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Did Brexiteers consider the business cycle of the UK trading partners?

Abstract

Brexit and post-Brexit trade policies can mean the UK shoring away from Europe, especially given the participation of the UK in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). Since the trading partners are located in a remote region, we consider relevant for the UK integration with the Asian region the synchronization of its trade with the partners' business cycle. We consider eight trading partner economies: Australia, Canada, Japan, New Zealand, Singapore, who are currently among the members of the CPTPP, and India, South Africa, and South Korea. We employ the autoregressive distributed lag methodology for the three-variable model of UK exports to the aforementioned countries, the partner economy's gross domestic product (GDP), and bilateral exchange rate. Additionally, in the case of Canada, Japan, Korea, and South Africa we introduce free trade agreement (FTA) dummies to check for the impact of the FTAs on UK exports, providing further implications for the potential effects of new FTAs. Given that the main results point at positive response of UK exports to the increase in a partner economy's GDP in some countries only and little impact of trade agreement implementation, we suggest that the new British government should consider business cycle synchronization in its trade policy development.

Key words: Brexit; Free Trade Agreements; Trade policy; ARDL; Business Cycle, Bilateral Exchange Rate

JEL Classification: F14, F15, F44

1. Introduction

Brexit—the withdrawal of the UK from the European Union (EU)—has been a topic that drew the attention of the economics community. The decision of the UK to reverse approximately 40 years of increasing integration with the European mainland represents a *unicum* in Europe. Previous cases of leaving the then European Community of Algeria, after becoming independent from France and of Greenland, the Danish autonomous territory, cannot be compared with the case of the UK, given the relevant political presence of the UK on the European and world stage, the size of its economy, its integration with the EU markets, and the integration level accomplished by the EU in the last two decades.

When the referendum to decide whether the UK should leave or remain as a member of the EU was held on June 23, 2016, the “leave” argument was not defined in all its aspects. The political debate turned immediately into a slogan battle where the simple Brexit slogan “Take Back Control” proved to be effective in finding resonance among the British public. The literature on the causes of Brexit identifies national sovereignty, immigration, and misinformation about the role of the EU as the factors that supported the leave campaign (Amorsson and Zoega 2018, Sampson 2017). During the campaign, especially, limiting the intra-EU migrant inflow that many British people identified as a problem and burden, fiscal savings on the UK net contributions to the EU common budget, and higher freedom in setting regulatory environment were pointed out as important merits of Brexit. However, the Brexit front was not united in its position regarding future relations with the EU. The so-called hard Brexiteers promoted the break of any ties with the EU, claiming more opportunities for a Brexit UK. Conversely, mild Eurosceptics advocated leaving the EU without leaving the Single Market.

Further, the re-emergence of the memories of the historical global clout of the UK and growing dissatisfaction with the EU trade policy led Brexiteers to claim that the independent UK could negotiate better deals with global partners. Brexit supporters, for example, the former Chancellor, Lord Lawson, claimed that Brexit would open new opportunities for the UK, encouraging British business to look beyond the Single Market to emerging economies, particularly in Asia (Kuchler 2013). On the opposite front, Fiona Hal, the leader of Lib Dem MEPs, stated that, “It is absurd to suggest that we must somehow choose between trade with Europe and with the rest of the world. [...]” (Sparrow 2013). It seems that Brexiteers neglect the importance of the European market for the UK, although half of all its exports, corresponding to almost 15% of gross domestic product (GDP) (Ottaviano et al. 2014b), are directed to the EU.

As mentioned, one of the economic arguments in favor of Brexit states that the Brexit UK could sign new and better trade agreements with non-EU countries. However, since 2006, the EU trade negotiators have increasingly engaged in free trade agreements (FTAs), opening new opportunities for EU business. For example, in the last decade, the EU signed FTAs with Asian countries, such as South Korea, Singapore, Japan, and Vietnam. Additionally, the EU reached an agreement in principle with China on investment, and it is negotiating agreements with the Philippines and Indonesia (European Commission 2021). In other words, the EU is already expanding its network of FTAs so that the number of additional FTAs signed by the UK compared to the EU could have a marginal weight. Simultaneously, the UK represents a smaller market than the EU; thus, it might find difficulty striking better conditions with the FTA partners than the EU. However, the UK could join the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), a trade agreement between

11 nations located in the Asia Pacific region.¹ Announced as of one of the trade policy objectives of Brexit Britain, it has been indeed hailed as a “major Brexit victory”.

Two aspects of new trade agreements signed by the UK should be factored in to evaluate their benefits. First, the new agreements should not alienate the UK from European standards. Any distance from Europe can be harmful for the UK economy, as evidenced by the rules of origin in the UK-EU Trade and Cooperation Agreement (TCA) – the free trade agreement that has been governing the relations between the two sides since 2021 – which have urged carmakers to request the British government to renegotiate the Brexit deal. Second, the rhetoric regarding the opportunities to be seized on the far-away (usually Asian) fastest-growing markets should consider that culture and distance still represent viable barriers to trade. Further, and most relevant to this paper, the reference to growing markets should not be disconnected from the level of the country’s development and market size affecting a country’s capacity to absorb imports. Overall, business cycle synchronization with the trading partners should be considered. Goto and Hamada (1994, p. 369) state that an FTA is more likely to be created by “natural trading partners” and Kang (2016) observes that the business cycle of trade partners should be considered in evaluating the possibility to sign an FTA with these partners.

Given this background, this paper aims to analyze the responsiveness of UK exports to non-European trading partners’ business cycle based on autoregressive distributed lag (ARDL) methodology. We consider eight partner economies: Australia, Canada, India, Japan, New Zealand, and Singapore, South Africa, and South Korea. The rationale to choose these countries is the following. Australia, Canada, Japan, New Zealand, and Singapore who are among the members of the CPTPP; India and South Africa, the key members of the Commonwealth; South Korea, with which the UK maintains existing trade arrangements of the EU–South Korea FTA. We think that this analysis may be helpful in shedding light on the synchronization of UK’s trade with the business cycle of the existing and potential FTA partners.

The contribution of our paper lies, first, in a model choice - we are using ARDL method instead of the usual gravity model of international trade to investigate the issue of UK exports relationship with a partner economy GDP to shed lights from a different perspective. Further, we try to draw conclusions on possibilities of the UK exports expansion from the perspective of trade responsiveness to a partner economy business cycle. Finally, this paper contributes to the literature on macroeconomic determinants of exports, concentrating on UK bilateral trade with chosen countries.

The rest of the paper is structured as follows. Section 2 describes literature review. It is organized into two parts. In the first part, we review the main literature regarding the effects of Brexit and new UK trade agreements. In the second part, we present literature review regarding business cycles integration related to the Asian region since the UK aims at integrating with that region. Section 3 presents patterns on the UK exports to the economies under study and other data used in analysis. Section 4 describes the methodology and data used for empirical analysis. Section 5 presents and discusses the results. Section 6 provides conclusions and implications.

¹ Before the UK accession, it included Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam.

2. Literature review

The main literature analyzing the trade and welfare effects of Brexit (Dhingra et al. 2017, Ebell et al. 2016, Ebell and Warren 2016, Ottaviano et al. 2014a) found that UK's withdrawal from the EU will negatively affect the British economy. The size of the impact depends on the alternative scenarios—more negative for pessimistic scenarios, which are, in general, labeled Hard Brexit or WTO scenario (i.e., trade between the UK and the EU based on the WTO terms). Additionally, the results of Baier et al.'s (2008) earlier empirical research implied that the UK trade with the EU would decrease by a quarter if the UK withdrew from the EU and joined the European Free Trade Association. However, Minford et al. (2015) found positive results for the UK due to Brexit by allowing the UK further going market liberalization and freer trade. However, their analysis has been criticized by Latorre et al. (2020, p. 73) due to “unrealistic assumptions and an over-simple modeling framework.” Moreover, Booth et al. (2015) found a positive impact of Brexit in the simulated scenario where the UK strikes an FTA with the EU, pursues free trade with the rest of the world, and goes through a deep deregulation process. Sampson (2017) and Latorre et al. (2020) raised doubts about the level of deregulation implied in the study.

Next, we consider research focused on whether FTAs with other countries can compensate for Brexit losses. Using a computable general equilibrium model, Ciuriak et al. (2015) showed that a UK–USA FTA falls short of compensating for the UK costs for Brexit. Moreover, Latorre et al. (2018) extended the analysis to include foreign direct investment agreements with large countries like China, Japan, and India. In their analysis, the harmful effects of Brexit for the UK cannot be compensated. Meanwhile, using a different class of models known as structural “new trade theory” model, Jackson and Shepotylo (2018) considered the scenarios where the UK withdraws from the EU and signs an FTA with the USA as well as where the UK withdraws from the EU and signs FTAs with the largest Commonwealth countries. Their results confirm that these agreements will not compensate for Brexit losses. For a more comprehensive review of the effects of Brexit, interested readers may refer to Sampson (2017) and Latorre et al. (2020).

Regarding distance as a still considerable barrier to trade, Krugman (2018) observed that despite the comparable market size of the US and EU, a deal between the UK and US is not worth the customs union UK had with the EU because the US is far away from the UK. Geographical distance also has a negative effect on business cycle synchronization both because far away countries trade less with each other and because they share fewer trade partners (Azcona 2022). Azcona (2022) also shows that countries with stronger bilateral trade relationships tend to have more synchronized business cycles and that being located in the same continent has a three times larger impact on co-movement due to increased trade with the same third countries than through higher bilateral trade. Another important implication from Azcona (2022)'s analysis is that two countries with a bilateral free trade agreement will see their business cycles become more similar if they join a multilateral trade agreement that boosts commerce with third countries, even if the multilateral trade agreement does not affect their bilateral trade.

Finally, we refer to the rich literature on the determinants of a country exports. Goldstein and Khan (1985) present imperfect substitutes model of a country' imports and exports, where export demanded by the rest of the world is a function of foreign income, domestic currency prices received by exporters and foreign prices expressed in domestic currency, and discuss the specification issues. Krugman et al. (2015) state that the export can be affected by both demand and supply sides. UNCTAD (2005) names foreign market access as critical

determinant of export performance and considers supply-side factors as export constraints especially in developing countries.

Among empirical literature, Delis et al. (2020) estimate the short run and long run elasticities of British exports by sector and destination to changes in British competitiveness (measured by real effective exchange rate - REER) and foreign income. They show that the immediate impacts are smaller than the long run impacts, and that foreign GDP impact is larger than impact of REER changes. Chisiridis and Panagiotidis (2018) estimate three-variable VAR model of Greek exports, real exchange rate and foreign income and show that exports are positively affected by the income variable. In a similar VECM model, Kang (2016) analyses an impact of EU economic growth and won-euro exchange rate on Korean exports to the EU and shows that the exports depend largely on growth in the EU. Cheng (2017) shows that uncertainty shocks of foreign economic policies have larger on exports of South Korea than uncertainty related to domestic policies. Aziz and Ahmad (2018) study UK imports from South Asian countries with error-correction model and show an asymmetric effect of exchange rate volatility on imports from some countries and commodities, whereas increase in British income can have negative impact on its imports. Jiang et al. (2020) study determinants of Japanese exports with VECM model and show that GDP of the rest of the world – a proxy for demand for exports – has the most significant impact on real exports whereas elasticity towards exchange rate is also statistically significant but very small. Labibah et al. (2020) use ARDL model and show positive impact of foreign income on Indonesian exports and Wardhana (2011) shows that GDP of China and exchange rate have statistically significant impact on Indonesian exports to this country.

3. Patterns in the UK exports

Figure 1 presents the real export values of the UK to each partner economy under analysis between 2010 and 2020. Vertical lines on the plots for Canada, Japan, Korea, and Singapore point at the year when trade agreement between the EU and each country entered into force: the EU–Canada Comprehensive Economic and Trade Agreement (CETA) has been provisionally in force from 2017; the EU–South Korea FTA had provisionally applied since July 2011 before it was formally ratified in December 2015. Moreover, EU–Japan Economic Partnership Agreement (EPA) and EU–Singapore FTA (EUSFTA) have been in force since February 2019 and from November 2019, respectively. Additionally, some provisions of the EU–South Africa Trade, Development and Cooperation Agreement had been applied since January 1, 2000, and it entered fully into force on May 1, 2004, both before the starting point of our data sample. It was later replaced with a more ambitious agreement: the EU–Southern African Development Community (SADC) EPA signed in June 2016 by the EU and South Africa, Botswana, Lesotho, Mozambique, Namibia, and Eswatini (formerly Swaziland). The EPA came provisionally into force in October 2016 (Mozambique provisionally applies it since February 2018). We mark this point on the graph as a date of a new more comprehensive agreement that tackles in more details the obstacles to trade liberalization.

The UK has agreed with partners to extend the provisions of the EU deals, that bound the UK while it was a member of the EU, after Brexit. In particular, the UK maintains the existing trade arrangements with Korea, as agreed in continuity FTA between the two countries signed on August 22, 2019. Canada and the UK decided to roll over the CETA to the UK–Canada FTA (Canada–UK Trade Continuity Agreement signed on December

9, 2020) and committed to entering into subsequent negotiations to work toward concluding a new comprehensive trade agreement tailored to the bilateral relationship. Further, the UK signed the Comprehensive EPA with Japan on October 23, 2020, representing the UK's first huge post-Brexit deal. Finally, the UK signed the FTA with Singapore that entered into force on February 11, 2021. Under its provisions, Singapore and UK companies enjoy the same benefits that they have been receiving under the EUSFTA and follow the same timeline for tariff reduction. In September 2019, the UK finalized talks with South Africa and some other African countries on trade continuity after Brexit (Southern African Customs Union, Mozambique–UK EPA), which entered into force in January 2021.

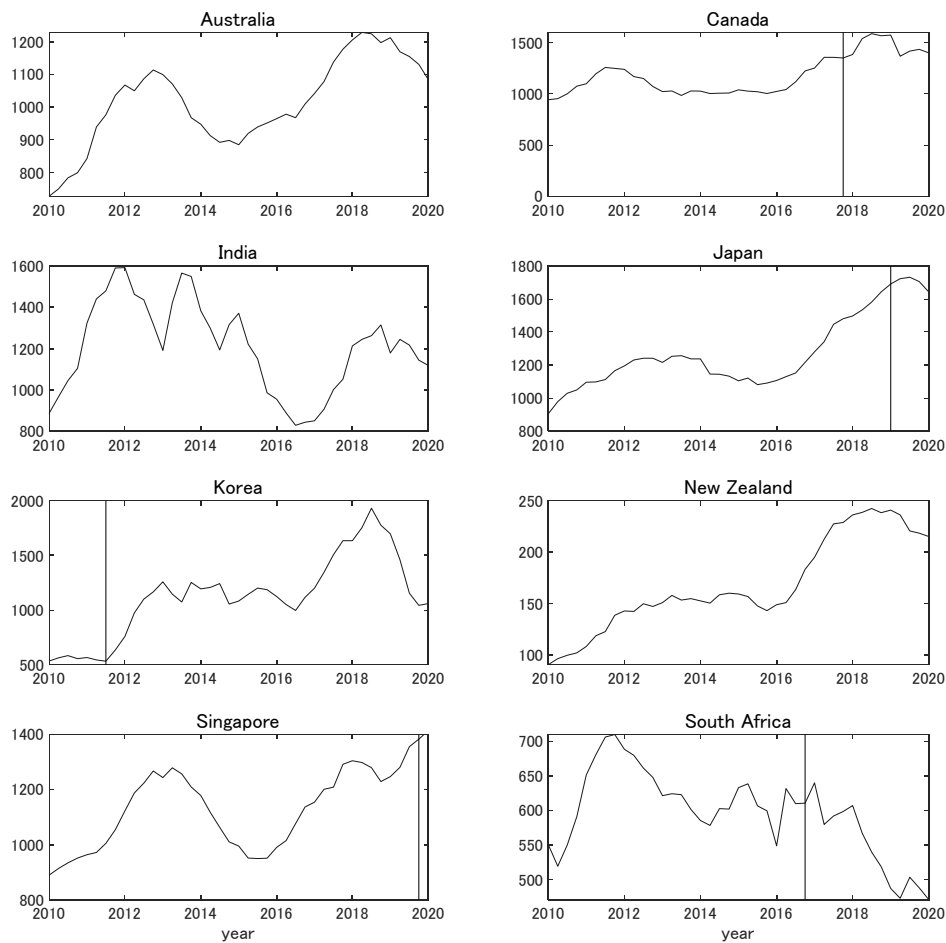


Fig. 1 Real exports of the UK to the partner economies (million British Pounds)

Source: authors' estimations based on the raw data from ONS (see Section 4 for details on data)

We can observe some common patterns in the exports data. With exception of India and South Africa, the UK's real exports data show rather upward trend through 2010s, albeit not steady. The exports tend to increase up to mid-2010s when we observe smaller or bigger fall in trade flows. Exports recover in most cases around

2016 or 2017 and reach higher levels than seen in the first half of the sample. In case of India and South Africa, the peak in exports takes place in the first half of 2010s, after which the considerable decrease in trade occurs. Exports to India recovers somehow from 2017 but it does not reach the high levels from 2012 and 2013. Meanwhile, in South Africa the downward trend lasts from 2012 until the end of the sample at the beginning of 2020. Another common pattern, visible to various extent in the trade data for the countries, is the fall in the UK exports that starts around mid-2018 or 2019.

Comparing the size of exports before and after implementation of the FTA, we can observe an especially high increase in the export to Korea and, to some extent, to Canada. In the former country, the amount of trade rises considerably soon after the provisional agreement application. Exports stay at remarkably higher levels in the following years, before a considerable fall in mid-2018. In the case of Canada, the increase in exports is not so significant and is relatively short-lived due to already mentioned fall in the UK exports, which in case of Canada started around 2019. In case of Japan and Singapore, there seems to be some increase after the trade agreement implementation but very short-lived for Japan and too short data period does not allow us to make more concrete observations. Finally, we cannot observe any increase in exports to South Africa following the new trade agreement; the exports seem to be on a downward trend.

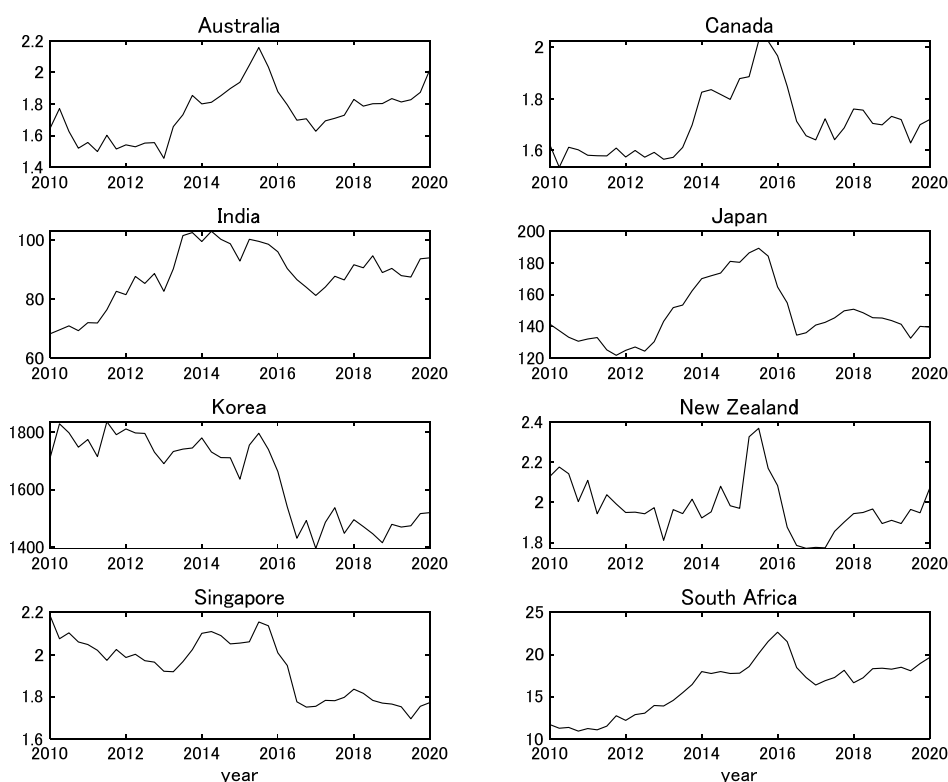


Fig. 2 Real exchange rates between British Pound and each partner economy currency (amount of currency per one GBP)

Source: authors' estimations based on the raw data from Bank of England (see Section 4 for details on data)

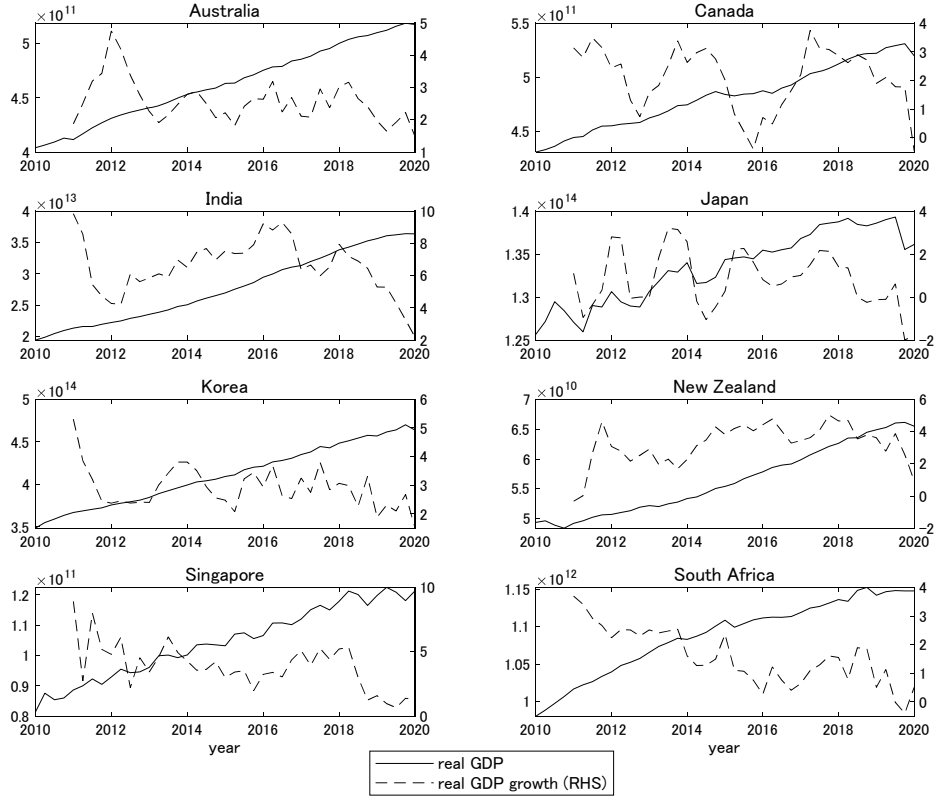


Fig. 3 Real GDP of the UK's partner economies (domestic currency, growth rate on RHS)

Source: data from St. Louis Fed and Singapore Department of Statistics (see Section 4 for details on data)

Further, Figures 2 and 3 present real exchange rates, and real GDP level and growth, respectively, of the eight countries under consideration. We can observe that the British pound has generally been appreciating against the partner economies in the first half of 2010s. The exceptions are Korean won and Singapore dollar against which pound shows depreciating trend also in the first half of 2010s. In all cases 2015-2016 bring the sharp depreciation of the British currency, which might be connected to the uncertainty before and after the Brexit referendum. The sterling was depreciating from the end of 2015, and fell sharply following the EU referendum vote in the second quarter of 2016.² GDP growth rates tend to fluctuate but for many countries, most prominently South Africa and Singapore, we observe rather falling trend.

4. Empirical methodology and data

This section describes the model implemented for our empirical analysis of the responsiveness of the UK exports to the economic situation in the eight partner economies and the data used for the analysis.

²

<https://www.ons.gov.uk/economy/inflationandpriceindices/articles/theimpactofsterlingdevaluationonpricesandtunoverinthemanufacturingsector/2017-09-15>

To investigate the issue of responsiveness of UK exports to trading partners' business cycle from a different perspective than commonly-used trade models, we estimate error-correction models for UK exports to each trading partner considered. Specifically, we estimate autoregressive distributed lag (ARDL) model ARDL ($p, q, \dots, q$):

$$y_t = c_0 + \sum_{i=1}^p \varphi_i y_{t-i} + \sum_{i=0}^q \beta'_i x_{t-i} + u_t \quad (1)$$

c_0 is an intercept, y_t is dependent variable, UK exports in our case, and x_t is a vector of explanatory variables. The ARDL model allows variables y_t, x_t to be purely $I(0)$, purely $I(1)$, or cointegrated. Further, the optimal lag orders p and q can differ across regressors and can be obtained by minimizing a model selection criterion, e.g., the Akaike information criterion (AIC) or the Bayesian information criterion (BIC).

The equation (1) can be represented in the following error-correction form:

$$\Delta y_t = c_0 - \alpha(y_{t-1} - \theta x_{t-1}) + \sum_{i=1}^{p-1} \vartheta_i \Delta y_{t-i} + \omega' \Delta x_t + \sum_{i=1}^{q-1} \delta'_i \Delta x_{t-i} + u_t \quad (2)$$

with the speed-of-adjustment coefficient $\alpha = 1 - \sum_{i=1}^p \varphi_i$ and the long-run coefficients $\theta = (\sum_{j=0}^q \beta_j) / \alpha$.

Thus, this model estimation allows us to check short-run dynamics ($\vartheta_i, \omega, \delta_i$), test for the existence of the long-term equilibrium between the variables of interest (bounds test by Pesaran et al. 2001) and check the equilibrium vector (θ), and learn the speed of reversion to long-run relationship when the equilibrium is distorted (α). We describe the dynamic evolution of UK exports (y_t) over time, irrespective of whether an equilibrium relationship with other variables (x_t) exists, eliminating with this model the risk of potentially running a spurious regression.

Following standard macroeconomics theory and literature on the macroeconomic determinants of a country exports (e.g., Chisiridis and Panagiotidis 2018, Delis et al. 2020, Kang 2016), in the benchmark specifications, we regress UK exports on the real GDP of each partner economy: Australia, Canada, India, Japan, Korea, New Zealand, Singapore, and South Africa – which is used as a measure of foreign income and thus foreign demand for UK exports, and bilateral real exchange rate between the British pound and the local currency – considered a proxy of UK competitiveness in trade with a partner economy.

In the next step, we also add to the models for Canada, Japan, Korea, and South Africa the dummy variable equal to 1 for the period after (provisional) entry into force of trade agreement between the EU and these three countries. The dummy enters the models as an exogenous variable.

All data are expressed at quarterly frequency and in logarithms. The sample period starts in the first quarter of 2010 and ends in the first quarter of 2020. Thus, we start the sample after the global financial crisis and exclude the impact of the COVID-19 pandemic on trade and economy from our analysis. All variables for the empirical analysis are in real terms, to insulate the measurements from the impact of inflation. Real GDP in local currency data is obtained from St. Louis Fed and Singapore Department of Statistics in the case of Singapore. Export data in British pounds come from the Office of National Statistics and are scaled using UK GDP deflator to generate real export flows, the step following Baier et al. (2008). Meanwhile, the bilateral exchange rate data are taken from Bank of England. We use CPI indices from St. Louis Fed and Singapore Department of Statistics for the UK and the partner economies to estimate the real bilateral exchange rates.

The choice of optimal lag for ARDL models is based on the Bayesian information criterion.

5. Estimation results

This section describes and discusses the empirical results based on the aforementioned model. First, we present the impact of each partner economy's GDP on the UK exports in a short and long run, and check for the existence of long-run relationship based on the benchmark model. Then, we show the impacts of FTAs on the exports to Canada, Japan, Korea, and South Africa based on the extended model.

Table 1 presents results from ARDL model in its error-correction form (equation 2). The top of each column shows the type of ARDL model estimated – the number of optimal lags for exports, exchange rate, partner GDP, respectively. The table reports coefficients of the adjustment term, coefficients for lags of variables in levels (long-term relationship) and coefficient for the first differences of the variables (short-term relationship). Additionally, the last row shows results from Pesaran et al. (2001) bounds test where null hypothesis is no level (i.e., long-term) relationship.

First, we observe that five countries in our sample show the long-term relationship between UK exports and a partner country GDP. The coefficient for variable in levels is statistically significant and the positive relationship seems to be especially strong in Japan, followed by Canada, New Zealand, and Australia. In India, on the other hand, the coefficient is negative – the result contrary to economic theory but also found sometimes in previous literature (e.g., Aziz and Ahmad 2018 for negative impact of UK GDP on its imports from Bangladesh).

Nevertheless, in case of South Korea, South Africa, and Singapore we cannot reject the null hypothesis of the bound test – in these three countries there seems to be no long-term relationship between UK exports and partner country GDP and bilateral exchange rate.³ It seems that the cointegrating relationship among GDP, exports, and exchange rates in the case of British bilateral exports is not a rule. Lack of this cointegration stays in contrast with the previous studies that have often found a cointegrating relationship between trade, exchange rate, and GDP (e.g., Jiang et al. 2020). This can be explained, in part, by the fact that we are estimating bilateral relationships, not the overall trade of a country, like Jiang et al. (2020) did. The cointegrating relationship between a country's total exports and real effective exchange rate is, in our opinion, more plausible than such a relationship occurring for each separate trading partner. The existence or non-existence of the long-term relationship might also be affected by the data period and data frequency used for empirical analysis.

The short-term relationship between UK exports and a partner country GDP does not seem to be common. There is the positive and statistically significant coefficient for Australia, Canada, and Japan only. In New Zealand the relationship becomes significant only with a lag. In India the coefficient is negative at 5% level. In other countries there is no statistically significant short-term relationship between the two variables.

Finally, the adjustment terms for countries in which we have the long-term relationship are relatively high, showing that after exports, exchange rate and a partner GDP leave the equilibrium state, the adjustment takes place at rather fast pace of 70-80% of the gap per quarter.

Generally, whereas Delis et al. (2020) show higher elasticity of British exports to foreign income in longer term, our results show important differences across the countries. UK exports to Australia seems to react strongly to Australia's GDP in short run but not as much in a long run. In case of Canada and Japan the responses

³ This result does not change even if we use the Akaike information criterion for the optimal lag choice instead of BIC used for the results presented in this paper. This lack of cointegration for some countries is also confirmed in the unit-root and cointegration tests we carried out before VAR estimations shown in the Appendix.

Table 1 Results for the benchmark ARDL models

	Australia	Canada	India	Japan	Korea	New Zealand	South Africa	Singapore
	ARDL(1, 0,1)	ARDL(1, 0,0)	ARDL(1, 1,0)	ARDL(1, 1,0)	ARDL(1, 0,0)	ARDL(4, 1,4)	ARDL(5, 2,6)	ARDL(2, 0,0)
ADJ								
lag_expo	-0.790***	-0.844***	-0.732***	-0.784***	-0.467***	-0.842***	-0.789	-0.467***
rts	(0.164)	(0.176)	(0.162)	(0.140)	(0.145)	(0.175)	(0.525)	(0.152)
LR								
lag_exrat	-0.818***	-1.182***	-0.618	-0.815***	-1.105	-2.129***	0.450	-2.558***
e	(0.255)	(0.398)	(0.815)	(0.138)	(1.982)	(0.481)	(0.384)	(0.791)
lag_gdp	0.773**	1.791***	-1.082**	4.490***	0.109	1.231***	-4.910**	-0.535
	(0.347)	(0.564)	(0.491)	(0.619)	(2.154)	(0.235)	(2.259)	(0.369)
SR								
D.exrate	-0.646**	-0.998**	1.290	0.179	-0.516	0.156	-0.513	-1.195***
	(0.241)	(0.408)	(0.975)	(0.282)	(0.912)	(0.381)	(0.544)	(0.388)
Lag_							-0.616	
D.exrate							(0.580)	
D.gdp	10.110**	1.512**	-0.792**	3.518***	0.051	3.369	1.167	-0.250
	(4.460)	(0.571)	(0.362)	(0.759)	(1.011)	(2.997)	(7.965)	(0.168)
Lag_						14.702***	9.109	
D.gdp						(3.383)	(7.977)	
Lag2_						-6.636**	-2.553	
D.gdp						(2.854)	(8.459)	
Lag3_						7.103**	7.152	
D.gdp						(2.827)	(9.275)	
Lag4_							-7.757	
D.gdp							(7.353)	
Lag5_							-0.056	
D.gdp							(10.807)	
Constant	2.969**	-0.465	10.872**	-7.383***	6.871	0.629	111.352	6.996**
	(1.304)	(2.138)	(4.225)	(2.386)	(10.676)	(0.971)	(70.173)	(2.575)
Observations	37	37	37	37	37	37	35	37
Log-likelihood	38.808	22.856	5.364	46.971	0.125	45.126	29.745	42.214
R2	0.445	0.413	0.421	0.507	0.261	0.788	0.726	0.496
Adj-R2	0.376	0.359	0.348	0.446	0.194	0.695	0.510	0.432
Bound test for level relationship	Reject H0	Reject H0	Reject H0	Reject H0	No reject	Reject H0	No reject	No reject

Notes: Bound test for level relationship: Pesaran, Shin, and Smith (2001) bounds test, H0: no level relationship;

Lower number of observations for South Africa due to a need to set aside more observations for the optimal lag selection

Coefficients: ADJ: adjustment term, LR: long-term (level) relationship vector; SR: short term relationship; Standard errors in parentheses; *p < 0.1, **p < 0.05, ***p < 0.01

are more balanced in both perspectives. In New Zealand the reaction takes place mostly in longer run. UK exports to Korea and Singapore does not seem to depend on the two countries' business cycle and in case of

India and South Africa, the response of UK exports to the GDP growth in these countries is actually negative. These results are robust to model specification, as we show in Appendix where we use VAR model as robustness check.

The benchmark models are next extended by adding as exogenous variable an FTA dummy equal to 1 for the period after the EU's negotiated FTAs with the four countries under study went into force, either provisionally or fully: Canada, Japan, South Korea, and South Africa.⁴ These FTAs directly impacted the UK when it was still a member of the EU and continued to affect the UK's export by the UK either maintaining existing trade arrangements or signing similar FTAs with the four countries.

Table 2 Results for ARDL models with FTA dummy

	Canada	Japan	Korea	South Africa
	ARDL(1,0,0)	ARDL(4,1,0)	ARDL(1,0,0)	ARDL(2,1,4)
ADJ				
lag_export	-0.876*** (0.183)	-0.539*** (0.158)	-0.484*** (0.153)	-1.271*** (0.312)
LR				
Lag_exrate	-1.034** (0.436)	-1.365*** (0.351)	-1.933 (2.811)	0.840 (0.545)
lag_gdp	1.166 (1.001)	6.940*** (1.591)	0.694 (2.488)	-6.347** (2.517)
SR				
D.exrate	-0.906** (0.431)	-0.029 (0.256)	-0.936 (1.391)	-0.203 (0.609)
D.gdp	1.021 (0.887)	3.738*** (0.691)	0.336 (1.244)	1.893 (7.116)
FTA	0.070 (0.097)	-0.088* (0.048)	-0.107 (0.264)	0.260 (0.234)
Constant	1.952 (3.960)	-9.641*** (2.230)	8.834 (11.857)	228.463** (98.016)
Observations	37	37	37	35
Log likelihood	23.16	54.326	0.219	25.723
R2	0.422	0.669	0.265	0.634
Adj R2	0.35	0.574	0.173	0.481

Notes: Coefficients: ADJ: adjustment term, LR: long-term (level) relationship vector; SR: short term relationship (only contemporary first differences reported in the table; higher lag orders not reported for the sake of brevity); Standard errors in parentheses; *p < 0.1, **p < 0.05, ***p < 0.01; Lower number of observations for South Africa due to a need to set aside more observations for the optimal lag selection

Table 2 holds the results. They show that in all countries FTA does not have positive impact on the UK exports to a partner country. In case of Japan the coefficient is even slightly negative and statistically significant. These results might be partly due to the rather short sample period after the FTA implementation, especially in

⁴ The dummy variables become one from Q4 2017 for Canada, Q3 2011 for Korea, Q2 2019 for Japan, and Q4 2016 for South Africa. We exclude from the analysis Singapore with which the agreement came into force in November 2019, i.e., just one quarter before the end of our sample.

case of Canada and Japan. As Figure 1 showed, UK exports tended to fall in 2019 when EU-Japan EPA was implemented which might be a reason for statistically significant negative coefficient and might have affected also other country, especially Canada, results. Overall, these results empirically confirm our observations based on the data in Figure 1 for the three latter countries—exports to Canada increases after FTA implementation to very small extent and in Japan and South Africa we cannot observe much positive impact of the trade agreements on the UK exports. Even though the data showed visible increase in exports to Korea after the trade agreement entered into force, the model does not confirm it—the reason might lie in very weak fit of the ARDL model for Korea, as observed also in Table 1 by lack of long-term relationship and very low R-squared and log-likelihood statistics.

6. Conclusions and implications

Although never firmly anchored in Europe, the United Kingdom had progressively moved closer thanks to its participation in the process of European integration. However, Brexit has once again alienated the UK from Europe. Furthermore, the discussion inside the British conservative government to scrap European laws, and the participation of the UK in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership pushed the UK further away from Europe.

This paper implements ARDL methodology to analyze the responsiveness of the UK exports to the economic situation in the eight partner countries, namely, Australia, Canada, India, Japan, Korea, New Zealand, Singapore, and South Africa. We used the Brexit, UK's aim to develop trade connections and negotiate trade agreements with these countries, and the fact of UK's accession into CPTPP as a background.

The high responsiveness of exports to GDP growth in a partner country would point at the high synchronization of the UK's exports with the trading partner business cycle and might offer hopes that removing barriers through trade agreements would bring the UK benefits from the economic growth in these countries. The responses of UK exports to partner's business cycles are, however, very unequal. We can see that UK exports is not well synchronized with growth in a highest-growing countries like India and South Africa. Rather, the most positive reaction is seen for the highly-developed economies like Japan, Australia, Canada, or New Zealand.

Altogether, our analysis offers limited optimism regarding UK exports developments and the impacts of the potential new trade agreements of the UK. Although the small sample of countries constrains the generalizations, FTAs with highly-developed economies like Japan, Australia, Canada, or New Zealand with whose business cycle the UK exports is better synchronized might have higher positive effects in the form of larger exports. Thus, similarly to Kang (2016), we can conclude that the business cycle of a partner country should be taken into consideration when forming trade strategies and seeking new trade agreements.

Given these business cycle differences and following the previous literature on the impacts of Brexit, which finds that FTAs of the UK with other partners cannot compensate for Brexit losses, we can conjecture that it is not advantageous for the UK to shore away from the EU, by trying to replace its economic ties with European partners with new trade agreements with other countries. While we assume that the membership in the CPTPP itself could be assessed positively, the remoteness of the Asia-Pacific region and different trade structures may be a hindrance to further synchronization for the UK with that region, hindering higher trade integration benefits.

Consequently, the reassessment of Global Britain and its relationship with the EU will be one of the most important tasks of the new British government.

Data availability

The trade, exchange rate, GDP data as well as GDP deflator and CPI data that support the findings of this study are available from:

- Trade: Office for National Statistics, UK, <https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/datasets/uktradeingoodsbyindustryandcommodityexports>
- Exchange rates: Bank of England, <https://www.bankofengland.co.uk/boeapps/database/index.asp?Travel=NixSTxTix&levels=2&XNotes=Y&A3790XNode3790.x=9&A3790XNode3790.y=13&Nodes=&SectionRequired=1&HideNums=-1&ExtraInfo=false#BM>
- Real GDP: St. Louis Fed, <https://fred.stlouisfed.org/categories/106>; Singapore Department of Statistics, <https://tablebuilder.singstat.gov.sg/table/TS/M015661>
- UK GDP deflator: St. Louis Fed, <https://fred.stlouisfed.org/series/GBRGDPDEFQISMEI>
- CPI indices: St. Louis Fed, <https://fred.stlouisfed.org/categories/9>; Singapore Department of Statistics, <https://tablebuilder.singstat.gov.sg/table/TS/M212881>

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Authors' contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by both authors. The first draft of the manuscript was written by both authors and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Competing Interests The authors have no competing interests to declare that are relevant to the content of this article

Ethics approval and consent to participate Not applicable

Consent for publication Not applicable

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