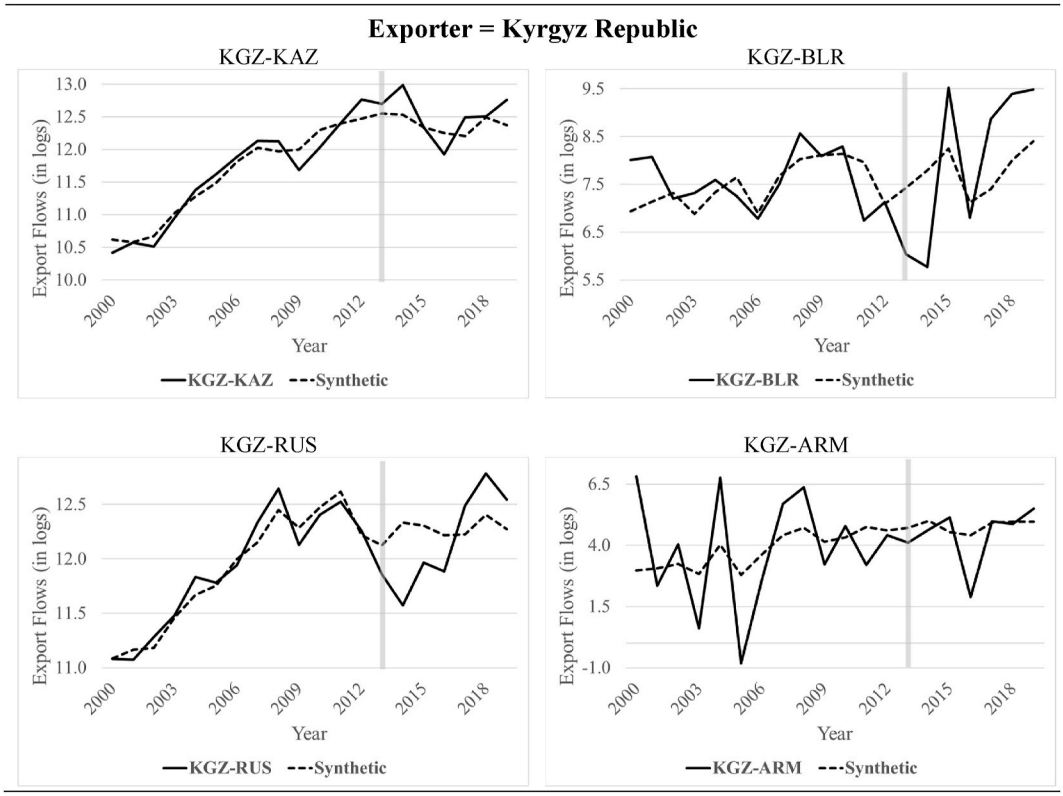

Fig. 3. (*continued*).

have looked at the same set of covariates as in the main analysis, and we have dropped from the donor pool exporter-importer pairs with a pre-treatment value of export flows at least 75% larger or smaller than that of the treated exporter-importer pair. This choice limits the potential for extrapolation bias (see Abadie et al., 2010).[22]

The individual exporter-importer pair estimates provide further insights into the heterogeneous effects of the two main waves of the Eurasian integration process (EACU/EAEU). As expected, Kazakhstan is the trade partner that lost more trade after the onset of the EACU. Then, consistently with aggregate estimates, Kazakh export flows gained momentum after the more recent implementation of the Eurasian single market compared with Russia, Belarus and Armenia. However, within the framework of bilateral trade with Kazakhstan post-EACU, the main beneficiary country is Belarus rather than Russia. This is reasonable since, unlike Kazakhstan, where on average tariffs increased after EACU, and Russia, where average tariffs remained practically unaltered, the average post-treatment tariffs for Belarus were seen to fall (Isakova et al., 2016). The Russian Federation increased its export flows compared with its synthetic counterfactual towards Armenia, but no significant rises were recorded towards Belarus, Kazakhstan, and the Kyrgyz Republic. Belarus is the country that has benefited mostly from CET and its exports compared to its synthetic counterfactual are sizable especially towards Kazakhstan. The two newcomers registered, as expected, more positive results: Armenia recorded a relevant increase in export flows with all EAEU partners, whereas for the Kyrgyz Republic such increases were towards Russia and Belarus. Overall, country pairs' net effects suggest that further integration within the Eurasian single market and the likely reduction of NTBs have provided additional benefits to EACU original member countries. These positive effects also extend to the smaller newcomer economies.

6. Robustness

Our estimates were subjected to a broad set of robustness checks. Specifically, we propose a set of checks apt to eradicate the most common concerns regarding the robustness of our empirical investigation. First, we extended the number of covariates for improving balancing and, specifically, we added per capita GDP to match country pairs characterized by a similar relative income net of other components of the common support. Second, we tested for anticipatory effects that potentially started even earlier by moving the pre-treatment year from 2009 to 2008 and from 2014 to 2013, respectively. Third, we move the pre-treatment year from 2009 to 2012 to test whether the signing of the CISFTA by Belarus and Russia in October 2011 affected our estimates. Fourth, we tested two alternative

[22] By aggregating the individual level estimates, we obtained aggregate estimates very similar to those reported in Fig. 2. This result reinforces the robustness of the empirical analysis conducted at the aggregate level.

algorithms to compute weights, the traditional SCM (adapted for the case of multiple treated units) and the Ridge augmented SCM proposed by Ben-Michael et al. (2021).[23] Furthermore, we checked whether third countries might have suffered from trade diversion, which would bias our estimates. To this end, we tested whether the removal of all exporter-importer pairs involving the country having the largest trade flows with EACU/EAEU countries (China) might affect the estimates. In addition, as Russia and Kazakhstan's exports are highly dependent on oil and gas, and that the price of oil fluctuated considerably during the period under analysis, we have repeated the analysis by using as dependent variable the log of export flows without oil. Moreover, rather than controlling only for time-invariant proxies of the MTR term, we follow Hannan (2017) and include a time-variant proxy of MTR indexes called "remoteness": $Rem_i = \sum_j \frac{dist_{ij}}{GDP_j / GDP_w}$. This variable measures a country's average weighted distance from its trading partners, where weights are the partner countries' shares of world GDP. Lastly, we check for potential selection bias by extending by including in the donor pool those exporter-importer pairs that did not trade with each other in at least one year between 1998 and 2008. The results of these tests are presented in Appendix B. The graphs in Figure B2 resemble those shown in Fig. 2, supporting the hypothesis that our findings are robust. The only exception concerns the signing of the CISFTA, which suggests a milder positive impact.

Last but not least, in view of the likely presence of spill-over effects engendered by trade agreements, we also focused on the validity of the Stable Unit Treatment Value Assumption (SUTVA) in our empirical analysis. SUTVA implies two separate issues: i) the 'unique treatment assumption', which is ensured in this case by the standardization of the Eurasian integration process for all member countries; and ii) the 'non-interference assumption', which implies the absence of spill-over effects between treated countries and the countries included in the donor pool. In our case, the countries that are supposed to be the most exposed to potential spillover effects of EACU/EAEU are those CIS countries not involved in the Eurasian integration process, i.e. Azerbaijan, Georgia, Moldova, Tajikistan, Ukraine, Uzbekistan and Turkmenistan. Notwithstanding EAEU is assumed to be a too small market to divert external competition and the bilateral agreements still in place among CIS countries weakened the potential trade diversion effects of EACU. To test for the potential presence of further spill-over effects of EACU/EAEU on the above CIS countries, we used two approaches based on the evaluation strategy described in Section 3. First, we compared EACU/EAEU exporter-importer trade flows within EACU/EAEU with EACU/EAEU exporter-importer trade flows with the rest of CIS.[24] Results are reported in Fig. 4. The right-hand side of this figure also reproduces the 95% confidence intervals of the log gap in export flows between treated and untreated exporter-importer pairs. For Panel B, the estimates are statistically significant in 2019 at the 5% level. We interpret the latter estimate as compelling evidence of EACU/EAEU-engendered trade diversion towards the other CIS countries. Second, we compare untreated CIS exporter-importer flows outside CIS with untreated CIS exporter-importer trade flows with EACU countries. Fig. 5 gives the estimates, which confirm the likely presence of trade diversion as untreated CIS countries increase their trade flows with countries outside CIS more than would have happened in the absence of the EACU/EAEU.

7. Conclusions

After a decade of progressive economic integration, a sound ex-post assessment of the trade benefits of the Eurasian trade integration process for participating countries is still lacking, with particular reference to the most recent steps of single market integration.

This article reports on the efforts we have made to overcome the well-known limits of current empirical analyses on the impact of preferential trade on bilateral trade by pairs of countries – such as the issue of tariff and non-tariff aggregation, the log-linearity of the gravity approach and the likely self-selection of member countries – by using an up-to-date non parametric methodology, namely the mean balancing approach. We used MB to compare member countries' trade flows in the Eurasian agreement with 700 exporter-importer pairs located in the Eurasian continent having similar pre-treatment features. Our results confirm the previous literature about the lack of a significant impact of the EACU on aggregate and a negative impact for Kazakhstan. More positive net effects have been detected for the EAEU. In this latter case, on aggregate, internal bilateral trade flows appear to have gained momentum in recent years for all countries, including Kazakhstan and the newcomers, albeit with a degree of heterogeneity. Although we cannot exclude that the registered increase in trade within the EAEU could be (at least partially) compensated by trade diversion with third countries, we consider our results as sound, since they have passed several robustness tests. They suggest that further integration within the Eurasian single market, essentially associated with easing non-tariff barriers, has provided additional benefits to EACU original member countries and that these positive effects also extended to the smaller newcomer economies. Overall, they support the original intentions of member governments regarding the importance of such an ambitious process of integration and the need for a "deep" Eurasian integration, beyond the reduction in tariffs. In other words, our results ask for conveying additional efforts to complete the Eurasian integration and let its member countries fully benefit from its hoped-for long-term effects. This looks an important empirical based message for policymaking, especially now when political tensions are increasingly affecting trade relations in the area.

[23] The Ridge augmented SCM is one of the few SCM-type estimators that, similarly to MB, can handle multiple treated units and the inclusion of time-invariant covariates. We have used this method as a robustness instead of as the main method since it might incur in extrapolation from the convex hull of the control units by allowing for negative weights.

[24] As the 2014 "Ukrainian crisis" affected the Ukrainian bilateral trade flows with regional partners by introducing numerous non-tariff trade frictions, we decided to exclude Ukraine from the analysis. Furthermore, since November 2014, the EU and Ukraine have provisionally applied an Association Agreement and, since January 2016, a Deep and Comprehensive FTA. This latter further facilitates trade between the parties by gradually approximate the Ukrainian legislation, including rules, procedures and standards to those of the EU.

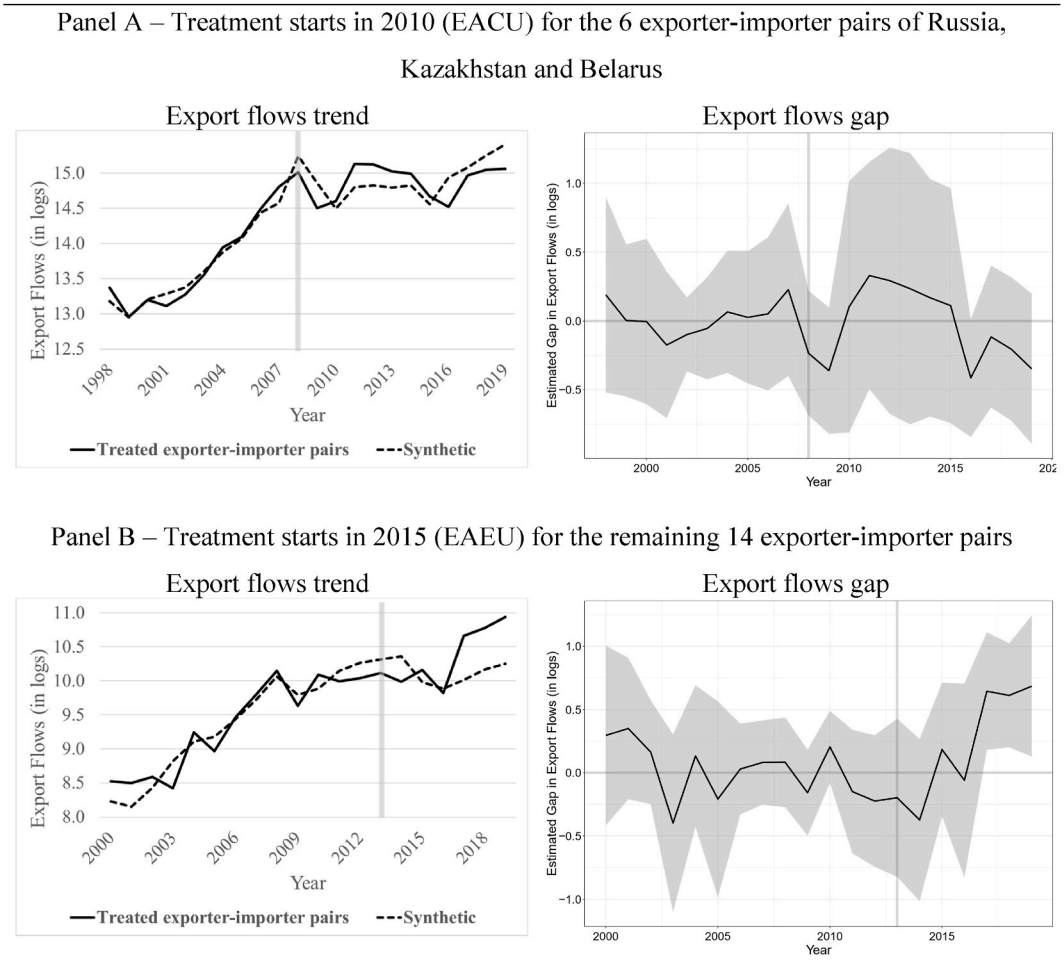

Fig. 4. Testing for the potential presence of trade diversion towards other CIS countries
Notes: Standard errors are estimated via a bootstrap procedure. 95% confidence bands are displayed.

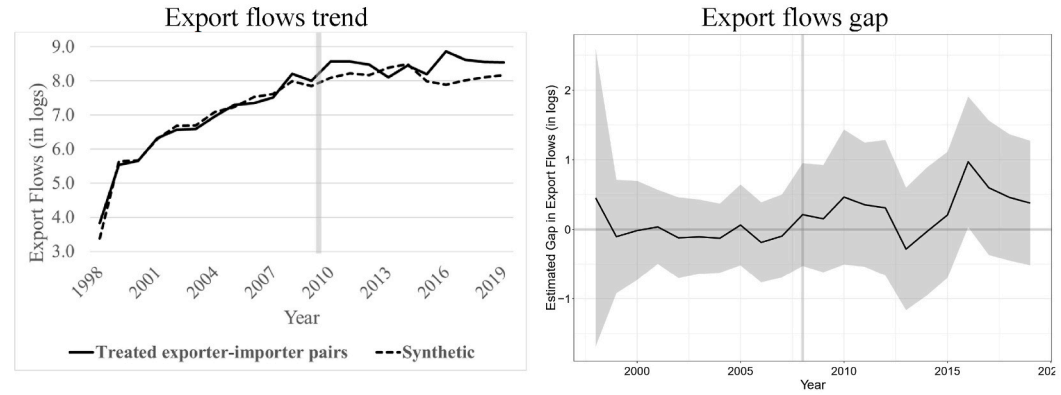

Fig. 5. Additional test for the potential presence of trade diversion towards other CIS countries.

Declarations

Funding

This study was not funded by any institution.

Availability of data and material

csv files available upon request.

Code availability

R scripts available upon request.

Declaration of competing interest

The authors declare that they have no conflict of interest.

Appendix A

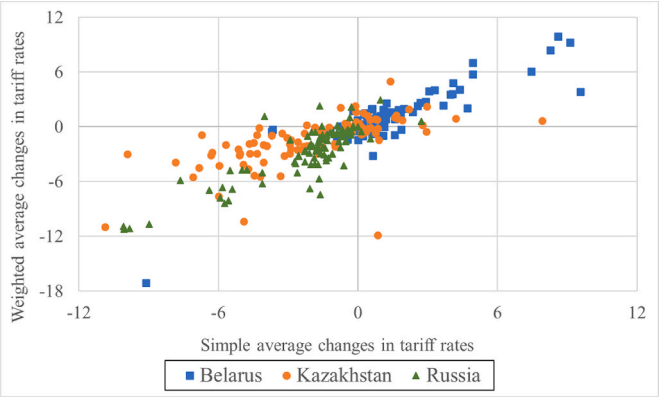

Fig. 1A. Changes in effectively applied tariff rates before and after EACU: a comparison between weighted and simple averages (two-digit HS classification).
Notes: Weighted average applied rates are weighted by the product import shares corresponding to each partner country. Tariffs before EACU refer to the period 2005–2009, while tariffs after EACU concern the years 2010–2014.
Source: Authors' elaboration from World Integrated Trade Solution data.

Table A.1
List of countries included in the final sample

Treated countries
Russia
Belarus
Kazakhstan
Armenia
Kyrgyz Republic
Countries in the donor pool
Albania
Bangladesh
Bosnia and Herzegovina
Cambodia
China
Iceland
India
Indonesia
Iran
Israel
Japan
Jordan
Korea

(*continued on next page*)

Table A.1 (*continued*)

Treated countries
Laos
Lebanon
Macedonia
Malaysia
Mongolia
Nepal
Norway
Pakistan
Philippines
Singapore
Slovak Republic
Sri Lanka
Thailand
Vietnam

Table A.2
Exporter-importer weights for the aggregate estimates

Exporter-importer pairs treated in 2010		Exporter-importer pairs treated in 2015	
Exporter-importer pair	Weight	Exporter-importer pair	Weight
Singapore-Jordan	24.2%	Jordan-Malaysia	19.2%
India-Singapore	18.6%	Singapore-India	14.3%
Israel-Jordan	16.7%	Albania-Bosnia and Herzegovina	8.9%
Malaysia-Singapore	11.7%	Cambodia-Laos	7.0%
Jordan-India	6.4%	Iceland-Lebanon	5.3%
Slovak Republic-Philippines	5.5%	Pakistan-Singapore	4.7%
Singapore-Malaysia	5.0%	Sri Lanka-Singapore	4.2%
Jordan-Singapore	2.5%	Singapore-Israel	3.9%
South Korea-Slovak Republic	2.0%	Singapore-Sri Lanka	3.7%
Jordan-Israel	1.8%	Sri Lanka-Malaysia	3.1%

Note: We report the 10 exporter-importer pairs that received the most weight. Weights sum up to 1. The weights refer to the aggregate estimates, while the weights for each individual exporter-importer analysis are not reported (available upon request).

Appendix B

Table B.1
Poisson pseudo-maximum likelihood (PPML) gravity estimates

		EACU		EAEU		EACU/EAEU	
Panel A – the same sample used in the MB analysis							
EACU/EAEU = 1	Coeff.	0.380***	0.124	0.087	−0.162*	0.101	−0.149
	SE	(0.093)	(0.089)	(0.137)	(0.090)	(0.135)	(0.091)
Importer, exporter FE		Yes	Yes	Yes	Yes	Yes	Yes
Time effects		No	Yes	No	Yes	No	Yes
Observations		7470		7326		7578	
Panel B – addition of untreated exporter-importer pairs that did not trade with each other in at least one year between 1998 and 2008.							
EACU/EAEU	Coeff.	0.384***	0.125	0.094	−0.164*	0.108	−0.151
	SE	(0.093)	(0.088)	(0.137)	(0.087)	(0.135)	(0.088)
Importer, exporter FE		Yes	Yes	Yes	Yes	Yes	Yes
Time effects		No	Yes	No	Yes	No	Yes
Observations		10,530		10,386		10,638	

Notes: the log of the GDP and the GVC share of the exporter and of the importer are included as control variables in all specifications.

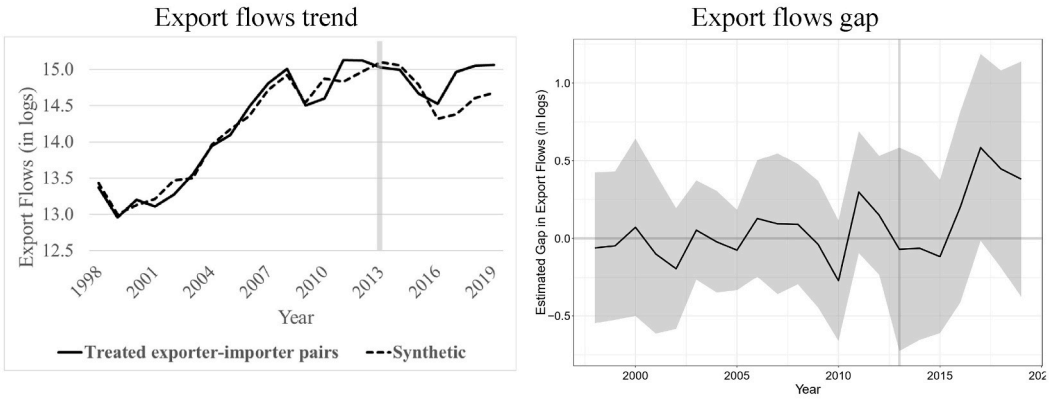

Fig. B.1. Actual and synthetic counterfactual export flows in logs when considering the six exporter-importer pairs of Russia, Kazakhstan and Belarus as treated only by the EAEU

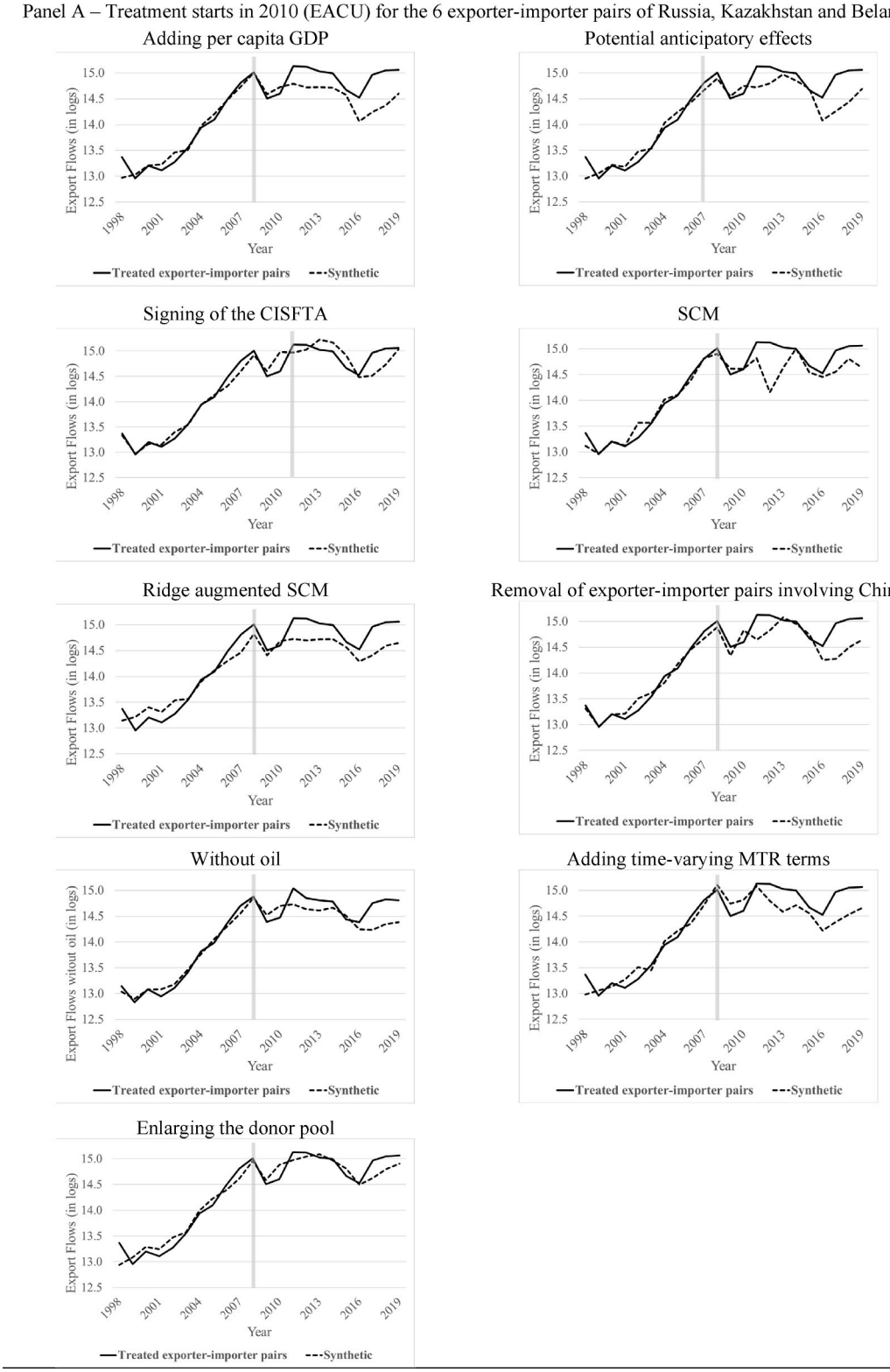

Fig. B.2. Robustness tests

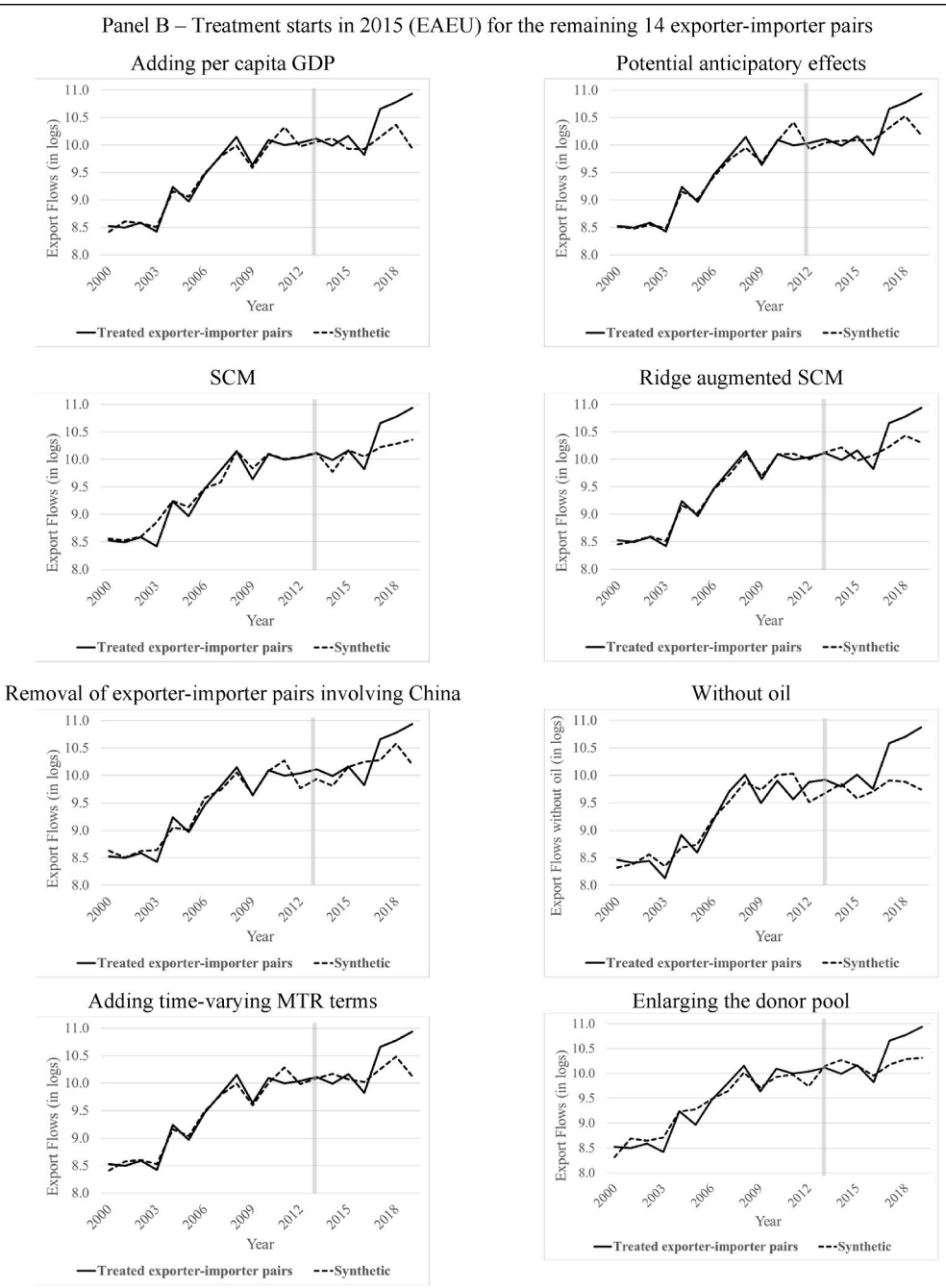

Fig. B.2. (*continued*).

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