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RESEARCH ARTICLE

Transforming East Asia: Regional Integration in a Trade War Era

Karen Jackson[1] · **Oleksandr Shepotylo**[2]

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Abstract
This paper evaluates the trade and welfare implications of further East Asian trade integration, through the signing of the China-Japan-Korea FTA, and continued trade tensions between the US and China. Our analysis uses a structural gravity approach to explore the effects of these cooperative and non-cooperative trade policies. Our key findings are: (i) for China, the FTA can compensate for continued trade tensions (ii) in terms of the FTA and for the members involved, reductions in tariffs are expected to lead to larger welfare gains compared to those from lower NTBs (iii) for the members involved, a deeper agreement will be more welfare enhancing. Overall, East Asian integration appears to be a more appealing prospect in light of tensions with the US.

Keywords Gravity model · China-Japan-Korea Free Trade Agreement · China-US trade war

JEL classification F13 · F14

1 Introduction

The jointly commissioned report (CJK Joint Study Committee 2011) assessing the potential for a China-Japan-Korea Free Trade Agreement (CJK FTA) presents a win-win-win situation. Nevertheless, after sixteen rounds of negotiations, progress halted in recent years and a general sense of pessimism settled over proceedings (Zhang 2019). However, signature of the Regional Comprehensive Economic Partnership (RCEP) has raised hopes for the prospects of concluding the CJK trade deal. From a Chinese perspective, the increased focus on regional integration is part of an

✉ Karen Jackson
k.jackson@westminster.ac.uk

Oleksandr Shepotylo
o.shepotylo@aston.ac.uk

[1] Westminster Business School, University of Westminster, London, UK

[2] Aston Business School, Aston University, Birmingham, UK

effort to counterbalance recent trade tensions with the US (Petri and Plummer 2020). While the China-US Phase One agreement has been in force since early 2020, this arrangement does not include any commitments for either side to reduce tariffs. China-US tariffs remain at an average of 20.7% (Chinese tariffs on US exports) and 19.3% (US tariffs on Chinese exports) compared to much lower rates on rest of the world exports (Peterson Institute for International Economics). Given the changing landscape in regional and global trade policy, it is important to re-evaluate the costs and benefits of regional integration in East Asia. This paper explores the potential impact of further East Asia trade integration, specifically the CJK FTA, alongside continued trade tensions between the US and China.

In the early stages of the CJK FTA negotiations the potential effects of the trade deal received attention from researchers, but in more recent years this interest has dwindled significantly (Urata and Abe 2000). For some time, the CJK FTA was viewed as a potential precursor to RCEP, whereas in reality the RCEP proved quicker to sign (Chiang 2013). As progress towards the trilateral arrangement waned, there has been a lack of new research that benchmarks the changes in trade and welfare that may result from the CJK FTA compared to the US-China tensions. Hence, this paper addresses three questions that have only recently become of significant policy interest: (i) From a Chinese perspective, will the welfare gains from the CJK FTA compensate for the welfare losses due to trade tensions with the US? (ii) In the context of East Asia trade integration, how important are reductions in tariff barriers compared to non-tariff barriers (NTBs)? (iii) In trade and welfare terms, how important is the type/depth of the CJK FTA?

In order to answer these questions, we use a structural model of global trade by Anderson et al. (2018) to conduct a general equilibrium analysis where we construct a number of scenarios that permit us to compare the trade and welfare effects for a range of countries. Our contribution is to provide much needed evidence on two opposing types of policies: cooperative (CJK FTA) and non-cooperative (China-US trade tensions), while also considering the impact of reducing different barriers to trade. The improved prospects for the trilateral agreement moving ahead is a recent development and the academic literature is yet to catch-up to the latest policy agenda.

Our findings suggest that China can compensate for both trade and welfare losses derived from tensions with the US by signing up to the CJK FTA. The new trilateral arrangement is expected to be more beneficial for Japan and Korea if China and the US maintain their trade war levels of trade costs. Other East Asian economies will lose out in terms of exports and welfare if the CJK FTA is signed, although the welfare losses will be mitigated by the US-China trade war. The trade and welfare effects from the CJK FTA are driven by tariff reductions to a greater extent than NTBs. Furthermore, the effects are significantly stronger if China, Japan and Korea commit to a deeper form of agreement. Therefore, the new evidence presented in this paper continues to support the findings of the jointly commissioned report. Moreover, the trade war provides further incentive to conclude the CJK FTA negotiations. In terms of trade effects, the negative impact from US-China tensions can be counterbalanced with the CJK FTA for both China and Korea.

The remainder of this paper is laid out as follows. The next section discusses the model, estimation strategy, and data. Section 3 sets out the scenarios. The empirical results are discussed in Sect. 4. Section 5 concludes.

2 Methodology

A micro-founded structural gravity model (Costinot and Rodríguez-Clare 2014; Head and Mayer 2014) is the basis of our modelling approach. We start with a standard model of trade and develop a system of structural equations describing global trade flows. After estimating the key model parameters on a panel in 1992–2018, we use the Poisson pseudo maximum likelihood estimation (PPML), which solves for inward and outward multilateral resistance terms as demonstrated by Fally (2015) and further elaborated by Anderson et al. (2018), to evaluate the baseline and counterfactual scenarios. A similar approach has been used in the recent literature to examine the North America Free Trade Agreement (Anderson et al. 2015) and the Belt and Road Initiative (Jackson and Shepotylo 2021).

2.1 Setting Up the Model

Consider N countries, indexed $i = 1, 2, ..., N$, each endowed with Q_i units of output. We rely on the Armington assumption that goods produced by each country are imperfect substitutes. We further use a constant elasticity of substitution to model consumer preferences. More specifically, a representative consumer in country j has preferences described as

$$U_j = \left[\sum_{i=1}^{N} \left(C_{ij} \right)^{(\sigma-1)/\sigma} \right]^{\sigma/(\sigma-1)} \tag{1}$$

where σ is elasticity of substitution. The consumer maximizes (1) subject to the budget constraint

$$\sum_{j=1}^{N} P_{ij} C_{ij} = E_j \tag{2}$$

where E_j is expenditure, P_{ij} is price of product i in country j and C_{ij} is consumption.

We assume an iceberg transportation cost - it takes $\tau_{ij} \geq 1$ units of good i to deliver one unit of this good from i to j, with $\tau_{ij} = 1$ if and only if $i = j$. In particular, the transportation cost is parametrically described as

$$\tau_{ij}^{1-\sigma} = \exp\left(\gamma_{dist} \ln(dist_{ij}) + \sum_{k=1}^{K} \gamma_{RTA_k} RTA_{ij}^{k} + \gamma_t \ln(1+t) + Z_{ij}\gamma_Z \right) + e_{ij} \tag{3}$$

where $dist_{ij}$ is distance, RTA_{ij}^{k} is a regional trade agreement of type k, t is applied tariff, and Z is the set of additional controls that capture bilateral trade costs.

Finally, total income is defined as $Y_i = p_i Q_i$, where p_i is the factory gate price. The model assumes that the ratio of aggregate expenditure to aggregate income remains constant, $Y_i/E_i = c$. It includes, but is not limited to, balanced trade as a special case when $c = 1$.

2.2 Equilibrium

Solving the model yields a structural gravity representation

$$X_{ij} = \frac{Y_i E_j}{Y_w}\left(\frac{\tau_{ij}}{\Omega_i P_j}\right)^{(1-\sigma)} \tag{4}$$

where X_{ij} is export from country i to country j, $Y_i = \sum_j X_{ij}$ is total income in country i, $Y_w = \sum Y_i$ is world income, and $E_j = \sum_i X_{ij}$ is total expenditure in country j. In addition, there are the following equilibrium relationships

$$\Omega_i^{(1-\sigma)} = \sum_j \frac{E_j}{Y_w}\left(\frac{\tau_{ij}}{P_j}\right)^{(1-\sigma)} \tag{5}$$

are the outward multilateral resistance and

$$P_j^{(1-\sigma)} = \sum_i \frac{Y_i}{Y_w}\left(\frac{\tau_{ij}}{\Omega_i}\right)^{(1-\sigma)} \tag{6}$$

inward multilateral resistance terms.

The factory gate price in country i in the equilibrium is characterized as follows

$$p_i = (Y_i/Y_W)^{1/(1-\sigma)}(1/\Omega_i) \tag{7}$$

2.3 Multilateral Resistance Terms in the Baseline and Counterfactual Scenarios

We first estimate trade elasticities with respect to regional trade agreements (RTA) and tariffs based on the gravity model presented in the Eq. 4. We rely on a sample of bilateral trade in 1992–2018, because using panel data allows us to control for all pair, source-time and destination-time heterogeneity in the data and to identify the parameters of interest by exploiting the time variation in the bilateral trade policy. The estimated equation is given by

$$X_{ij,t} = \exp\left(\sum_{k=1}^{K} \gamma_{RTA}^k RTA_{ij,t}^k + \gamma_t \ln(1 + t_{ij,t}) + D_{ij} + \pi_{jt} + \omega_{it}\right) + e_{ij,t} \tag{8}$$

where D_{ij} contorls for bilateral, time-invariant trade costs, including distance, language, common border. π_{jt} and ω_{it} control for inward and ouward multilateral resistance terms. The model is estimated by the PPML method, and the key parameters, $\hat{\gamma}_{RTA}^k, k = 1, 2, ..K$ and $\hat{\gamma}_t$, are recovered.

For the next step we use a sample of trade flows in 2018 and estimate the constrained version of the structural gravity model 4, where the key parameters are constrained to be equal to the values estimated with the panel data.

$$X_{ij} = \exp\left(\sum_{k=1}^{K} \hat{\gamma}^{k}_{RTA} RTA^{k}_{ij} + \hat{\gamma}_t \ln(1 + t_{ij,t}) + \gamma_{dist} \ln dist_{ij} + Z_{ij}\gamma_Z + \pi_j + \omega_i\right) + e_{ij,t} \tag{9}$$

In addition to distance, we control for common border and common language at this stage. The focus of this estimation step is to recover the estimates of the inward and outward multilateral resistance terms, $\hat{\pi}_j$ and $\hat{\omega}_i$.

Once we have computed the global trade equilibrium under the baseline, we modify the key policy variables according to the counterfactual scenarios, described in the next section and repeat the computation of the inward and outward multilateral resistance terms and corresponding changes in income and expenditure using the iterative process described by Anderson et al. (2018). Finally, we calculate changes in trade flows and consumer welfare before and after the counterfactual trade policy changes. The changes in bilateral exports are computed as

$$E\hat{X}P_{ij} = 100\% \times \frac{\hat{X}'_{ij}}{\hat{X}_{ij}} \tag{10}$$

where $\hat{X}_{ij}$ and $\hat{X}'_{ij}$ are bilateral flows in the baseline and counterfactual scenarios respectively.[1]

The welfare changes are computed as follows:

$$\hat{W}_i = 100\% \times \left(\frac{\frac{Y'_i}{P'_i}}{\frac{Y_i}{P_i}} - 1\right) \tag{11}$$

2.4 Data

This paper uses trade data from Directions of Trade Statistics (DOTs), where the DOTS sample covers 160 countries for the period 1992–2018.[2] DOTS does not include internal trade, which is required to solve the model and to compute the welfare effects. We calculate internal trade, X_{ii}, based on World Bank data on national

[1] Changes in aggregate exports are computed as $AGGREGATEEXP_i = \sum_j 100\% \times \frac{\hat{X}'_{ij}}{\hat{X}_{ij}}$

[2] DOTS is the primary data source for aggregate trade flows. We use aggregate data because our counterfactual analysis focuses on the average impact of the trade policy given that the sectoral outcomes of the negotiations are unclear. Trade data in DOTs is available since 1960, but for a limited number of countries. Moreover, the tariff data that is available for this study starts in 1992, which determines the starting date of our analysis.

Table 1 Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Export	677,722	0.790	22.805	0	4352.662
RTA	677,722	0.179	0.383	0	1
Applied tariff, %	651,671	7.539	9.828	0	1205.5
FTA	677,722	0.0460	0.209	0	1
PSA	677,722	0.063	0.242	0	1
CU	677,722	0.026	0.160	0	1
EIA	677,722	0.022	0.147	0	1
Common border	677,722	0.018	0.134	0	1
Common spoken language	677,722	0.113	0.225	0	1
Colony	677,722	0.013	0.113	0	1
Common legal origin	677,703	0.324	0.468	0	1
Ln Dist	677,722	8.687	0.832	2.134	9.886

accounts and balance of payments, adjusting for the share of services in GDP and for the share of value added in export statistics based on OECD estimates:

$$X_{ii,t} = GDP_{it}(1 - s_{it}) - EXP_{it} \times vas_{it}, \tag{12}$$

where *GDP* is gross domestic product, *s* is share of services in *GDP*, *EXP* is value of exports, and *vas* is share of value added in exports.[3] Table 1 presents a table of summary statistics for the variables used in this paper.

Data on preferential trade agreements comes from Mario Larch's Regional Trade Agreements Database (Egger and Larch 2008). RTA is a binary variable that takes a value of 1 if a country-pair has an active regional trade agreement (RTA) in place and 0 otherwise. 17.9% of bilateral pairs trade are part of an RTA. This includes partial scope agreements (PSA, 6.3%), free trade agreements (FTA, 4.6%), customs unions (CU, 2.6%) and economic integration areas (EIA, 2.2%).

Data on MFN and preferential tariffs are taken from the WITS/TRAINS database. The MFN rates were further imputed using interpolation if there are gaps for certain years or replaced by country average for the same year if the country-pair tariff was missing. We further computed the applied tariff as the minimum value from the MFN and preferential rates. On average, the applied tariff is 7.5%, but there is a high variability in the applied rates, which can be as high as 1200%. The log of one plus the applied tariff is used in the regression analysis and structural modelling.

Finally, data on bilateral trade costs, including common border, common spoken language, colony, common legal origin and distance are taken from the CEPII gravity dataset (Head et al. 2010).

[3] We imputed the share of value added in exports for countries that are not present in the OECD sample based on their level of economic development, size and global time-trend.

3 Scenarios

Our interest lies in understanding the possible impact of deeper integration within East Asia, via the signing of the CJK FTA, alongside the continued China-US trade tensions. The analysis presented in this paper is illustrative. We model nine scenarios and estimate the associated trade and welfare changes. The scenarios are selected so that we can examine the trade off between the CJK FTA and the China-US trade tensions. At the same time, we wish to understand the extent of the trade and welfare effects on Japan and Korea depending on the depth of the FTA, and the changes that may be attributed to tariffs and NTBs. Therefore, our scenarios reflect two central policy changes:

(i) **CJK FTA**

Given that we are uncertain as to the outcome of the CJK FTA, we consider a range of possible outcomes. Our starting point is to evaluate actual data on the trade effects of RTAs in general over the period 1992–2018. This allows us to explore the impact of the CJK FTA assuming that it has the average effect of RTAs in our dataset. To calculate this effect we estimate export elasticities with respect to RTAs then use this in our general equilibrium calculations. Secondly, we are also interested in disaggregating the trade and welfare impact from the CKJ FTA into two parts: tariff effect and NTB effect. NTBs between Korean and Japan have come under the spotlight recently due to an escalation of barriers. In Sep 2019, this resulted in a complaint by Korea against Japan to the World Trade Organisation (WTO) around the use of export controls, which restricted supplies of products used in the production of mobile phones and other electronic devices. This is only one of many complaints to the WTO in recent years due to the wide use of NTBs. By contrast tariff barriers are relatively low for China, Korea and Japan: simple average tariffs of 5-6% in 2019. Therefore, the three countries may be reticent to abandon the use of NTBs, while further lowering tariffs may be less contentious. Thirdly, we also relax the assumption of the CJK FTA representing an average RTA. Therefore, using data on 4 types of agreements (Free Trade Agreement (FTA), Partial Scope Agreement (PSA), Customs Union (CU) and Economic Integration (EI)) we can identify the effect for varying depths of agreement.

(ii) **China-US trade tensions**

During 2018–2020, China-US tariffs have risen to an average of 20.7% (Chinese tariffs on US exports) and 19.3% (US tariffs on Chinese exports), compared to 6.1% (Chinese tariffs) and 3.0% (US tariffs) on rest of the world exports (Peterson Institute for International Economics). While a Phase One agreement has been implemented, this does not have any provision for reducing tariffs back towards pre-trade war levels. At the present time, there has been no suggestion that negotiations towards a Phase Two (or comprehensive agreement) will start anytime soon. Therefore, in this case we assume the higher tariff rates continue. It is possible that the signature of the CJK FTA or continuation of increased trade costs due to higher China-US tariffs may alter

productive capacities. However, the present analysis is confined to assessing the impact of changes in relative trade costs on exports and welfare.

4 Empirical Results

4.1 Estimating Tariff and RTA Elasticities

We first estimate export elasticities with respect to regional trade agreements and import tariffs. We use data for 1992–2018, which is the time period when the tariff data is available. We also look at 5 year interval data for 1992–2017 to reduce noise in the annual trade data. Therefore, the results are presented for two datasets. The estimation is performed by PPML with the full set of exporter-year, importer-year, and bilateral fixed effects. Standard errors are clustered at the country-pair.

Table 2 reports the results of the estimation. Trade elasticities are in line with the coefficients reported in the literature (Head and Mayer 2014). We first estimate the

Table 2 Elasticity of export with respect to RTAs and tariffs

	(1) RTA 5 Year	(2) RTA All	(3) Types 5 Year	(4) Types All	(5) Tariff 5 Year	(6) Tariff All	(7) Types+Tariff 5 Year	(8) Types+Tariff All
RTA, Yes = 1	.418**	.354**	.472**	.411**	.230**	.186**	.281**	.242**
	(.048)	(.045)	(.047)	(.045)	(.041)	(.035)	(.039)	(.035)
ln(1+ Applied tariff/100)					−4.969**	−4.847**	−4.615**	−4.567*
					(.51)	(.44)	(.49)	(.43)
Free Trade Agreement			−.298**	−.284**			−.231**	−.238**
			(.056)	(.048)			(.048)	(.043)
Partial Scope Agreement			.066	.063			.127*	.112**
			(.059)	(.044)			(.067)	(.049)
Customs Union			.341**	.238**			.498**	.311**
			(.13)	(.095)			(.11)	(.083)
Economic Integration			.716**	.756**			.685**	.720**
			(.097)	(.094)			(.091)	(.088)
Pseudo R-Square	.96	.96	.96	.96	.96	.96	.96	.96

The dependent variable is export. Data for odd-number models are 1992–2017 in five year intervals. Data for even-number models are 1992–2018. All models have country-year and pair fixed effects. All models are estimated by PPML using Stata module **ppmlhdfe** developed by Correia et al. (2020), which absorbs multiple levels of fixed effects

*($p < 0.1$), **($p < 0.05$) Standard errors are clustered at country pair.

elasticity of trade with respect to a generic RTA in columns (1) and (2). The elasticity estimated on the annual data is 0.354, while on the 5-year intervals is 0.418. In both cases, the coefficient is statistically significant. For the RTA scenario we use the coefficient from column (2) as a more conservative estimate. We further deconstruct the RTA elasticity by the type of RTA, ranging from a shallow Free Trade Agreement (FTA) to Economic Integration Agreement (EIA) in columns (3) and (4). We use the results from column (4) to construct scenarios that vary by degree of integration. The elasticity of trade with respect to Free Trade Agreement is 0.127, with respect to Partial Scope Agreement is 0.474, with respect to Customs Union is 0.649, and with respect to Economic Integration Area is 1.167. We further add the applied tariff variable in columns (5) and (6). The coefficient of the applied tariff is negative and significant, ranging between −4.6 and −4.9. It also reduces the trade creation effect of RTA to 0.186-0.281, which is consistent with the literature, as the effect of an RTA can be decomposed into the effect of the tariff reduction and the effect stemming from the reduction of NTBs as well as the harmonisation of non-tariff measures (NTMs). We use the applied tariff coefficient in column (6) for the trade war scenario. We also use the coefficients for the applied tariff and RTA to decompose the effect of an RTA into the mechanisms due to tariff reductions and due to NTB reductions.

4.2 General Equilibrium Results

We now turn to the results of our counterfactual scenarios, starting with Table 2 that presents the changes in exports, measured in percentage change relative to the status quo.[4] US-China trade tensions have the expected negative impact on Chinese and US exports. We also note a 0.02% fall in Korean exports, driven by the importance of the US and China as Korea's trade partners. This scenario assumes that Korea continues not to take sides in the US-China trade tensions. If Korea gets dragged into taking sides then the trade effects are likely to be more negative. For the rest of the East Asian and Pacific region, excluding China, Japan and Korea, we find a 0.03% increase in exports. This suggests that they are benefiting from opportunities to export more to the Chinese and US markets by replacing US/Chinese based suppliers. The regions that look set to gain the most due to the trade war are Canada and Mexico followed by Latin America and the Caribbean. The effect on Canada and Mexico reflecting the benefits resulting from trade being diverted from China.

The implementation of a CJK FTA is shown in the RTA column of Table 2. Starting with the column labelled *RTA - Overall column*, where we assume the implementation of a generic RTA, we find that the largest gains in terms of percentage change of exports is experienced by Japan, followed by significant but more moderate gains for China and Korea. The rest of the East Asia and Pacific region experiences a 0.15% fall in exports, while South Asian economies are expected to experience the largest fall of 0.17%. Much more moderate impacts are felt across the remaining regions. Turning

[4] Table 6 in the Appendix presents the corresponding PPML gravity regressions that determined the baseline scenarios.

to consider the effect on exports derived from tariff and NTB changes associated with the CJK FTA, we find that changes in tariffs are expected to have a larger impact on exports for China, Japan and Korea. If we then examine the impact depending on the type of agreement, the deeper the agreement the stronger the impact on exports.

When there is both trade tensions and the implementation of the CJK FTA, the results are super-additive. The CJK FTA compensates China for the damaging effects of trade tensions. For Korea, the combination of US-China trade tensions and the new FTA is very beneficial in terms of exports: 12.62%. Japan are expected to see a more moderate effect from the combined policies, largely because their exports are only expected to be moderately affected by trade tensions. The combined policies are also expected to have the strongest negative effects on the exports of other East Asian, Pacific and South Asian countries. This appears to be largely driven by the impact of the CJK FTA on countries that are near neighbours of China, Japan and Korea.

Table 3 presents the changes in welfare in selected countries and regions for the full general equilibrium. The results for the trade war show large negative effects on the US and China. While China is expected to find that implementing the CJK FTA would more than compensate from the damaging effects of the trade war. In other words, the combined policies are super-additive. While Korea is expected to experience a negative effect on its aggregate exports, when it comes to welfare our results suggest a moderate rise. In fact the welfare gain due to US-China trade tensions is expected to be greater for Korea than Japan. In terms of the CJK FTA, Japan stands to gain the most in welfare terms. However, when we assume trade tensions and the implementation of the CJK FTA, Korea looks set to gain the most closely followed by Japan. In welfare terms, all regions (when China, Japan, Korea and the US are excluded) experience gains from the combined policies. In all cases,

Table 3 Changes in aggregate exports, %

	RTA			**RTA types**				**Trade war**	
	Overall	NTB	Tariff	FTA	PSA	CU	EIU		+ RTA
Countries									
China	3.15	1.52	2.36	1.09	4.29	6	11.33	−4.28	1.76
US	−0.1	−0.05	−0.03	−0.04	−0.13	−0.18	−0.3	−3.35	−3.51
Japan	14.87	6.77	8.99	5.01	20.56	29.48	60	0.19	18.82
Korea	2.74	1.45	2.16	1.06	3.53	4.55	6.68	−0.02	12.62
Regions (not including reported countries)									
East Asia & Pacific	−0.15	−0.07	−0.09	−0.05	−0.21	−0.29	−0.55	0.03	−0.31
Europe & Central Asia	−0.03	−0.01	−0.01	−0.01	−0.04	−0.05	−0.09	0.13	0.06
Latin America & Caribbean	−0.04	−0.02	−0.01	−0.01	−0.05	−0.07	−0.12	0.48	0.41
Middle East & North Africa	−0.03	−0.02	−0.01	−0.01	−0.04	−0.06	−0.1	0.05	−0.05
North America	−0.02	−0.01	0	−0.01	−0.03	−0.03	−0.06	0.76	0.73
South Asia	−0.17	−0.09	−0.09	−0.06	−0.24	−0.36	−0.75	0.12	−0.25
Sub-Saharan Africa	−0.04	−0.02	−0.02	−0.01	−0.05	−0.07	−0.11	0.16	0.06
Total	**1.32**	**0.62**	**0.91**	**0.46**	**1.81**	**2.56**	**4.97**	**−1.24**	**1.05**

The table reports changes in aggregate exports. For regions and total effect the results are output weighted

except North America (where the US is excluded) the gains are moderate. For Canada and Mexico, the welfare gains from the trade tensions are larger, partly due to the increase in aggregate exports explained earlier in this section.

If we consider the impact of different elements of the CJK FTA, we find that a larger proportion of the welfare gains for China, Japan and Korea are due to tariff reductions than the lowering of NTBs. When we move away from assuming a generic RTA, we find that a deeper CJK FTA will bring larger benefits. In terms of the effects on both exports and welfare, the results suggest at least a five-fold increase in the percentage change in welfare if the agreement is a CU rather than an FTA.

Overall, the results suggest that from a Chinese perspective, the welfare gains from the CJK FTA are expected to compensate for the welfare losses due to trade tensions with the US. In addition, the expected welfare gains for Japan and Korea from the CJK FTA are much more convincing if the China-US trade tensions are ongoing. Therefore, the potential gains from an FTA may be considered large enough to promote policy makers in Japan and Korea to try to overcome the various non-economic obstacles (see Table 4).

5 Robustness Checks and Discussion

5.1 Elasticity of Trade: Log-linear Model

As a robustness check, we consider a log-linear model with the full set of exporter-year, importer-year, and pair fixed effects. In order to retain zero trade flows in our

Table 4 Changes in welfare, %

	RTA			**RTA types**				**Trade war**	
	Overall	NTB	Tariff	FTA	PSA	CU	EIU		and RTA
Countries									
China	0.28	0.13	0.2	0.1	0.38	0.53	0.98	−0.18	0.37
US	−0.01	−0.01	0	0	−0.01	−0.02	−0.02	−0.34	−0.35
Japan	1.8	0.85	1.05	0.62	2.46	3.46	6.69	0.06	2.09
Korea	0.5	0.24	0.42	0.17	0.69	0.98	1.89	0.08	2.22
Regions (not including reported countries)									
East Asia & Pacific	−0.06	−0.03	−0.04	−0.02	−0.09	−0.13	−0.29	0.08	0
Europe & Central Asia	−0.01	−0.01	0	0	−0.01	−0.02	−0.02	0.03	0.02
Latin America & Caribbean	−0.01	−0.01	−0.01	0	−0.01	−0.02	−0.03	0.06	0.05
Middle East & North Africa	−0.01	−0.01	0	−0.01	−0.02	−0.02	−0.03	0.04	0.02
North America	−0.01	−0.01	−0.01	0	−0.01	−0.02	−0.02	0.22	0.21
South Asia	−0.04	−0.02	−0.02	−0.01	−0.05	−0.08	−0.16	0.06	0.01
Sub-Saharan Africa	−0.02	−0.01	−0.01	−0.01	−0.03	−0.03	−0.04	0.06	0.03
Total	**0.14**	**0.06**	**0.09**	**0.05**	**0.19**	**0.26**	**0.51**	**−0.05**	**0.19**

Consumer welfare changes are measured as changes in real GDP per capita. For regions and total effect the results are output weighted

Table 5 Elasticity of export with respect to RTAs and tariffs. Log-linear model

	(1) RTA 5 Year	(2) RTA All	(3) Types 5 Year	(4) Types All	(5) Tariff 5 Year	(6) Tariff All	(7) Types+Tariff 5 Year	(8) Types+Tariff All
RTA, Yes = 1	.251**	.154**	.179**	.132**	.230**	.141**	.158**	.121**
	(.036)	(.027)	(.041)	(.032)	(.035)	(.027)	(.041)	(.032)
ln(1 + Applied tariff/100)					−.785**	−.907**	−.781**	−.900**
					(.17)	(.12)	(.17)	(.12)
Free Trade Agreement			.169**	.094**			.157**	.081**
			(.056)	(.041)			(.055)	(.040)
Partial Scope Agreement			.024	−.072			.057	-.046
			(.15)	(.11)			(.15)	(.11)
Customs Union			.149*	.000			.169*	.014
			(.089)	(.067)			(.090)	(.068)
Economic Integration Agreement			.392**	.314**			.389**	.317**
			(.063)	(.048)			(.063)	(.049)
R-Square	.90	.90	.90	.90	.90	.90	.90	.90

The dependent variable is the natural log of (1 + export), where export is measured in US dollars. Data for odd-number models are 1992–2017 in five year intervals. Data for even-number models are 1992–2018. All models have country-year and pair fixed effects. All models are estimated by log linear model wiht full set of fixed effects using Stata module **reghdfe**, which absorbs multiple levels of fixed effects

*($p < 0.1$), **($p < 0.05$) Standard errors are clustered at country pair

analysis, our dependent variable is the natural log of exports in US dollars plus 1. Standard errors are clustered at the country pair. The results are presented in Table 5. The log linear model provides an estimate of the elasticity of trade with respect to RTA of 0.251 in column (1), which is lower than for the PPML model. It also gives a lower estimate of the absolute value of the elasticity of trade with respect to tariffs.

5.2 Policy Scenario: Trade War

In order to check how our results reported in the previous section are sensitive to the assumptions about the elasticity of trade with respect to RTA and tariffs, we run simulations, where we estimate the welfare gains from the trade war with RTA Scenario (last column of Table 4) for different combinations of elasticities: RTA semi-elasticity in the range 0.1 to 0.5 and the tariff elasticity in the range of −1 to −5. The results are presented in Figs. 1 and 2 for the countries of interest. While welfare gains for China, Korea, and Japan are increasing with a higher elasticity of trade with respect to RTA, the US

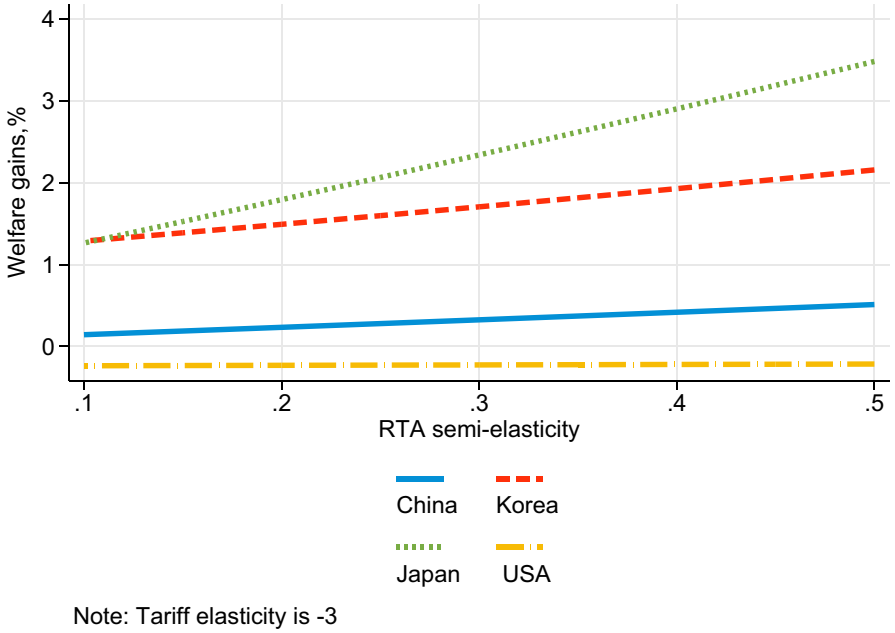

Fig. 1 Welfare gains of the Tariff War and RTA scenario for different semi-elasticities of RTA

welfare stays virtually unchanged, since it depends on the trade elasticity with respect to the tariffs. Welfare gains for China, Korea, and Japan are declining with lower absolute values of the elasticity of trade with respect to tariff, while welfare gains are increasing for the US. It is also clear that while the size of the effect depends on the assumptions for the trade elasticities, the qualitative conclusions remain unchanged.

5.3 Intermediate Goods and Gains From Trade

A large share of imported intermediate goods in production may amplify gains from trade (Arkolakis et al. 2012; Caliendo and Parro 2015). The amplification comes from the input-output loop in the creation of tradable intermediate goods using tradable intermediate goods and decreasing fixed costs (under monopolistic competition).

Our model is focused on final goods and does not capture this effect because of the data limitations and lack of evidence on the potential trade policy scenarios that are specific to intermediate goods in particular. According to the OECD Input-Output database, the share of imports of intermediate goods to GDP is 7% for US, 12% for China and Japan, and 29% for Korea. This indicates that the reported effects are potentially underestimated, particularly for Korea. We leave this question for future research, within a modelling framework with multiple sectors and intermediate goods.

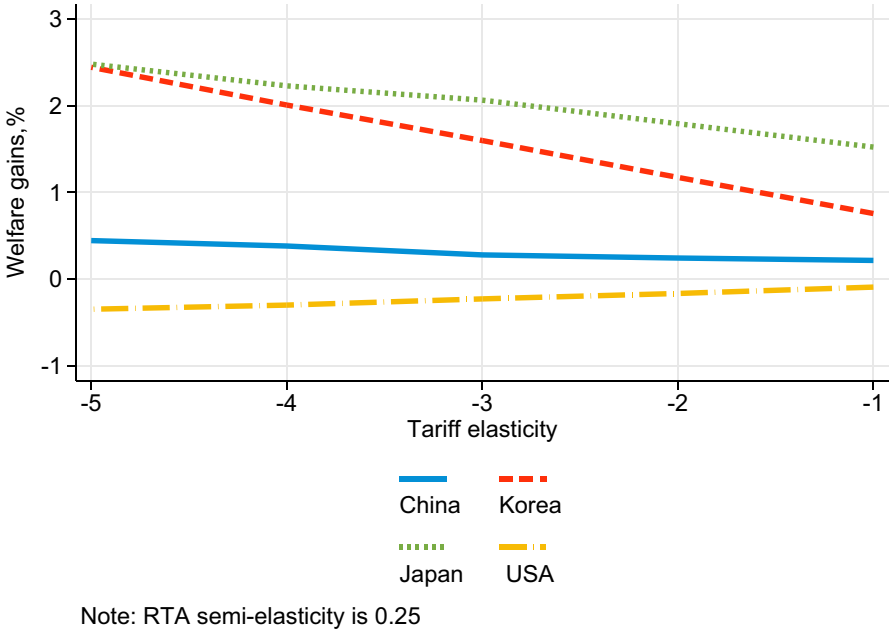

Fig. 2 Welfare gains of the Tariff War and RTA scenario for different tariff elasticities

6 Conclusions

This paper has employed a structural model of global trade to explore the potential impact of the CJK FTA against the backdrop of China-US trade tensions. The original jointly commissioned feasibility study concluded that the CJK FTA would be win-win-win for all three economies. Our results suggest that the US-China trade tensions add further support to the benefits of concluding the FTA negotiations. Furthermore, the signing of the RCEP agreement has created a much more positive attitude towards the potential for concluding the CJK FTA.

Tariff reductions are likely to be easier to negotiate since China, Korea and Japan all favour the use of NTBs when dealing with trade concerns. In fact, we find that tariff reductions contribute to a larger proportion of the welfare gains from an FTA for the three members. As expected, a deeper CKJ FTA would bring more gains, but it is unlikely that the initial agreement will be a CU since they tend to be considerably more difficult to negotiate, making them much rarer than FTAs. Nevertheless, even a relatively shallow trade deal would be worthwhile for China, Korea and Japan.

Appendix

Constrained PPML estimation for 2018, which is used to calculate the baseline levels of the inward and outward multilateral resistance terms are presented in Table 6.

Table 6 Constrained PPML regressions used for scenario simulations

	1	2	3	4
Export				
RTA, Yes = 1	.186	.354	.474	.649
Applied tariff	-4.847	−2.555*	−1.686	−.448
	(.)	(1.38)	(1.40)	(1.44)
Common border	−.035	−.137	−.207*	−.308**
	(.11)	(.11)	(.11)	(.12)
Common language	1.092**	1.190**	1.240**	1.313**
	(.14)	(.13)	(.13)	(.14)
Colonial past	−.072	−.086	−.091	−.098
	(.10)	(.11)	(.11)	(.11)
Common legal	.001	.020	.036	.059
	(.078)	(.078)	(.079)	(.081)
$\ln(dist_{ij})$	−1.053**	−1.074**	−1.083**	−1.098**
	(.047)	(.052)	(.054)	(.056)
R^2	0.9	0.9	0.9	0.9

The dependent variable is export. Data is for 2018. All models have country and destination fixed effects. All models are estimated by PPML using Stata module **ppmlhdfe** developed by Correia et al. (2020)

*($p < 0.1$), **($p < 0.05$) Robust standard errors

Declarations

Conflicts of Interest The authors declared that they have no conflict of interest.

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