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ORIGINAL PAPER

The impact of the Eurasian Economic Union–Iran preferential trade agreement on mutual trade at aggregate and sectoral levels

Amat Adarov[1] · **Mahdi Ghodsi**[1,2]

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Abstract

In October 2019, the preferential trade agreement between the Eurasian Economic Union (EAEU) and Iran entered into force. In the present study, we estimated its expected impact on mutual trade flows at aggregate and sectoral levels using the gravity model of trade based on the global sample of bilateral trade flows at the harmonized system six-digit level. The analysis suggested that the implementation of the agreement will boost mutual trade for both trading partners, with relatively greater gains expected for the EAEU's exports to Iran. The total gains in mutual trade were estimated to reach over USD 72 million, with exports from the EAEU to Iran anticipated to increase by 19.1%, compared with a rise in exports from Iran to the EAEU of up to 7%. The difference in the impact is highly heterogeneous across the five EAEU countries and across sectors. The major export gains are estimated to accrue in the agri-food sectors—especially, trade in miscellaneous fruits and vegetables—and in the chemicals, textile, polymer production and selected electrical and machinery manufacturing sectors.

Keywords EAEU · Iran · Trade agreement · Gravity model · Poisson pseudo-maximum likelihood

JEL Classification F13 · F14 · F15 · F17

✉ Mahdi Ghodsi
ghodsi@wiiw.ac.at
https://wiiw.ac.at/mahdi-ghodsi-s-1042.html

Amat Adarov
adarov@wiiw.ac.at
https://wiiw.ac.at/amat-adarov-s-1055.html

1 The Vienna Institute for International Economic Studies-Wiiw, Rahlgasse 3, 1060 Vienna, Austria

2 Vienna University of Economics and Business (WU), Vienna, Austria

1 Introduction

On 27 October 2019, the trade agreement between the Eurasian Economic Union (EAEU) and Iran was implemented. Although at times called a free trade agreement, de facto, it is a preferential trade agreement (PTA), as its scope is limited to a selection of product lines for which mutual import tariffs are reduced or eliminated. However, the agreement has sufficient depth and covers the main product categories traded between Iran and the EAEU (Armenia, Belarus, Kazakhstan, Kyrgyzstan and Russia). The EAEU framework, amongst other foreign trade regulations, enforces a common customs territory and imposes a common external tariff (CET) against non-bloc trading partners (see Adarov 2018, for details). Therefore, free trade agreements or PTAs facilitate access to a rather large, joint market of the five EAEU member states.

The EAEU–Iran PTA covers approximately 55% of the total mutual trade between the partners and focuses on a range of agricultural and selected manufacturing products. On the one hand, in line with the agreement, Iran grants preferential treatment for meat and selected agri-food products, metals, electronics and other items. The average import tariff applied by Iran to imports from the EAEU in line with the agreement decreases from 22.4 to 15.4% for manufactured goods and from 32.2 to 13.2% for agricultural products. Overall, 360 product lines are affected. On the other hand, Iran receives preferential treatment for its exports of fruits and vegetables, metal products, construction materials, and selected other items such as tableware and carpets. The average import tariff applied by the EAEU against Iran is to decline for agricultural products from 9.6 to 4.6% and for manufactured goods from 8 to 4.7%. In total, 502 product lines are affected by the preferential treatment (Sect. 2 provides a more detailed review of the tariff changes associated with the PTA).

Although the import tariff reductions are not comprehensive in scope, they are significant and cover a large share of traded products. This makes the agreement essential particularly for Iranian exports, as the EAEU market is much larger than Iran's. As of 2019, Iran's gross domestic product (GDP) constituted only approximately 24% of the aggregate EAEU GDP; however, it remains a relatively large market in the regional context. The PTA is based on the World Trade Organization (WTO) rules. In this context, note that four of the EAEU economies are already members of the WTO; the exception is Belarus, which, however, has to comply indirectly with the WTO regulations via the common EAEU framework.[1] However, Iran is not yet a WTO member, mainly because of its strained political relations with the US. The implementation of the agreement will thus indirectly facilitate longer-term mutual cooperation consistent with the WTO rules. In fact, the current PTA is a fixed-term agreement (currently fixed for 3 years), but throughout this period, the parties agree to consider a possible transition to a more comprehensive and deeper free trade agreement.

[1] For additional discussion, see also Adarov (2019).

The trade agreement is thus expected to bring benefits to both parties. However, to date, no formal empirical analysis of the possible effects of the EAEU–Iran PTA agreement has been found, and the present study was the first attempt to fill this gap. Generally, there are only a few studies that analyze ex ante or ex post trade impacts of the Eurasian economic integration (see, for instance, Adarov 2018; De Souza 2011; EBRD 2012; Tarr 2016). In addition to this, our study was most closely related to the empirical literature studying the trade effects of PTAs, free trade agreements and other forms of bilateral or multilateral integration in a gravity model setting (Tinbergen 1962; Anderson and Wincoop 2003; Head and Mayer 2014). In most cases, the impact of trade agreements is evaluated empirically by introducing a simple dummy variable or, in some cases, a variable that reflects the depth of an agreement (See, for instance, Baier and Bergstrand 2007; Caporale et al. 2009; Carrère 2006; Gylfason et al. 2015; Okabe and Urata 2014; Sandberg et al. 2006. For a comprehensive review of the related literature and approaches, also see Baier and Bergstrand 2018.).

The approach of using a dummy variable for PTA to measuring their effect is, however, rather simple and does not allow a more granular differentiation of the depth of an agreement by sectors, which is necessary in our case, considering that the agreement is a PTA and affects only a fraction of mutually traded products with varying intensity of trade across the participating countries. Generally, import tariffs had been theoretically and empirically found to produce diverse impacts on trade flows depending on the elasticity of substitution of products. As Chaney (2008) for instance argued and proved using a constant elasticity of substitution, products with larger elasticity of substitution may be more sensitive to ad valorem (iceberg) trade costs. Naturally, trade elasticities of variable costs vary across products, and, therefore, different trade agreements have different impacts depending on the products they cover; thus, the effects are not directly comparable.

In this respect, our study was related to the papers that analyzed the impact of trade integration by relying on preferential import tariffs rather than a PTA dummy variable (see, e.g. Cipollina and Salvatici 2007; Emlinger et al. 2006; Disdier et al. 2015) and estimate trade–tariff elasticities in a gravity setup (Fontagné 2020; Feenstra and Romalis 2014; Caliendo and Parro 2015). Particularly, in Fontagné (2020), using a fine level of disaggregation at the harmonized system (HS) six-digit level allowed to consistently estimate trade elasticities and reduce the downward bias when a higher level of sectoral aggregation is used (Imbs and Mejean 2015). Finally, the theoretical underpinning behind our approach was provided in Baier et al. (2018), who, inter alia, developed a theoretical framework for comparative statics associated with the 'partial effects' of changes in bilateral variable trade costs. In our case, we exclusively focused on bilateral import tariffs at the HS six-digit level (constituting bilateral variable trade costs in a general framework) as the trade regime between the EAEU and Iran does not change otherwise, e.g. the EAEU–Iran PTA does not envision changes in non-tariff barriers.

Specifically, considering these developments in the literature, we used the gravity model of trade estimated for the detailed product data at the HS six-digit level to examine the ex ante effects of the implementation of the agreement at aggregate and sectoral levels. Notably, the EAEU–Iran trade agreement is a PTA covering only a fraction of products and corresponding import tariffs rather than attempting to achieve deeper forms of integration. This allowed us to focus explicitly on these tariffs at a fine level of sectoral disaggregation rather than to use a more crude approach of relying on a bilateral PTA dummy variable, as often done in similar literature applying the gravity model of trade.

Our analysis suggested that the implementation of the agreement will boost mutual trade for both the EAEU and Iran, albeit with several asymmetries in terms of the beneficiary countries and sectors. The total gains in mutual trade were estimated to reach over USD 72 million, with exports from the EAEU to Iran expected to increase by 19.1% and exports from Iran to the EAEU by up to 7%.

The impact also differed significantly across sectors. The results suggested that the major increases in exports will accrue to the agri-food sectors, as well as to chemicals, rubbers/plastics (polymers), textiles and selected electrical and machinery manufacturing sectors. The gains in exports from the EAEU to Iran were larger and more diversified across sectors. Iran, by contrast, will see most gains in its exports of fruits and vegetables, as well as foodstuffs (however, its polymer production, chemicals, textile and machinery/electrical equipment sectors will also benefit significantly). In terms of the expected increase in trade, both in absolute values and in percentage terms relative to the pre-PTA levels, exports from the EAEU to Iran appeared to benefit more than exports from Iran to the EAEU, although the EAEU market is much larger than that of Iran. This was, however, perfectly consistent with the much greater import tariff liberalization introduced by the EAEU–Iran PTA on imports to Iran, whereas Iran maintained a much more restrictive trade regime before the PTA implementation in comparison with the EAEU (it should also be noted that the average import tariff imposed by Iran after the entry into force of the PTA was still much higher than the tariff applied by the EAEU).

The rest of the paper is structured as follows. The methodology, the data and present stylized descriptive facts on the EAEU–Iran PTA trade agreement and trade dynamics are outlined in Sect. 2. The results of the econometric analysis and their policy implications are reviewed in Sect. 3. Finally, conclusions are provided in Sect. 4.

2 Methodology and data

2.1 Gravity model specification

An estimate of the elasticity of trade values concerning tariffs was required for the affected products, to measure how much the import tariff reductions envisioned by the agreement stimulated trade between Iran and the EAEU members. Following the literature on the gravity framework, we estimated the elasticity of tariffs to trade value at the HS six-digit level. The gravity framework was initially proposed by Tinbergen (1962) for studying bilateral trade flows. Similar to Newton's physical law of gravity, this model in its basic form estimates bilateral trade values as a function of the size of the two partner economies and the geographical distance between them.

The model was further developed by other scholars (see Anderson and Wincoop 2003; Head and Mayer 2014) to analyze the impact of trade policy measures and other economic factors on bilateral trade flows.

Since we had been interested in the elasticity of trade to tariffs and the tariff data were not available for Iran from conventional publicly available sources at the required level of detail, we used the tariff schedules published in the text of the PTA agreement, reporting both pre-PTA and post-PTA tariff schedules. The former were consistent with the tariffs applied in 2017. Thus, our estimations owing to data constraints were bound to the cross-section of worldwide bilateral trade flows for the HS six-digit level products included in the PTA for the year 2017. The traditional gravity equation to be estimated is as follows:

$$M_{ijh} = e^{\left[\begin{array}{c} \alpha_1 + \alpha_2 \ln\left(T_{ijh} + 1\right) + \alpha_3 Y_i + \alpha_4 Y_j + \alpha_{5d} D_{ij} + \alpha_{5l} L_{ij} + \alpha_{5c} C_{ij} + \alpha_{5h} H_{ij} \\ +\alpha_{6eaeu} EAEU_i + \alpha_{6wto} WTO_i + \alpha_{6eu} EU_i + \alpha_{7eaeu} EAEU_j + \alpha_{7wto} WTO_j + \alpha_{7eu} EU_j \\ +\alpha_{8eaeu} EAEU_{ij} + \alpha_{8wto} WTO_{ij} + \alpha_{8eu} EU_{ij} + \omega_h \end{array}\right]} . \varepsilon_{ijh}, \tag{1}$$

where M_{ijh} is the imports value of HS six-digit product h from exporting country j to importing country i in 2017; $\ln\left(T_{ijh} + 1\right)$ is the effectively applied tariff rate imposed by country i on the imports of product h from country j in logarithmic form; Y_i and Y_j are the GDP values of the importing and exporting countries, respectively, in logarithmic form; D_{ij} is the geographical distance between trade partners; L_{ij} is a dummy variable indicating whether two partners have common languages; C_{ij} is a dummy variable indicating the contiguity of the two partners; H_{ij} is a dummy variable indicating the shared colonial history between the two countries; $EAEU_i$, WTO_i and EU_i are dummy variables that indicate whether importing countries are in 2017 members of the EAEU, WTO and the European Union (EU) respectively; $EAEU_j$, WTO_j and EU_j are dummy variables indicating whether exporting countries are in 2017 members of the EAEU, WTO and EU respectively; $EAEU_{ij}$, WTO_{ij} and EU_{ij} are dummy variables that indicate whether both trading partners are in 2017 members of the EAEU, WTO and EU respectively; ω_h is the HS six-digit level product-fixed effects (FE) term to control for heterogeneity across products; and ε_{ijh} is the standard error of the model that is estimated robustly against heteroscedasticity.

The use of the 2017 data however might adversely affect the estimates of the trade elasticity of tariffs at the global level due to business cycle dynamics and other time-specific distortions. Therefore, to achieve more robust results, in the benchmark gravity model instead of using the 2017 cross-section data, we used 5 years averages for continuous explanatory variables (averages over the periods 2013–2017), as well as the trade variable (denoted $\tilde{M}_{ijh}$). Notably, our data constraint was related to the availability of import tariff data for Iran. However, since Iran is not a member of the WTO and has no enforced PTA with other countries, its pre-PTA tariffs were also applied for Iran's imports from other countries; therefore, we could safely assume that its import tariffs can be used as an average import tariff also for the periods 2013–2017. However, we also reported the cross-sectional estimation results using the data only from the year 2017 for comparison.

Since trade values included many zeros and after taking logarithm those flows would drop out of the estimation sample if a log-specification is used, the gravity literature instead applies the Poisson pseudo-maximum likelihood (PPML) estimator proposed by Silva and Tenreyro (2006). The estimator better accounted for zero values in the dependent variable and also yielded estimates robust in the presence of heteroscedasticity. Since import tariffs may take the value of zero for some products, we added unity to the tariff rate and expressed it in the logarithmic form, consistent with the literature. Thus, in this specification, α_2 shows the elasticity of trade concerning tariffs and is the main parameter of interest in our analysis.

Although the explanatory variables in the abovementioned model were adopted from the traditional gravity models, the omitted variable bias problem may remain, as GDP and other country-specific variables may not completely account for all relevant factors affecting trade flows at the product level. Moreover, there could be additional country-pair characteristics that were not fully captured by conventional gravity country-pair variables (such as the bilateral distance or the common colonial history); for instance, relevant to the question under consideration, lasting Iran–United States animosity affecting trade dynamics was not captured by other variables. Therefore, we included country-pair FE that account for all these potential sources of the omitted variable bias as follows (the conventional gravity model is also estimated for additional inference):

$$M_{ijh} = e^{\left[\alpha_1+\alpha_2\ln\left(T_{ijh}+1\right)+\omega_h+\omega_{ij}\right]}.\epsilon_{ijh}, \tag{2}$$

where ω_{ij} is the country-pair FE vector; ϵ_{ijh} is the new standard error that is robust against the abovementioned omitted variable bias; and other variables are defined as above. Thus, with both product- and country-pair FE, the remaining variation would be attributed to the changes in tariffs and trade values across country-pair products. The country-pair FE would partially control for the multilateral resistance in a cross-sectional gravity that is discussed in the literature (Anderson and Wincoop 2003). However, our data and analysis had the product dimension, too. Therefore, following Chaney (2008), we included an additional control variable that controls for the remoteness from the rest of the world in each product traded bilaterally. Using a Taylor-series expansion following Baier and Bergstrand (2009), we calculated the remoteness index for bilateral distance and contiguity as the GDP-weighted average of distances with all other partner countries—remoteness index for distance MRD_{ij} and contiguity MRC_{ij} to be used in the gravity model specifications without country-pair FE (otherwise, these terms are absorbed by the latter). However, since we were interested in having a multilateral trade resistance term also at the product level, we implemented also a remoteness index for GDP-weighted import tariffs with all partner countries computed as follows:

$$\begin{aligned} MRT_{ijh} = {} & \left[\sum_{k=1}^{N}\theta_k\ln\left(T_{ikh}+1\right)\right] + \left[\sum_{m=1}^{N}\theta_m\ln\left(T_{mjh}+1\right)\right] \\ & - \left[\sum_{k=1}^{N}\sum_{m=1}^{N}\theta_k\theta_m\ln\left(T_{kmh}+1\right)\right], \theta_i = \frac{Y_i}{\sum_i^N Y_i}, \\ & \forall i \in \{1, j, k, m, \dots, N\}, \end{aligned} \tag{3}$$

where MRT_{ijh} is the multilateral resistance in tariffs for a bilateral product ijh; N is the total number of countries in the sample of analysis; and θ_i is the GDP share of country i in the world. Instead of tariffs, distance and contiguity can be inserted in this formula to calculate multilateral trade resistance in distance or contiguity. Theoretically, holding the bilateral variables such as $\ln\left(T_{ijh}+1\right)$ constant, bilateral trade from j to i increases in this multilateral resistance term (Baier and Bergstrand 2009).

In the benchmark model based on 5 years averages of trade values $\tilde{M}_{ijh}$ and tariffs $\tilde{T}_{ijh}$, in addition to country-pair and HS six-digit product FE, the multilateral trade resistance in tariffs term $\widetilde{MRT}_{ijh}$ using 5 years averaged tariffs was also included to give unbiased estimation results. The benchmark estimation model then was specified as follows:

$$\tilde{M}_{ijh} = e^{\left[\alpha_1+\alpha_2\ln\left(\tilde{T}_{ijh}+1\right)+\alpha_3\widetilde{MRT}_{ijh}+\omega_h+\omega_{ij}\right]}.\epsilon_{ijh}. \tag{4}$$

Robustness checks were also performed excluding these terms, as well as additional regressions using the canonical form of the gravity model (with continuous variables instead of a range of FE) for comparison. The goodness of fit was compared across the models to justify the choice of the benchmark equation using the R-square and Akaike information criteria (AIC), in addition to these theoretical considerations stemming from the literature.

Finally, to allow for heterogeneity of import tariff effects across sectors, we also run estimations on the benchmark model in Eq. (4) individually for broader sectoral groups including all bilateral trade flows of products at the HS six-digit that are indicated in the PTA. To this end, we aggregated the respective HS six-digit products to the 15 sectors as outlined in Appendix Table 4 (the corresponding HS two-digit level section codes were listed). Amongst the sectors listed, only sector 7 (raw hides, skins, leather and furs) and sector 10 (footwear/headgear) were not covered by the EAEU–Iran PTA and thus were omitted from the analysis.

After obtaining the estimates, the growth in trade values between Iran and the EAEU members after the tariff reductions envisioned in the PTA were calculated as follows:

$$d_{ijh}^{M_{PTA}} = \frac{\widehat{M_{ijh}^{T_{post-PTA}}} - \widehat{M_{ijh}^{T_{pre-PTA}}}}{\widehat{M_{ijh}^{T_{pre-PTA}}}}, \tag{5}$$

where $\widehat{M_{ijh}^{T_{pre-PTA}}}$ is the fitted trade value of imports from Eq. (4) using bilateral and product FE with the effectively applied import tariff rates *before* the PTA implementation (the 5 years average in the baseline specification or the year 2017 for alternative specifications) and $\widehat{M_{ijh}^{T_{post-PTA}}}$ is the fitted trade value from Eq. (4) with the preferential tariffs *after* the PTA implementation. Thus, $d_{ijh}^{M_{PTA}}$ indicates how much trade would increase as a result of the import tariff reductions envisioned in the trade agreement. We examined the extent of this increase at the aggregate country and sectoral levels in absolute and relative terms, considering the statistical significance of the estimates, to gauge the expected effects of the EAEU–Iran PTA on mutual trade flows.

2.2 Data

Bilateral product-level trade data were collected from the UN Comtrade database through the World Bank's World Integrated Trade Solution (WITS) software. Tariffs were compiled as ad valorem equivalents (AVEs) of simple average tariffs at the HS six-digit level estimated by the UNCTAD methodology. The data on tariffs, provided by the UNCTAD Trade Analysis Information System, are also collected through WITS. However, since there are some missing values, the data from the WTO Integrated Data Base were also collected to complement. Effectively applied tariff rates were constructed in their AVEs. Preferential tariff rates were used in cases where there is a free trade agreement between the trading countries. Whenever preferential tariff rates are not applicable, most-favored nation tariffs are used. If both are not applicable, the applied tariff rates are used to augment the data. The data on GDP are collected from the World Development Indicators of the World Bank. The data on distance and other bilateral variables were obtained from the CEPII geo-distance database. The data on the import tariffs of Iran and the EAEU associated with the PTA were obtained from the Eurasian Economic Commission. Table 4 presents the summary statistics for the variables used in the econometric analysis.

As noted above, in the baseline model, we used the data averaged over the periods 2013–2017 for continuous variables, including trade, and in alternative specifications only the year 2017. Consistent with the gravity literature discussed above, zero trade values were also included in our estimations. The use of 5 years average trade values reduces to some extent the incidence of zero trade values (thus, the sample size with positive trade values increases, which is also beneficial for the identification of the effects).

Additionally, a large number of zero import tariffs imposed on a range of products in the global sample existed, which makes the average log tariffs close to zero in Table 5. All variables except imports and dummy variables were in logarithmic form. The average global bilateral trade value of products covered in the PTA was approximately USD 318,000, whereas the maximum traded value in 2017 ($\boldsymbol{M_{ijh}}$) was approximately USD 41 billion. Taking the 5 years average of trade values reduced the maximum traded value ($\boldsymbol{M_{ijh}}$) to approximately USD 19 billion, whereas increasing the sample mean to USD 321,000 also reduced the standard deviation. A similar pattern was observed for tariffs after taking their 5 years average.

The mean of the contiguity variable indicated that approximately 2% of the bilateral product flows in the sample crosses only one border. Approximately 15% of trade flows in the sample was between countries sharing the same language, approximately 1.5% was between countries sharing colonial history. The average log distance in the sample indicated that the distance between countries in the sample of bilateral trade flows is approximately 5863 km.

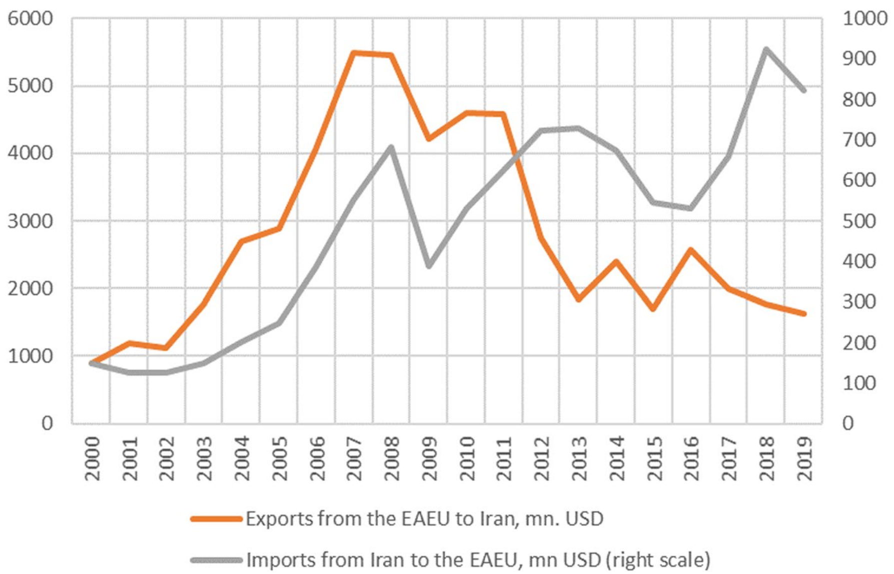

Fig. 1 EAEU–Iran trade dynamics, USD million. Sources: UN Comtrade; Eurasian Economic Commission

Only 3.2% of importing countries in the sample are EAEU members, whereas 2.2% of exporting countries in the sample were members of the EAEU. The reason was that the number of exporting countries was larger than the number of importing countries in the sample: 195 compared with 238. Approximately 90% of countries in the sample were members of the WTO, and approximately 20% of them were members of the EU.

2.3 Stylized facts approximately EAEU–Iran trade

First, we provided a few key facts approximately foreign trade dynamics and the composition of trade between the EAEU and Iran. Figure 1 shows the dynamics of the mutual trade between the EAEU countries and Iran (the total of the five EAEU countries is included also for the pre-2015 period, i.e. the period before the inception of the EAEU.) As Iran reported only fragmented data for its foreign trade to the UN Comtrade, we instead used the mirror data (imports to the EAEU from Iran reported by its trading partners).[2] As can be seen, the level of exports from the EAEU to Iran is much higher than the other way around. This is regardless of Iran's market size less than a quarter of the EAEU's aggregate market size as measured, for instance, by purchasing power parity-adjusted GDP. However, in the post-crisis period,

[2] The data were also cross-checked for general consistency with the data reported by Iran for the available years, as well as with the data obtained from the Eurasian Economic Commission.

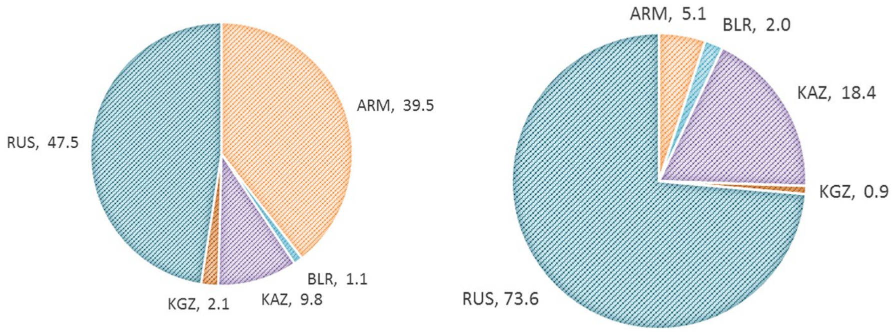

Fig. 2 Composition of the EAEU–Iran trade by EAEU countries, 2019. Source: Eurasian Economic Commission

exports from the EAEU to Iran had been declining, whereas exports from Iran to the EAEU had been increasing, thereby gradually reducing the trade asymmetry.

However, this export growth was not smooth, and it suffered major declines triggered by three key episodes throughout. The first decline in exports was due to the global financial crisis in 2008. The second fall in imports from Iran occurred between 2013 and 2016, which coincided with the intensification of sanctions by the international community over Iran's nuclear program, which also led to a recession in Iran (Ghodsi et al. 2018). The third decline occurred in 2019, after the United States withdrew from the Iran nuclear deal, the Joint Comprehensive Plan of Action and secondary US sanctions were imposed to prohibit third countries from doing business with Iran.[3]

Importantly, trade with Iran was also unequally distributed amongst the EAEU countries (Fig. 2). Most of Iran's trade with the bloc takes place with Russia (both exports and imports), which is not surprising, given that the Russian market comprises over 80% of the aggregate EAEU market. Armenia is also a very important export destination for Iran, accounting for almost 40% of Iran's exports to the EAEU in 2019 (based on its exports of electricity).[4] Amongst the EAEU's exporters, Kazakhstan is the second-largest exporter to Iran after Russia, accounting for 18% of the bloc's exports to Iran.

The analysis of the sectoral composition of trade at the HS four-digit level based on 2019 data (see Tables 6, 7 for a list of the 30 most significant products traded) suggested that both exports to Iran from the EAEU and from the EAEU to Iran were dominated by agri-food products. The most significant export items from the EAEU to Iran were barley, sunflower products and corn, which by far surpass other exports in total annual value (for these products, the export value exceeds USD 300 million

[3] https://wiiw.ac.at/iran-new-sanctions-starting-to-bite-n-357.html.

[4] Note that Iran is importing gas and electricity from some neighboring countries, such as Armenia and Turkmenistan. The reason was that Iran's area is vast and the infrastructure to supply energy to the northern parts of Iran is insufficient, whereas its oil and gas fields are mostly located in the south-west of the country, necessitating energy imports.

Table 1 Import tariffs imposed by the EAEU and Iran against each other before and after the PTA, in per cent

No.	Sectors	EAEU's import tariffs			Iran's import tariffs		
		Before	After	Percentage change (%)	Before	After	Percentage change (%)
1	Animal and animal products	5.86	1.45	– 75	17.61	13.09	– 26
2	Vegetable and fruit products	5.81	2.33	– 60	21.55	13.48	– 37
3	Foodstuffs	3.86	1.43	– 63	32.48	12.15	– 63
4	Mineral products	4.41	2.39	– 46	5.00	5.00	0
5	Chemicals and allied industries	3.21	0.47	– 85	21.52	15.02	– 30
6	Plastics/rubbers	6.14	2.75	– 55	8.33	8.00	– 4
8	Wood and wood products	–	–	–	12.57	11.13	– 11
9	Textiles	0.95	0.21	– 78	41.47	29.82	– 28
11	Stone/glass	11.58	6.32	– 45	12.50	12.50	0
12	Metals	9.26	5.49	– 41	17.79	11.46	– 36
13	Machinery/electronics	5.39	3.27	– 39	9.72	8.23	– 15
14	Transportation	3.95	0.00	– 100	5.63	5.08	– 10
15	Miscellaneous other products	–	–	–	23.33	17.83	– 24

Source: own computations based on the EAEU–Iran PTA

as of 2019). Sunflower products and corn were exported predominantly from Russia, whereas barley was exported from both Kazakhstan (61.5%) and Russia (38.5%). Other important exports from the EAEU to Iran were wood, electrical energy, meat, vegetables and fruits and to a smaller extent selected electronic and machinery equipment.

Exports from Iran to the EAEU were dominated by petroleum products, nuts, cement and miscellaneous fruits and vegetables. The market composition of Iranian exports also differed significantly across sectors: petroleum products were exported almost exclusively to Armenia, whereas Russia was the main market for Iranian fruits and vegetables.

In this respect, the reduction of tariffs focusing predominantly on the agri-food sector and other products sizeable in bilateral trade was fully justified and was likely to bring further improvements in mutual trade. Table 1 provides a broad overview of the import tariffs on the products affected by the PTA, showing the import tariff levels before and after the PTA as well as the reduction of tariff protection in percentage terms (only the products that were included in the PTA were considered in the analysis). For brevity, we reported the averages by broad 15-sector classification as outlined in the methodology section.

As already mentioned, the EAEU–Iran agreement covers approximately 55% of the total mutual trade. In line with the agreement, Iran grants preferential treatment for meat and selected agri-food products, metals, electronics and other items. The average import tariff applied by Iran to imports from the EAEU decreases from 22.4 to 15.4% for manufacturing products and from 32.2 to 13.2% for agricultural products. Generally, 360 product lines were affected. Conversely, Iran receives preferential treatment for its exports of fruits and vegetables, metal products, construction materials and selected other items such as tableware and carpets. The average import tariff applied by the EAEU against Iran was to decline for agricultural products from 9.6 to 4.6% and for manufacturing products from 8 to 4.7%. Overall, 502 product lines were affected by preferential treatment.

The PTA covers a sizeable share of mutually traded products, and the magnitude of the reduction of tariff protection was significant but asymmetric, as Iran had a more restrictive trade regime before the implementation relative to the EAEU's CET and after the PTA also maintains a much higher average import tariff in comparison with the EAEU. At the same time, the market of the EAEU is much larger, which implies that the impact of (smaller) import tariff reductions on the EAEU will have a greater positive impact on Iranian exports in absolute values. In this respect, the market size, as well as control for other important macroeconomic characteristics to determine the net impact of PTA implementation should be considered, which we did next using the gravity model framework.

3 Estimation results

3.1 Evidence from the gravity model

Table 2 presents the PPML estimation results of the gravity model based on the cross-section of worldwide bilateral trade values in 2017 (models 1 and 4) and the 5 years average trade values for the periods 2013–2017 (other models, including the benchmark model 7) of all product categories (six-digit HS level) that are included in the EAEU–Iran trade agreement. In the table, models 1–3 corresponded to the estimation results based on Eq. (1) using HS six-digit product FE. Model 2 was based on 5 years average data. Model 3, whereas also based on 5 years average, incorporated multilateral trade resistance terms by introducing the remoteness index for tariffs MRT_{ijh}, distance MRD_{ij}, and contiguity MRC_{ij}. Models 4–7 included country-pair FE and therefore country-level and country-pair-level variables were excluded. To facilitate the comparability of the estimates and the goodness-of-fit statistics, models 1–6 were estimated using the same sample. Models 6 and 7 were therefore conceptually identical, both based on the FE gravity specification and including the tariff-based multilateral trade resistance term (this term has variation across products and therefore does not drop out unlike the two other remoteness indices), but model 7 was estimated with an expanded sample of non-zero trade observations (as discussed in the data section, averaging over 5 years increases their incidence). Amongst the models estimated on the same sample (models 1–6), according to R-squared and AIC, model 6 had the best goodness-of-fit (in addition to other desirable properties discussed in Sect. 2). Therefore, we used the equivalent of model 6 for a larger sample of data—model 7—as our benchmark model for the main inference on the impacts of the EAEU–Iran PTA at aggregate and sectoral levels.

According to the benchmark model, a 1% reduction in import tariffs stimulates global trade in the affected products (i.e. the products covered in the PTA agreement) on average by 4%. The coefficient for tariffs was statistically significant at the 1% level. Given the statistical and economic significance of the estimate, we used this information to compute the impact of the PTA on the EAEU–Iran mutual trade flows (discussed in the next section).

Although our main interest was in the import tariff elasticity from the FE model, the results should be reviewed for continuous gravity model variables from conventional gravity models (models 1–3). In line with the gravity literature, the economic size of both trading partners had a positive impact on trade. The estimated elasticity of GDP to trade values was smaller than unity, which confirmed the Engel's law phenomenon, i.e. when a country's income grows by 1%, its traded (imported or exported) value in these products grows by < 1%. Trade between countries with a common border and the same language tends to be larger than bilateral trade between geographically more distant countries. However, sharing a colonial history is only weakly significant.

Notably, a negative and statistically significant coefficient of the EAEU dummy variable for *importing* countries points to a negative impact of the EAEU on imports outside the bloc that is consistent with the expectations for trade-diverting customs unions. The coefficient of the EAEU dummy variable for *exporting* countries was statistically insignificant. However, the very positive and highly significant coefficient of the EAEU dummy for *both* trading partners suggested a strong trade creation effect of the EAEU (the results pointing at non-trivial trade diversion and trade creation effects of the EAEU in this regard were in line with the evidence reported in Adarov (2018), based on the synthetic control and the gravity model for the full sample of products at higher levels of aggregation). This indicated that the EAEU members were trading in these products amongst themselves roughly from approximately 1.14 to 1.5 times more than they do with the countries outside the bloc.

Similarly, the estimates for the EU dummy variables indicated a higher degree of mutual trade at statistically significant levels when both trading partners were EU members, whereas the EU framework negatively impacts imports from non-EU countries. The magnitudes of the trade creation and the trade diversion effects were rather similar to those of the EAEU. Finally, our results suggested that countries that are both members of the WTO enjoy higher levels of mutual trade in these products, signifying an essential role of the WTO framework for facilitating global trade.

The multilateral trade resistance terms are also statistically significant and have an expected sign, indicating that larger GDP-weighted multilateral trade costs with the third countries induce higher bilateral trade flow between the importing and exporting countries under consideration, ceteris paribus.

Next, using the estimates from the benchmark model, we computed the expected effects of the EAEU–Iran agreement on mutual trade flows for each country in the agreement, followed by analysis at the sectoral level.

Table 2 Gravity estimation results using the PPML with all products included in the EAEU–Iran PTA

Dependent variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7 (benchmark)
	M_{ijh}	$\tilde{M}_{ijh}$	$\tilde{M}_{ijh}$	M_{ijh}	$\tilde{M}_{ijh}$	$\tilde{M}_{ijh}$	$\tilde{M}_{ijh}$
$ln(T_{ijh}+1)$	−3.92***	−3.29***	−4.24***	−2.27***	−1.87***	−3.24***	−4.00***
	(0.37)	(0.41)	(0.41)	(0.38)	(0.42)	(0.44)	(0.77)
Y_i	0.69***	0.70***	0.73***				
	(0.012)	(0.012)	(0.013)				
Y_j	0.83***	0.83***	0.86***				
	(0.011)	(0.012)	(0.013)				
$Contiguity_{ij}$	0.47***	0.47***	0.52***				
	(0.065)	(0.067)	(0.065)				
$Language_{ij}$	0.33***	0.35***	0.38***				
	(0.054)	(0.053)	(0.055)				
$Colony_{ij}$	0.11*	0.11*	0.073				
	(0.063)	(0.060)	(0.062)				
$Distance_{ij}$	−0.58***	−0.59***	−0.60***				
	(0.028)	(0.028)	(0.029)				
$EAEU_i$	−0.40***	−0.37***	−0.29***				
	(0.089)	(0.072)	(0.077)				
$EAEU_j$	0.16	0.21	0.29*				
	(0.15)	(0.16)	(0.17)				
$EAEU_{ij}$	1.46***	1.22***	1.14***				
	(0.21)	(0.21)	(0.21)				
WTO_i	−0.15	0.14	0.18				
	(0.20)	(0.19)	(0.19)				
WTO_j	0.76***	0.72***	0.75***				
	(0.25)	(0.15)	(0.15)				
WTO_{ij}	−0.0050	0.046	0.026				
	(0.28)	(0.20)	(0.20)				

Table 2 (continued)

Dependent variable	Model 1 M_{ijh}	Model 2 $\tilde{M}_{ijh}$	Model 3 $\tilde{M}_{ijh}$	Model 4 M_{ijh}	Model 5 $\tilde{M}_{ijh}$	Model 6 $\tilde{M}_{ijh}$	Model 7 (benchmark) $\tilde{M}_{ijh}$
EU_i	−0.53***	−0.56***	−0.53***				
	(0.059)	(0.060)	(0.060)				
EU_j	−0.031	−0.11**	−0.088*				
	(0.061)	(0.051)	(0.050)				
EU_{ij}	0.72***	0.76***	0.69***				
	(0.093)	(0.087)	(0.088)				
MRT_{ijh}			1.24***			1.74***	2.68***
			(0.40)			(0.33)	(0.80)
MRD_{ij}			0.061				
			(0.045)				
MRC_{ij}			−0.79***				
			(0.25)				
Constant	−21.7***	−22.1***	−24.0***	17.6***	17.7***	17.7***	17.6***
	(0.59)	(0.61)	(0.89)	(0.022)	(0.022)	(0.022)	(0.023)
Observations	6,471,892	6,471,892	6,471,892	6,471,892	6,471,892	6,471,892	10,058,838
Pseudo R-squared	0.681	0.701	0.702	0.749	0.766	0.766	0.776
AIC	1.19097e+13	1.10954e+13	1.10775e+13	9.35988e+12	8.69993e+12	8.69290e+12	9.15131e+12
Product FE -ω_h	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bilateral FE -ω_{ij}	No	No	No	Yes	Yes	Yes	Yes

Models 1 and 4 were based on the year 2017. Other models were based on a 5 years average. Models 1–3 corresponded to the estimation results based on Eq. (1) using HS six-digit product FE. Models 4–7 additionally include country-pair FE and therefore country-level and country-pair-level variables were excluded. Models 6 and 7 included the tariff-based multilateral trade resistance term

Robust standard errors in parentheses, *$p<0.1$; **$p<0.05$; ***$p<0.01$

Models 1–6 were run over the same sample to make their estimation diagnostics comparable. Based on R-squared and AIC, model 6 was the fittest

PPMLHDFE package developed by Correia et al. (2019) is applied

Table 3 The estimated impact of the EAEU–Iran PTA implementation on aggregate trade

Exporter	Importer	Pre-PTA trade, USD	Post-PTA trade, USD	Increase, %	Increase, USD	95% prediction interval for post-PTA trade $\widehat{M_{ijh}^{T_{post-PTA}}}$, USD	
		$\widehat{M_{ijh}^{T_{pre-PTA}}}$	$\widehat{M_{ijh}^{T_{post-PTA}}}$	$d_{ijh}^{M_{PTA}}$ %	$d_{ijh}^{M_{PTA}}$ USD	Lower bound	Upper bound
ARM	IRN	7,509,475	8,931,355	18.93	1,421,880	8,931,325	8,931,385
BLR	IRN	14,800,005	17,627,037	19.10	2,827,032	17,627,006	17,627,068
KAZ	IRN	23,892,350	28,443,362	19.05	4,551,012	28,443,331	28,443,393
KGZ	IRN	1,650,633	1,962,704	18.91	312,071	1,962,674	1,962,734
RUS	IRN	209,181,048	249,206,600	19.13	40,025,551	249,206,568	249,206,631
IRN	ARM	32,961,210	34,744,672	5.41	1,783,462	34,744,647	34,744,698
IRN	BLR	4,573,440	5,032,624	10.04	459,184	5,032,593	5,032,655
IRN	KAZ	39,851,270	43,497,899	9.15	3,646,629	43,497,868	43,497,929
IRN	KGZ	5,487,734	5,736,426	4.53	248,692	5,736,401	5,736,451
IRN	RUS	249,529,283	266,333,557	6.73	16,804,275	266,333,528	266,333,587

The table shows the aggregate fitted trade value for the products in the PTA for the pre-PTA and the post-PTA periods: $\widehat{M_{ijh}^{T_{2017}}}$ is the pre-PTA fitted trade value, $\widehat{M_{ijh}^{T_{PTA}}}$ is the post-PTA fitted trade value, $d_{ijh}^{M_{PTA}}$ shows the difference between the pre-and post-PTA values in USD and percentage change, the two rightmost columns show the 95% prediction interval for post-PTA trade level.

3.2 Trade implications of the agreement

First, we computed the effects of the EAEU–Iran agreement at the aggregate level for each pair of countries in the agreement before and after the PTA implementation. The expected trade values were based on model 7 estimated via PPML as outlined in Table 2 in the previous section on the worldwide bilateral trade flows of products included in the PTA at the HS six-digit level. Table 3 reports the fitted pre- and post-PTA bilateral aggregate trade values, as well as the change in trade in absolute and relative terms. As noted previously, the fitted values convey the total expected trade for the products included in the PTA agreement and not the total aggregate trade between the countries, which would include other products not affected by the agreement.

Results showed that the impact of the PTA implementation was asymmetric in several ways. In terms of percentage gains in exports, the EAEU countries stand to benefit more than Iran, which is to be expected, since Iran maintained a more restrictive foreign trade policy stance with much higher average import tariffs compared with the EAEU CET before the PTA and because the PTA-induced tariff reductions were also greater. The aggregate trade in the affected products was expected to increase by 19.1% for exports from the EAEU to Iran and by up to 7% for Iranian exports to the EAEU. The magnitude of the gains differs significantly across countries. In absolute US dollar values, the largest gains are projected for trade between Russia and Iran in both exports and imports: an increase in exports from Russia to Iran by over USD 40 million and from Iran to Russia by almost USD 17 million. This result was also consistent with our expectations, as the size of the Russian economy by far exceeds that of its EAEU partners and Iran. Summarizing the impact across all five EAEU countries and Iran, the total gains in mutual trade were estimated to reach over USD 72 million.

One of the drawbacks of the aggregate approach pooling all sectors in a single estimation framework was that it does not allow for the heterogeneity of the effects across sectors, amongst others, concerning the elasticity of the import tariff. Therefore, as also discussed earlier, for extra robustness and for additional inference concerning the effects for different sectors, we next estimated the benchmark model on a sector-by-sector basis in line with the sectoral classification introduced in Sect. 2 (15 sectors, 13 of which are covered by the PTA). The approach pools HS six-digit products only within the corresponding sector group for the global sample of countries, and the estimation proceeds again via the FE PPML specification. On the basis of the sectoral estimation results, we then computed the expected impact of the PTA implementation for specific sectors.

Figure 3 shows the estimates for the import tariff elasticity by broad sector groups (sectors 7 and 10 were not included in the PTA), also indicating their statistical significance. Full estimation results with corresponding regression diagnostics by broad sector groups were presented in Table 8. For most of the sectors, the import tariff enters negatively and statistically significantly (at least at the 10% level and in most cases at the 1% level of statistical significance). The only exceptions were sectors 4 (mineral products), 11 (stone/glass), 12 (metals) and 15 (other various products). Amongst the statistically significant tariff elasticities, the highest magnitude

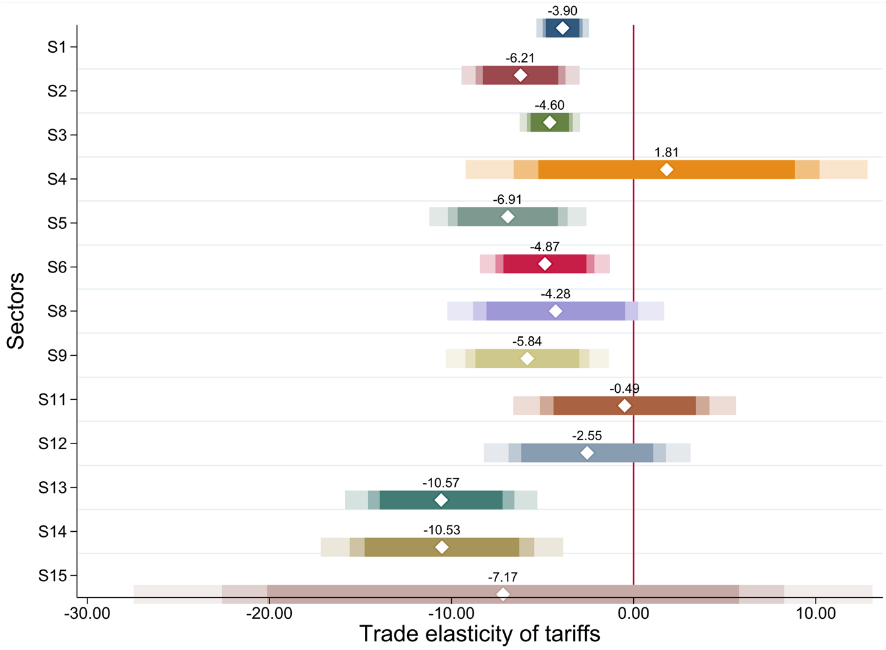

Fig. 3 Import elasticity of tariffs by sector. Source: Own estimates

in absolute value was identified for sectors 13 and 14 (machinery/electrical equipment and transport manufacturing sectors) and the lowest for sector 1 (animals and animal products). The diamonds show the point estimates of the import elasticity of tariffs (the estimates are also labeled) for each of the sectors as outlined in the methodology section. The associated bars with the varying color intensity indicate 90% (darker), 95% and 99% (lighter) confidence intervals based on the estimated standard errors.

Using the estimated elasticities, we again computed the pre-PTA and post-PTA fitted trade values, as well as the PTA-induced trade impact by sectors for each pair of countries in the agreement. Table 8 lists the detailed results of this exercise. Figure 4 for clarity shows the results only for the largest sectors (those with the value of exports exceeding USD 500,000), for which the estimated gains are also notable both in relative terms (trade estimated to increase by more than 5% after the PTA) and in absolute terms (above 200,000 USD). In this analysis for robustness, we only consider sectors for which the tariff estimates are statistically significant at least at the 10% level.

The estimations for individual sectors point to significant differences in the effects of the agreement across both sectors and countries. Reviewing the detailed sectoral results (Table 9), in terms of the percentage change in trade induced by the PTA, the largest gains were projected for exports from the EAEU to Iran in sector 3 (foodstuffs); the trade was expected to double. Furthermore, notable gains of 50%–65% were estimated for sector 5 (chemicals and allied industries) and sector

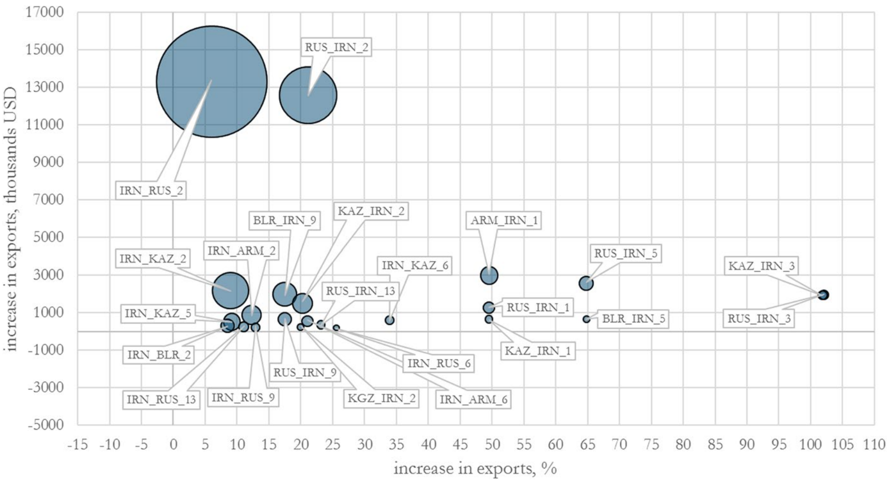

Fig. 4 Sectors with the largest estimated export gains. Source: Own estimates

1 (animal products). Trade (with Iran) in the chemical sector, however, is sizeable only in Russia and Belarus. In addition, in the case of exports from Russia to Iran and exports from Belarus to Iran, a notable growth in exports was estimated for the textile sector (around 17%).[5]

Gains in exports from Iran to the EAEU countries were particularly high in relative terms in the plastic/rubber sector, with exports rising by > 13–37% to each member of the EAEU.[6] In addition, amongst the larger sectors of Iran, more modest but still notable growth in exports is expected in the machinery/electrical and textiles sectors, especially in the case of exports from Iran to Russia the textiles sector is estimated to increase by almost 13% and exports in the machinery/electrical sector by approximately 11% relative to the pre-PTA average level.

However, as already noted, trade in some of the sectors with the highest gains in relative percentage terms is rather small in absolute values (measured in USD), and when looking at the largest gainers only amongst the bigger sectors in terms of the current trade flow values, the highest gains were expected for the agri-food sectors, especially in the trade (both exports and imports) between Russia and Iran in the vegetable and fruit products (sector 2). The notable asymmetry in comparison with other sectors and trading partners was expressly visible in Fig. 4. This sector was already the largest in terms of the trade value amongst all sectors traded between the EAEU and Iran. Another relatively large sector—albeit much smaller in comparison

[5] De facto, the PTA implementation did not dramatically change the trade regime in the textiles sector on either the EAEU or the Iranian side: on the one hand, the EAEU prior to the PTA already maintained a very low import tariff (0.95%), which decreased slightly further after the PTA implementation; conversely, Iran maintains a very high level of protection for textile products even after the PTA implementation, with an average import tariff of 29.82%.

[6] The major traded item in this sector was polymer production.

with sector 2 (see also Figure 9)—with the highest estimated gains is the animal and animal products (sector 1), for which we estimated an increase in the exports from Armenia, Kazakhstan and Russia to Iran by almost 50%, ceteris paribus.

Applying a slightly different perspective to these results and summarizing across countries, the largest improvements in exports in terms of percentage gains will occur in the exports from the EAEU countries to Iran (as noted, approximately 100% in the foodstuff, approximately 50% in the chemical, and 50% in the animal product sectors). As for the exports from Iran to the EAEU, the gains were more modest, and the highest percentage increase (in the 20–37% range, depending on the destination) was estimated for the plastic/rubber sector on account of Iran's polymer production. Similarly, in terms of absolute gains in exports rather than percentage gains, the highest increases were expected in the exports from the EAEU countries to Iran. This was consistent with the aggregate country-level results reported earlier and is expected given the asymmetric import tariff changes induced by the EAEU–Iran PTA, with much greater import tariff reductions envisioned for Iran (which had a more restrictive import policy vis-à-vis the EAEU before the PTA), whereas the EAEU CET had already been at moderate levels before the agreement, and the reduction of tariffs as a result of the PTA was therefore less dramatic. One should also consider that these results are computed as expected levels of trade conditional on other macroeconomic factors. Particularly, in line with the gravity modeling framework, we net out the impacts of such relevant macroeconomic factors as the business cycle dynamics picked up by the GDP variables. Therefore, for instance, a drop in the GDP of the EAEU or Iran as a result of an economic crisis would result in less intensive mutual trade or even a decline in bilateral trade despite the PTA implementation.

4 Concluding remarks

In the present study, we estimated the impact of the 2019 EAEU–Iran trade agreement on mutual trade between the EAEU countries and Iran at the aggregate and sectoral levels. The analysis suggests that the reduction of tariffs along the lines of the agreement will bring benefits to both trading partners. As expected, the major gains will accrue to the exported products in which the bilateral trade had already been quite intensive in recent years, before the implementation of the PTA, particularly in the agri-food sectors. At the same time, one should consider that the EAEU–Iran PTA implies only a partial reduction of import tariffs for selected products, which means that a further intensification of integration (e.g. the full elimination of tariffs on the products already included in the PTA or the inclusion of additional products in the PTA) is likely to bring greater benefits to mutual trade.

Also, note that any greater integration efforts should focus not only on the reduction of import tariffs but also on the elimination of non-tariff barriers to trade. Nowadays, non-tariff barriers to trade generally constitute a more important impediment to trade than import duties and are particularly important in the case of Iran, given that it is not a WTO member and has only been an observer since 2005. In this regard, the implementation of the PTA and a further deepening of its cooperation with the EAEU could be beneficial to Iran, as it may indirectly facilitate its transition to international standards, which would be conducive to its foreign trade in general. As a large share of the mutually traded products is in the agri-food sectors, it also makes sense to facilitate faster cross-border transit of the products and automatization/digitalization of the customs procedures to avoid delays and administrative burdens at the border.

For the EAEU, with its much larger market size relative to Iran, the direct economic benefits of trade with Iran expected for some sectors may not be essential, and the geopolitical gains associated with a deeper partnership may not be as important as they are for Iran. However, for Iran, improved access to the EAEU market represents a matter of strategic importance and a means to mitigate at least to some extent the adverse macroeconomic impacts associated to date with the wide-ranging US sanctions, which are also an impediment to Iran's trade relations with the West in general.

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Compliance with ethical standards

Conflict of interest The authors declare no conflict of interest.

Appendix

See Tables 4, 5, 6, 7, 8 and 9.

Table 4 Sectoral classification used in sector-by-sector estimations

No.	Description	From HS section	To HS section
1	Animal and animal products	01	05
2	Vegetable and fruit products	06	15
3	Foodstuffs	16	24
4	Mineral products	25	27
5	Chemicals and allied industries	28	38
6	Plastics/rubbers	39	40
7	Raw hides, skins, leather, and furs	41	43
8	Wood and wood products	44	49
9	Textiles	50	63
10	Footwear/headgear	64	67
11	Stone/glass	68	71
12	Metals	72	83
13	Machinery/electronics	84	85
14	Transportation	86	89
15	Miscellaneous	90	97

Table 5 Summary statistics for the variables used in the econometric analysis

Variable	Observations	Mean	Std. dev	Minimum	Maximum
M_{ijh}	10,058,838	318,399.4	25,000,000	0	41,400,000,000
$\tilde{M}_{ijh}$	10,058,838	321,290.4	21,700,000	0	19,300,000,000
$ln(T_{ijh}+1)$	9,764,664	0.0744392	0.1051908	0	3.433987
$ln(\tilde{T}_{ijh}+1)$	10,058,838	0.079658	0.1041064	0	3.246505
Y_i	9,889,738	25.10119	2.157656	19.48478	30.60069
Y_j	9,205,651	24.75692	2.271406	17.51978	30.60069
Contiguity$_{ij}$	9,674,266	0.0199309	0.1397629	0	1
Language$_{ij}$	9,674,266	0.1535561	0.3605228	0	1
Colony$_{ij}$	9,674,266	0.0150728	0.1218425	0	1
Distance$_{ij}$	9,674,266	8.676446	0.8276325	4.087945	9.901043
$EAEU_i$	10,058,838	0.0321866	0.1764955	0	1
$EAEU_j$	10,058,838	0.0225941	0.1486054	0	1
$EAEU_{ij}$	10,058,838	0.0007933	0.028155	0	1
WTO_i	10,058,838	0.9209193	0.2698647	0	1
WTO_j	10,058,838	0.7968506	0.4023428	0	1
WTO_{ij}	10,058,838	0.7316269	0.4431129	0	1
EU_i	10,058,838	0.2018086	0.4013501	0	1
EU_j	10,058,838	0.1649834	0.3711656	0	1
EU_{ij}	10,058,838	0.0289	0.1675254	0	1
MRT_{ijh}	10,058,838	0.0806231	0.1003455	− 0.1441561	3.255749
MRD_{ij}	10,058,838	9.226193	1.730614	− 1.140924	11.00343
MRC_{ij}	10,058,838	0.0061739	0.0747491	− 0.0534401	0.4343861

Table 6 Top 30 exports from the EAEU to Iran, 2019. Sources: UN Comtrade

Rank	HS code	Product name	USD million	Share in total trade, %				
				ARM	BLR	KAZ	KGZ	RUS
1	1003	Barley	432.8	–	–	61.5	–	38.5
2	1512	Sunflower seed, safflower or cotton-seed oil and their fractions; whether or not refined, but not chemically modified	384.1	0.0	–	–	–	100.0
3	1005	Maize (corn)	301.4	–	–	–	–	100.0
4	4407	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness exceeding 6 mm	70.3	0.2	3.5	–	–	96.3
5	2716	Electrical energy	62.5	100.0	–	–	–	–
6	0204	Meat of sheep or goats; fresh, chilled or frozen	58.5	13.9	–	10.1	7.0	69.0
7	1507	Soya-bean oil and its fractions; whether or not refined, but not chemically modified	44.0	–	–	–	–	100.0
8	0713	Vegetables, leguminous; shelled, whether or not skinned or split, dried	22.5	–	–	19.5	42.9	37.6
9	8517	Telephone sets, including telephones for cellular networks or for other wireless networks; other apparatus for the transmission or reception of voice, images or other data (including wired/wireless networks), excluding items of 8443, 8525, 8527, or 8528	19.1	1.2	0.0	–	–	98.8
10	8705	Special purpose motor vehicles; not those for the transport of persons or goods (e.g. breakdown lorries, road sweeper lorries, spraying lorries, mobile workshops, mobile radiological units, etc.)	12.3	–	–	–	–	100.0
11	1001	Wheat and meslin	12.1	–	–	9.4	–	90.6
12	1205	Rape or colza seeds; whether or not broken	11.0	–	–	81.2	–	18.8
13	2843	Colloidal precious metals; inorganic or organic compounds of precious metals, whether or not chemically defined; amalgams of precious metals	9.8	–	–	–	–	100.0
14	8901	Cruise ships, excursion boats, ferry-boats, cargo ships, barges and similar vessels for the transport of persons or goods	8.3	–	–	–	–	100.0
15	4011	New pneumatic tyres, of rubber	8.1	–	92.5	–	–	7.5
16	4801	Newsprint, in rolls or sheets	7.0	–	37.8	–	–	62.2
17	8529	Transmission apparatus; parts suitable for use solely or principally with the apparatus of heading no. 8525 to 8528	6.4	–	–	–	–	100.0
18	4703	Chemical wood pulp, soda or sulphate, other than dissolving grades	6.4	–	–	–	–	100.0

Table 6 (continued)

Rank	HS code	Product name	USD million	Share in total trade, %				
				ARM	BLR	KAZ	KGZ	RUS
19	0201	Meat of bovine animals; fresh or chilled	6.3	–	1.0	97.6	–	1.4
20	8406	Turbines; steam and other vapor turbines	4.2	–	–	–	–	100.0
21	5402	Synthetic filament yarn (other than sewing thread), not put up for retail sale, including synthetic monofilament of less than 67 decitex	4.1	–	–	–	–	100.0
22	8548	Waste and scrap of primary cells, primary batteries and electric accumulators; spent primary cells, spent primary batteries and spent electric accumulators; electrical parts of machinery or apparatus, n.e.c. or included elsewhere in chapter 85	3.4	100.0	–	–	–	–
23	9031	Measuring or checking instruments, appliances and machines, n.e.c. or included in this chapter; profile projectors	3.3	–	0.1	–	–	99.9
24	5601	Wadding of textile materials and articles thereof; textile fibres, not exceeding 5 mm in length (flock), textile dust and mill neps	3.3	–	–	–	–	100.0
25	8606	Railway or tramway goods vans and waggons; not self-propelled	3.2	–	–	–	–	100.0
26	7204	Ferrous waste and scrap; re-melting scrap ingots of iron or steel	3.2	61.0	–	38.6	0.5	–
27	2922	Oxygen-function amino-compounds	3.2	–	0.0	–	–	100.0
28	2930	Organo-sulphur compounds	3.1	–	–	–	–	100.0
29	7326	Iron or steel; articles, n.e.c. in chapter 73	3.1	0.3	0.4	0.2	–	99.1
30	4804	Uncoated kraft paper and paperboard, in rolls or sheets, other than that of heading no. 4802 or 4803	3.0	–	–	–	–	100.0

Table 7 Top 30 imports to the EAEU from Iran, 2019. Sources: UN Comtrade

Rank	HS code	Product name	USD million	Share in total trade, %				
				ARM	BLR	KAZ	KGZ	RUS
1	2711	Petroleum gases and other gaseous hydrocarbons	66.3	99.0	–	–	–	1.0
2	0802	Nuts (excluding coconuts, Brazils and cashew nuts); fresh or dried, whether or not shelled or peeled	54.2	3.2	0.3	9.8	3.7	83.0
3	0810	Fruit, fresh; n.e.c. in chapter 08	47.9	6.8	0.3	0.8	0.4	91.7
4	2523	Portland cement, aluminous cement (ciment fondu), slag cement, supersulphate cement and similar hydraulic cements, whether or not colored or in the form of clinkers	47.6	56.6	–	29.7	0.0	13.7
5	0709	Vegetables; n.e.c. in chapter 07, fresh or chilled	35.5	3.1	0.1	1.8	0.0	95.0
6	0702	Tomatoes; fresh or chilled	34.5	2.2	0.4	1.6	–	95.8
7	2710	Petroleum oils and oils from bituminous minerals, not crude; preparations n.e.c, containing by weight 70% or more of petroleum oils or oils from bituminous minerals; these being the basic constituents of the preparations; waste oils	33.5	100.0	–	–	0.0	–
8	0707	Cucumbers and gherkins; fresh or chilled	26.5	4.8	2.9	4.8	0.3	87.2
9	0804	Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens; fresh or dried	23.8	4.1	4.3	51.7	4.6	35.3
10	0809	Apricots, cherries, peaches (including nectarines), plums and sloes, fresh	23.8	0.2	0.2	0.1	–	99.5
11	0806	Grapes; fresh or dried	22.5	6.0	3.5	18.4	0.2	71.9
12	2713	Petroleum coke, petroleum bitumen; other residues of petroleum oils or oils obtained from bituminous minerals	22.3	99.8	–	–	0.2	–
13	3901	Polymers of ethylene, in primary forms	21.7	69.4	–	13.3	7.1	10.2
14	0704	Cabbages, cauliflowers, kohlrabi, kale and similar edible brassicas; fresh or chilled	17.1	3.2	0.2	0.2	–	96.4
15	0401	Milk and cream; not concentrated, not containing added sugar or other sweetening matter	17.0	0.9	–	0.4	0.1	98.6
16	7202	Ferro-alloys	13.9	40.6	–	–	–	59.4
17	3002	Human blood; animal blood for therapeutic, prophylactic or diagnostic uses; antisera, other blood fractions, immunological products, modified or obtained by biotechnological processes; vaccines, toxins, cultures of micro-organisms (excluding yeasts) etc	13.2	–	–	1.8	–	98.2
18	6907	Ceramic flags and paving, hearth or wall tiles; ceramic mosaic cubes and the like, whether or not on a backing; finishing ceramics	11.7	62.3	0.1	10.6	1.5	25.5
19	0703	Onions, shallots, garlic, leeks and other alliaceous vegetables; fresh or chilled	11.5	3.1	–	8.5	0.3	88.1

Table 7 (continued)

Rank	HS code	Product name	USD million	Share in total trade, %				
				ARM	BLR	KAZ	KGZ	RUS
20	7210	Iron or non-alloy steel; flat-rolled products, width 600 mm or more, clad, plated or coated	11.2	100.0	–	–	–	–
21	0705	Lettuce (lactuca sativa) and chicory (cichorium spp.) fresh or chilled	11.0	0.6	–	0.0	–	99.4
22	7214	Iron or non-alloy steel; bars and rods, not further worked than forged, hot-rolled, hot drawn or hot-extruded, but including those twisted after rolling	10.9	89.9	–	0.3	–	9.8
23	3903	Polymers of styrene, in primary forms	10.8	14.8	–	7.0	0.5	77.7
24	0807	Melons (including watermelons) and papaws (papayas); fresh	10.4	12.1	1.6	0.6	0.2	85.5
25	6802	Monumental or building stone, worked (except slate) and articles thereof (not of heading no. 6801) mosaic cubes etc., of natural stone including slate; artificially colored granules of natural stone	8.2	15.3	0.4	39.2	9.1	36.0
26	7306	Iron or steel (excluding cast iron); tubes, pipes and hollow profiles (not seamless), n.e.c. in chapter 73	7.8	99.9	–	0.0	–	0.1
27	7013	Glassware of a kind used for table, kitchen, toilet, office, indoor decoration or similar purposes (other than of heading no. 7010 or 7018)	7.2	10.4	2.7	39.6	27.6	19.7
28	2830	Sulphides; polysulphides whether or not chemically defined	6.6	81.5	–	1.7	0.2	16.6
29	5503	Synthetic staple fibres, not carded, combed or otherwise processed for spinning	6.1	12.3	–	1.4	1.7	84.6
30	3902	Polymers of propylene or of other olefins, in primary forms	5.9	66.1	–	33.7	0.1	0.1

Table 8 Estimation results of the gravity model by sectors

Sectors	S1	S2	S3	S4	S5	S6	S8	S9	S11	S12	S13	S14	S15
$ln\left(\tilde{T}_{ijh}+1\right)$	−3.90***	−6.21***	−4.60***	1.81	−6.91***	−4.87***	−4.28*	−5.84***	−0.49	−2.55	−10.6***	−10.5***	−7.17
	(0.56)	(1.26)	(0.64)	(4.28)	(1.68)	(1.39)	(2.31)	(1.73)	(2.38)	(2.20)	(2.05)	(2.58)	(7.88)
MRT_{ijh}	1.25*	5.28***	3.38***	−5.13	4.73**	0.15	−0.33	−0.40	4.43**	−0.24	8.99***	6.73***	0.67
	(0.68)	(1.06)	(0.47)	(4.07)	(2.06)	(1.29)	(1.66)	(2.26)	(2.25)	(1.80)	(2.04)	(2.20)	(6.50)
Constant	16.8***	17.0***	16.5***	21.0***	18.7***	17.3***	16.5***	16.1***	17.7***	16.5***	17.3***	18.8***	15.8***
	(0.088)	(0.084)	(0.039)	(0.053)	(0.024)	(0.036)	(0.040)	(0.11)	(0.052)	(0.039)	(0.031)	(0.051)	(0.083)
Observations	216,027	791,434	479,671	78,063	484,246	507,355	567,067	550,041	289,500	617,023	673,048	452,458	23,368
Pseudo R-squared	0.745	0.698	0.796	0.991	0.909	0.884	0.784	0.752	0.870	0.781	0.857	0.837	0.833
AIC	2.09490e+11	1.00366e+12	3.39544e+11	5.58187e+10	4.25672e+11	2.50863e+11	3.29380e+11	1.71507e+11	1.43019 e+11	4.37192 e+11	4.98734e+11	9.58689e+11	8.75741e+09
Product FE − ω_h	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bilateral FE − ω_{ij}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses, * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Each column estimates the benchmark gravity model for each sector labeled S1-S15. PPMLHDFE package developed by Correia et al. (2019) is applied

Table 9 Estimated effects of the EAEU–Iran PTA agreement by sectors

Exporter	Importer	Sector	Sector name	Trade value, USD		Change in trade		95% Prediction interval for post-PTA trade, USD	
				Before PTA	After PTA	USD	%	Lower bound	Upper bound
IRN	RUS	2	Vegetable products	219,178,690.64	232,475,914.59	219,178,690.64	6.07	232,475,904.29	232,475,924.89
RUS	IRN	2	Vegetable products	59,570,072.26	72,153,068.58	59,570,072.26	21.12	72,153,063.81	72,153,073.35
ARM	IRN	1	Animal and animal products	6,031,320.52	9,021,661.29	6,031,320.52	49.58	9,021,657.80	9,021,664.79
RUS	IRN	5	Chemicals and allied industries	3,986,468.36	6,569,374.98	3,986,468.36	64.79	6,569,365.53	6,569,384.44
IRN	KAZ	2	Vegetable products	24,277,329.25	26,453,799.11	24,277,329.25	8.97	26,453,788.98	26,453,809.23
RUS	IRN	8	Wood and wood products	86,826,218.74	88,950,608.36	86,826,218.74	2.45	88,950,598.72	88,950,617.99
BLR	IRN	9	Textiles	11,361,046.06	13,348,645.88	11,361,046.06	17.49	13,348,622.06	13,348,669.69
RUS	IRN	3	Foodstuffs	1,922,903.75	3,885,972.85	1,922,903.75	102.09	3,885,968.62	3,885,977.08
KAZ	IRN	3	Foodstuffs	1,899,561.55	3,834,450.68	1,899,561.55	101.86	3,834,446.51	3,834,454.84
KAZ	IRN	2	Vegetable products	7,388,374.43	8,886,476.46	7,388,374.43	20.28	8,886,471.89	8,886,481.03
RUS	IRN	1	Animal and animal products	2,574,240.57	3,849,090.50	2,574,240.57	49.52	3,849,087.02	3,849,093.99
IRN	ARM	2	Vegetable products	7,241,501.84	8,132,501.32	7,241,501.84	12.30	8,132,491.02	8,132,511.62
IRN	RUS	3	Foodstuffs	17,964,188.82	18,647,400.61	17,964,188.82	3.80	18,647,398.52	18,647,402.70
BLR	IRN	5	Chemicals and allied industries	1,020,147.19	1,681,716.00	1,020,147.19	64.85	1,681,706.64	1,681,725.36
KAZ	IRN	1	Animal and animal products	1,321,484.58	1,975,950.70	1,321,484.58	49.53	1,975,947.21	1,975,954.18
RUS	IRN	9	Textiles	3,668,443.55	4,310,224.74	3,668,443.55	17.49	4,310,200.90	4,310,248.59
IRN	KAZ	6	Plastics/rubbers	1,768,720.39	2,369,362.45	1,768,720.39	33.96	2,369,359.06	2,369,365.84
IRN	ARM	6	Plastics/rubbers	2,624,918.59	3,177,339.48	2,624,918.59	21.05	3,177,336.80	3,177,342.17
IRN	KAZ	5	Chemicals and allied industries	5,630,861.54	6,145,849.45	5,630,861.54	9.15	6,145,844.40	6,145,854.50
RUS	IRN	13	Machinery/electronics	1,542,193.37	1,899,288.72	1,542,193.37	23.16	1,899,285.23	1,899,292.20
IRN	BLR	2	Vegetable products	3,593,699.92	3,899,773.42	3,593,699.92	8.52	3,899,763.26	3,899,783.59

Table 9 (continued)

Exporter	Importer	Sector	Sector name	Trade value, USD		Change in trade		95% Prediction interval for post-PTA trade, USD	
				Before PTA	After PTA	USD	%	Lower bound	Upper bound
KGZ	IRN	2	Vegetable products	1,192,446.37	1,430,422.54	1,192,446.37	19.96	1,430,418.05	1,430,427.02
IRN	RUS	13	Machinery/electronics	2,136,959.16	2,373,391.07	2,136,959.16	11.06	2,373,387.63	2,373,394.50
IRN	RUS	9	Textiles	1,737,249.38	1,960,740.61	1,737,249.38	12.86	1,960,728.39	1,960,752.83
IRN	RUS	6	Plastics/rubbers	783,784.20	984,261.03	783,784.20	25.58	984,257.72	984,264.35
KGZ	IRN	1	Animal and animal products	386,096.19	577,292.61	386,096.19	49.52	577,289.13	577,296.10
IRN	KAZ	13	Machinery/electronics	1,124,539.78	1,305,911.62	1,124,539.78	16.13	1,305,908.06	1,305,915.19
IRN	KGZ	2	Vegetable products	1,588,998.16	1,745,359.10	1,588,998.16	9.84	1,745,349.03	1,745,369.17
IRN	RUS	14	Transportation	2,051,391.33	2,186,765.55	2,051,391.33	6.60	2,186,760.50	2,186,770.61
IRN	ARM	3	Foodstuffs	1,769,814.71	1,899,082.44	1,769,814.71	7.30	1,899,080.30	1,899,084.59
BLR	IRN	13	Machinery/electronics	479,334.19	590,077.71	479,334.19	23.10	590,074.24	590,081.18
IRN	KGZ	6	Plastics/rubbers	688,475.60	774,807.61	688,475.60	12.54	774,805.67	774,809.54
ARM	IRN	5	Chemicals and allied industries	120,457.40	198,727.91	120,457.40	64.98	198,718.88	198,736.94
IRN	KAZ	9	Textiles	458,976.79	533,617.97	458,976.79	16.26	533,604.64	533,631.31
IRN	ARM	13	Machinery/electronics	826,434.39	889,812.76	826,434.39	7.67	889,810.06	889,815.47
RUS	IRN	6	Plastics/rubbers	3,434,111.18	3,495,194.59	3,434,111.18	1.78	3,495,194.35	3,495,194.83
KGZ	IRN	3	Foodstuffs	58,476.40	117,080.60	58,476.40	100.22	117,076.60	117,084.61
IRN	BLR	5	Chemicals and allied industries	250,460.00	298,596.66	250,460.00	19.22	298,591.43	298,601.88
IRN	KGZ	5	Chemicals and allied industries	2,021,547.18	2,062,117.94	2,021,547.18	2.01	2,062,115.15	2,062,120.73
IRN	KAZ	3	Foodstuffs	809,318.05	849,772.27	809,318.05	5.00	849,770.00	849,774.54
IRN	KGZ	9	Textiles	280,626.80	312,786.27	280,626.80	11.46	312,775.53	312,797.00

Table 9 (continued)

Exporter	Importer	Sector	Sector name	Trade value, USD		Change in trade		95% Prediction interval for post-PTA trade, USD	
				Before PTA	After PTA	USD	%	Lower bound	Upper bound
IRN	ARM	9	Textiles	304,621.40	336,505.32	304,621.40	10.47	336,495.08	336,515.55
RUS	IRN	14	Transportation	948,407.17	978,817.15	948,407.17	3.21	978,813.68	978,820.62
IRN	RUS	5	Chemicals and allied industries	308,177.40	338,170.20	308,177.40	9.73	338,165.03	338,175.36
ARM	IRN	13	Machinery/electronics	124,493.00	152,607.91	124,493.00	22.58	152,604.61	152,611.22
IRN	KGZ	3	Foodstuffs	408,871.62	436,032.91	408,871.62	6.64	436,030.71	436,035.10
ARM	IRN	3	Foodstuffs	26,249.40	52,615.46	26,249.40	100.44	52,611.43	52,619.48
BLR	IRN	8	Wood and wood products	1,037,389.61	1,062,775.25	1,037,389.61	2.45	1,062,765.62	1,062,784.88
IRN	RUS	1	Animal and animal products	472,864.19	491,139.63	472,864.19	3.86	491,136.90	491,142.36
IRN	BLR	9	Textiles	110,940.00	128,774.70	110,940.00	16.08	128,761.44	128,787.96
IRN	BLR	6	Plastics/rubbers	42,220.00	57,662.02	42,220.00	36.58	57,658.42	57,665.63
ARM	IRN	2	Vegetable products	74,929.20	89,870.57	74,929.20	19.94	89,866.10	89,875.03
IRN	ARM	5	Chemicals and allied industries	3,106,835.37	3,119,858.34	3,106,835.37	0.42	3,119,856.35	3,119,860.34
BLR	IRN	14	Transportation	391,547.99	404,033.46	391,547.99	3.19	404,029.99	404,036.92
KGZ	IRN	5	Chemicals and allied industries	12,580.20	20,754.27	12,580.20	64.98	20,745.24	20,763.30
IRN	ARM	14	Transportation	34,292.20	42,355.56	34,292.20	23.51	42,350.93	42,360.19
IRN	KAZ	14	Transportation	61,720.60	67,103.29	61,720.60	8.72	67,097.63	67,108.95
ARM	IRN	8	Wood and wood products	194,483.80	199,252.95	194,483.80	2.45	199,243.41	199,262.48
KAZ	IRN	13	Machinery/electronics	16,577.80	20,385.57	16,577.80	22.97	20,382.14	20,389.01
IRN	BLR	13	Machinery/electronics	19,600.00	22,800.40	19,600.00	16.33	22,796.85	22,803.95
IRN	KGZ	14	Transportation	31,176.60	34,030.16	31,176.60	9.15	34,025.65	34,034.67

Table 9 (continued)

Exporter	Importer	Sector	Sector name	Trade value, USD		Change in trade		95% Prediction interval for post-PTA trade, USD	
				Before PTA	After PTA	USD	%	Lower bound	Upper bound
KAZ	IRN	5	Chemicals and allied industries	3,314.20	5,463.93	3,314.20	64.86	5,454.64	5,473.22
ARM	IRN	9	Textiles	11,504.80	13,524.41	11,504.80	17.55	13,501.30	13,547.53
BLR	IRN	6	Plastics/rubbers	93,619.00	95,284.46	93,619.00	1.78	95,284.22	95,284.70
IRN	BLR	14	Transportation	11,320.00	12,308.12	11,320.00	8.73	12,302.45	12,313.79
IRN	BLR	3	Foodstuffs	19,480.00	20,421.77	19,480.00	4.83	20,419.49	20,424.06
IRN	KGZ	13	Machinery/electronics	9,102.40	9,841.83	9,102.40	8.12	9,838.95	9,844.70
KGZ	IRN	13	Machinery/electronics	1,033.40	1,267.00	1,033.40	22.60	1,263.70	1,270.30
KAZ	IRN	8	Wood and wood products	6,372.80	6,528.76	6,372.80	2.45	6,519.13	6,538.38
ARM	IRN	14	Transportation	2,000.00	2,062.33	2,000.00	3.12	2,059.04	2,065.61
ARM	IRN	6	Plastics/rubbers	3,131.00	3,186.72	3,131.00	1.78	3,186.47	3,186.97
IRN	KAZ	1	Animal and animal products	1,027.20	1,068.77	1,027.20	4.05	1,065.99	1,071.55

The estimated trade effects are reported only for the sectors with the statistical significance of the estimated import tariff elasticity of at least 10%. The data are sorted by the change in trade USD values in descending order

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