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Determinants of UK-Japan and UK-Korea Trade in the Light of Trade Agreements, Brexit and COVID-19 Pandemic

Agata Wierzbowska[a]
Chae-Deug Yi[b]

This study applies the vector autoregressive method to examine the determinants of UK-Japan and UK-Korea trade since the 2000s. Given the European Union's (EU) implemented trade agreements with the two countries and the UK's individual agreements with Japan and Korea, which came into effect when the UK left the EU, we look at the developments in and determinants of the UK's bilateral trade with Japan and Korea. In addition to estimating the impact of the economic situation and real exchange rate on the trade, we also look at the impact of the aforementioned EU trade agreements and Brexit. Results show that the UK exports to both countries are considerably more dependent on the partner's economic situation and exchange rate than imports. This finding suggests that UK's ability to extend its exports to the two countries lies largely beyond the scope of its own efforts. UK exports are also more affected by the implementation of trade agreements than imports.

Keywords Brexit, Free-Trade Agreements, VAR

1 Introduction

In January 2021, the UK left the European Union (EU) partly because of dissatisfaction with the EU trade policy. The UK also claimed that, through Brexit, Britain could negotiate better deals with global partners, encouraging British businesses to look beyond a single market to emerging economies, particularly in Asia (Kuchler 2013). Thus, for its post-Brexit global strategy, the UK has focused, amongst others, on maintaining and further developing relations with Japan and South Korea, taking the EU trade agreements with the two countries as the starting

a Graduate School of Economics, Kobe University, wierzbowska@econ.kobe-u.ac.jp
b College of Economics and International Trade, Pusan National University, givethanks@pusan.ac.kr

point. The UK-Korea free-trade agreement (FTA) was signed in August 2019 and came into effect in January 2021, maintaining existing trade arrangements of the EU-Korea FTA that was provisionally implemented in July 2011 and went into force formally in December 2015. The EU and Japan implemented the EU-Japan Economic Partnership Agreement (EPA) in February 2019, whereas the UK and Japan signed their agreement in October 2020, which also came into effect in January 2021, in a form that largely follows the EU-Japan EPA.

Given this background, we are interested in examining the determinants of UK exports and imports with Japan and South Korea since the 2000s. Thus, we employ the vector autoregressive (VAR) method to check how bilateral trade flows react to changes in the real economy and exchange rate. Furthermore, we estimate extended models with dummy variables to examine the impacts of trade agreement implementation and Brexit.

Numerous papers analysed impact of the trade agreements with South Korea and Japan (e.g., Cherry 2018, Felbermayr et al. 2019, Yoshii and Yi 2021 for the EU trade agreements, and Yi 2022 for the UK trade agreements). Also numerous studies used the VAR methodology to analyse the determinants of the UK, Japanese and Korean trades. For instance, Zang and Baimbridge (2012) investigated the relationships amongst exports, imports and economic growth in South Korea and Japan. They found that GDP growth has a positive relationship with imports of both countries. Meanwhile, economic growth has a negative effect on export growth in South Korea, whereas in Japan, exports facilitate growth, but such growth fails to increase exports. Fadzil and Masih (2017) also made similar observations for Japan. Jiang et al. (2020) showed that the yen depreciation because of Abenomics has not boosted exports owing to the low speed of export adjustments to exchange rate changes.

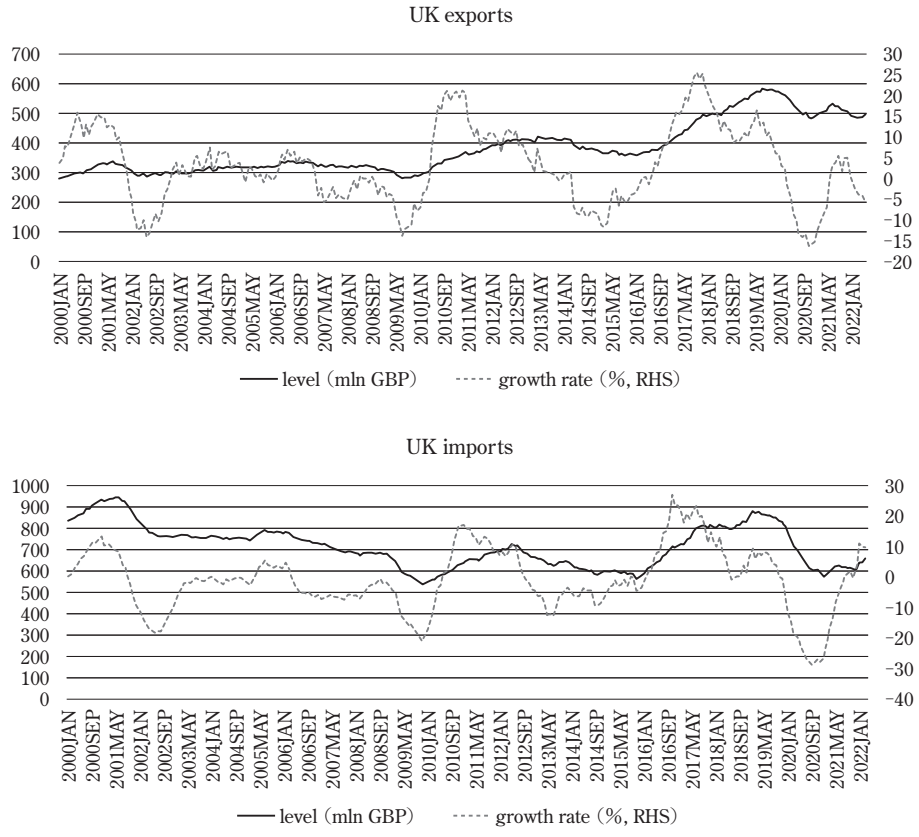
However, to the best of our knowledge, only a few studies considered bilateral trade and the context of trade agreements and Brexit. Kang (2016) showed that Korean exports to the EU decreased after implementing the FTA because of the low GDP growth in Europe at the time and weak euro, whereas Korean imports increased. Choudhry (2008) found that real exchange rate volatility has facilitating effect on UK imports from Japan. This study provides additional evidence on what factors shaped UK bilateral trade with Japan and South Korea, and contributes to the literature by considering also the impact of Brexit.

The rest of the paper is structured as follows. Section 2 presents the data on UK-Japan and UK-Korea trade flows. Section 3 describes the model and data used for empirical analysis. Section 4 holds the estimation results, and Section 5 concludes the study.

2 UK trade with Korea and Japan

This Section describes the developments in the UK bilateral trade with Korea and Japan since 2000. Figure 1 presents the data on UK bilateral trade with Japan. UK exports have been rather stable in the 2000s and increased slightly at the beginning of the 2010s and then again from the mid-2010s. Around the time of the EU-Japan EPA implementation, i.e., in 2019, the exports actually went down significantly, and we can observe a slight and short-lived recovery during the second half of 2020. UK imports from Japan, on the other hand, were generally declining through the 2000s, but the 2010s witnessed similar developments as exports: an increase from 2010 to 2012, followed by a decrease lasting until 2016, then another increase and a significant decline from mid-2019. Imports seem to have just slightly recovered around mid-2021 but are still far from pre-2019 levels.

Figure 1. UK exports and imports to Japan and year-on-year growth rate

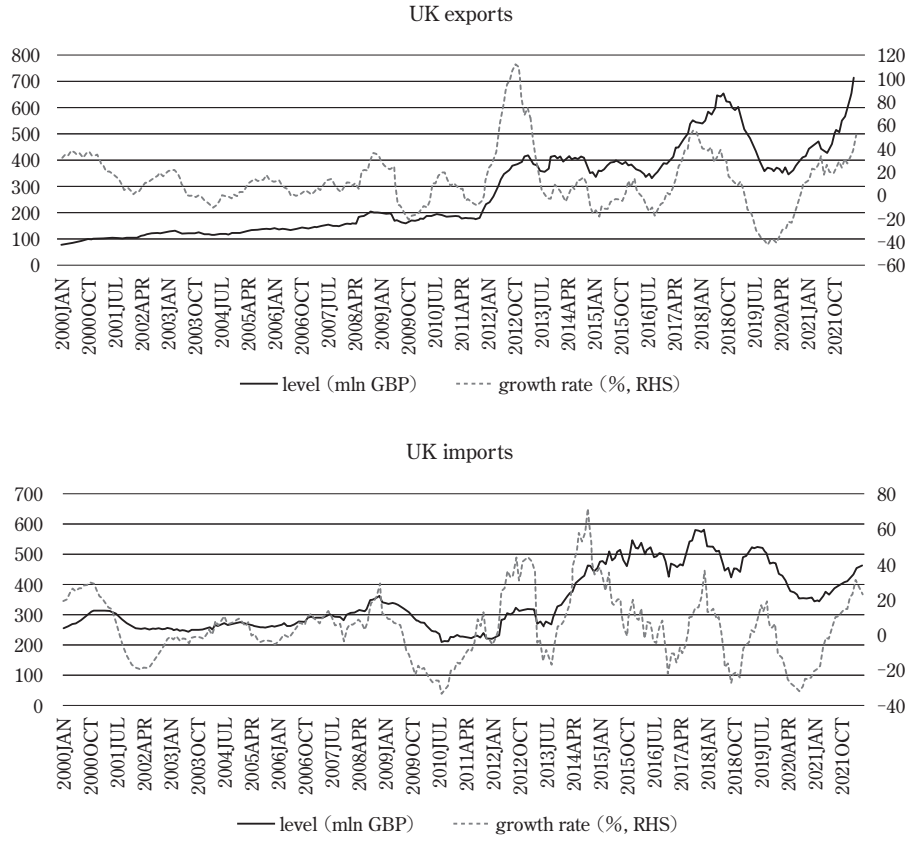


Source: ONS, authors' estimations; exports and imports presented as 12-month moving averages

Generally, we can observe that the EU-Japan EPA has no positive impact on the export and import data. Exports and imports start falling down around the time of its implementation. Thus, the decline started before the COVID-19 pandemic, and thus, it is unclear how much of the fall was caused by the global health crisis. We can only assume that the extent of the fall, including the delayed recovery in trade, was in part caused by the impact of the pandemic on global trade or the UK's withdrawal from the EU.

Figure 2 presents the UK exports to and imports from South Korea. We can observe that UK exports were increasing slightly but steadily through the 2000s and increased visibly in mid-2011 at the time of provisional implementation of EU-Korea FTA and in 2016 after the full FTA implementation in December 2015. Between 2011 and 2016, the trade shows a slightly downward trend but at considerably higher levels than exports before 2011. The UK exports sharply decreased in 2018, but we can observe no visible drop because of the COVID-19 pan-

Figure 2. UK exports and imports to Korea and year-on-year growth rate



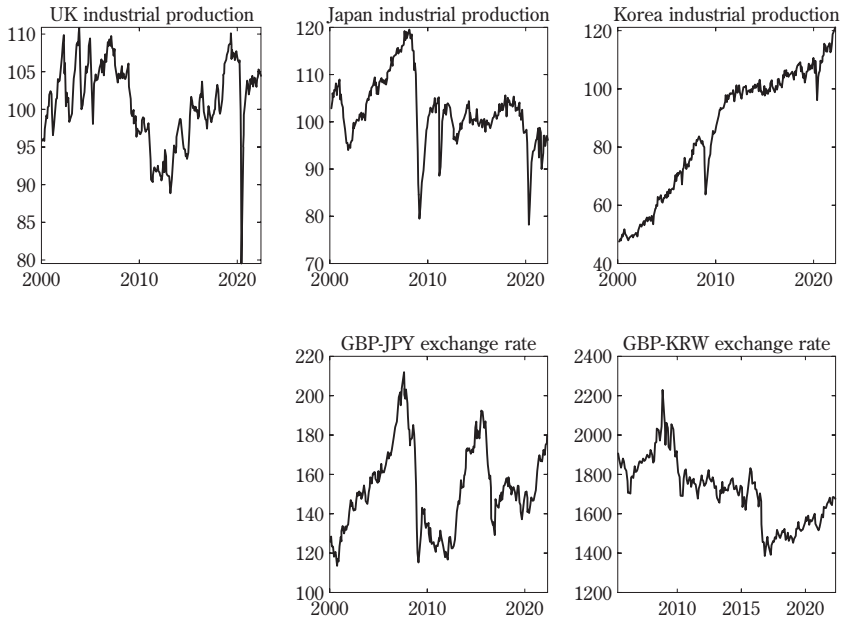
Source: ONS, authors' estimations; exports and imports presented as 12-month moving averages

demic and Brexit. Exports also started recovering already in mid-2020 and then increased again in mid-2021.

UK imports were also increasing through the 2000s but with a visible decrease around the time of the global financial crisis (GFC). In the 2010s, UK imports increased around 2013, i.e., not directly after the provisional implementation of EU-Korea FTA. Afterwards, the imports are rather fluctuating with no visible trend. Moreover, the trade fell visibly before the pandemic and Brexit took place — around 2019, and it recovered in early 2021.

Figure 3 presents the developments of industrial production indices in the UK, Japan and South Korea and the real exchange rates of Japan's and South Korea's currencies with the British pound. Industrial production in South Korea has generally been growing since 2000, with deep and sharp falls at the time of the GFC and COVID-19 pandemic. In the UK and Japan, we can observe growth in the 2000s, followed by a sharp fall because of the GFC. The 2010s brought an upward trend in the UK and rather flat developments in Japan, both followed by a recession at the time of the pandemic. The British pound depreciated against the Korean won after GFC until 2016, when the trend turned upward. Against the Japanese yen, there are appreciation periods up to the GFC, and from 2012 to 2016, both ended with sharp depreciations.

Figure 3. Industrial production and real exchange rate data



Source: St. Louis Fed, Bank of England, authors' estimations

3 Data and model

In this Section, we present the model and data used to analyse determinants of the UK trade with Japan and Korea.

The empirical analysis is based on a simple VAR model. First, we construct the following structural VAR model:

$$B(L)X_t=\varepsilon_t, \quad (1)$$

where X_t is a vector of endogenous variables, $B(L)=B_0-B_1L-\cdots-B_pL^p$ is a pth order lag polynomial of a coefficient matrix $B_m(m=0, \cdots, p)$ (the diagonal elements of the matrix of contemporaneous coefficients B_0 are equal to 1) and ε_t is a vector of serially uncorrelated structural disturbances with a mean of zero and a covariance matrix of $\sum_\varepsilon=I$.

The structural model above can be described by the following reduced-form VAR:

$$A(L)X_t=u_t, \quad (2)$$

where $A(L)=I-A_1L-\cdots-A_pL^p$ is a pth order lag polynomial of a coefficient matrix $A_m(m=1, \cdots, p)$, and $u_t=R\varepsilon_t$ is a vector of serially uncorrelated reduced-form innovations with a mean of zero and a covariance matrix of $\sum_u$. We use Cholesky decomposition of the reduced-form covariance matrix $\sum_u(\sum_u=R^{-1}R^{-1'})$ to identify structural shocks ε_t.

In the basic specification, we follow Kang (2016) and include the importing country's economic situation as represented by the industrial production index, UK export or import data and bilateral real exchange rate. Specifically, the data vectors for each model are as follows:

(*a*) $X1_t=(prodJapan_t, UKexpJapan_t, GBPJPY_t)$

(*b*) $X2_t=(prodUK_t, UKimpJapan_t, GBPJPY_t)$

(*c*) $X3_t=(prodKorea_t, UKexpKorea_t, GBPKRW_t)$

(*d*) $X4_t=(prodUK_t, UKimpKorea_t, GBPKRW_t)$

For each model, we estimate and present impulse-response functions (IRFs) and historical decomposition analysis results.

Then, we also estimate extended models to check the impact of trade agreements and Brexit on bilateral trade. The extended models for the trade agreement impact include the FTA dummy, which takes a value of 1 for the time after the EU-Japan EPA went into force (February 2019) for Japan and after the EU-Korea FTA went into force (provisional entry in July 2011 and full implementation in December 2015) for Korea. For the Brexit impact, we include in a model dummy variable that takes a value of 1 from January 2021.

All data are of monthly frequency, in levels and expressed in logarithms. Therefore, we allow

for implicit co-integration relationships in the data. However, as Sims et al.（1990）stated, obtaining consistent estimates of the parameters is still possible. VAR models are estimated with three lags in the case of Japan and four lags in the case of South Korea, based on the Akaike information criterion.

The bilateral export and import data come from the UK Office for National Statistics, are denominated in GBP and cover the period from January 2000 and from January 2005 to April 2022 for Japan and Korea, respectively. Data on exports and imports are smoothed by estimating 12-month rolling averages（e.g., December 1997 data are a 12-month average from January to December 1997; January 1998 data are a 12-month average from February 1997 to January 1998, etc.）.

The industrial production data of the UK, Japan and Korea are taken from St. Louis Fed, whereas the British pound exchange rate data with Japanese yen and Korean won come from the Bank of England. The exchange rate data show the price of one unit of GBP in yen and won, respectively. We use CPI indices of the UK, Japan and Korea from the St. Louis Fed to estimate real exchange rates based on the nominal exchange rates.

4 Results

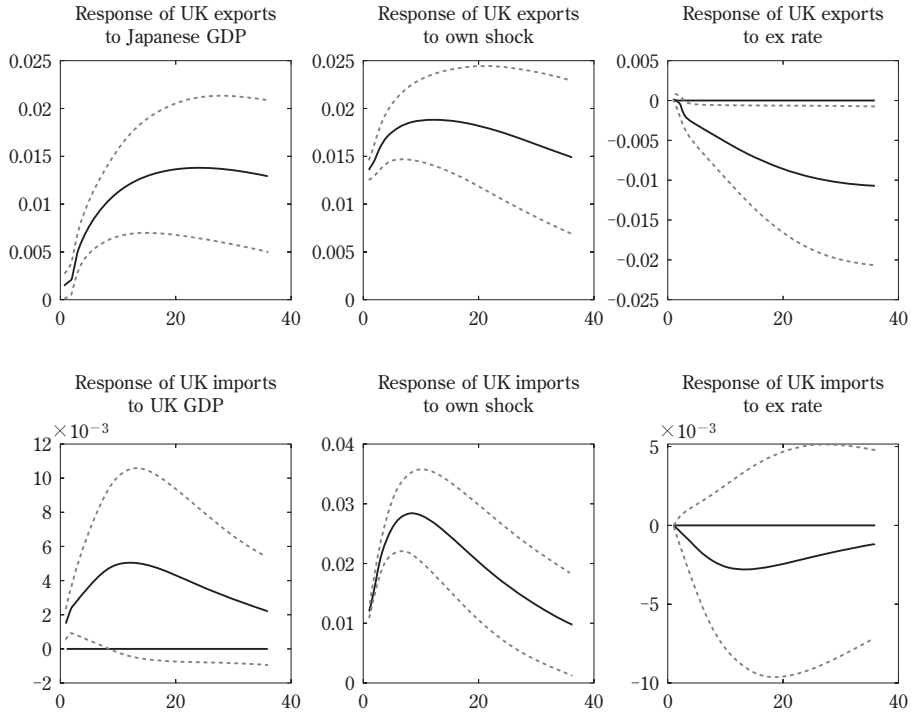
In this Section, we present the results of the VAR models described in the previous Section.

4. 1 UK trade with Japan

Figure 4 presents the IRFs for data vectors（a）and（b）. We observe that both UK exports and imports respond positively to the positive shock in the Japanese and British industrial production, respectively. However, the response of exports is considerably larger and statistically significant most of the time, whereas the positive response of imports is significant only for the first few months. The UK exports to Japan seem more dependent on the Japanese economic situation than Japanese exports to the UK on the British situation. British pound appreciation depresses UK exports, but UK imports do not respond to the pound-yen exchange rate changes.

Figure 5 shows a historical decomposition of the UK exports and imports with Japan. We can observe here how each variable in the model contributed to the exports and imports throughout the sample period. The stacked bars decompose exports and imports of the UK into components that are explained by each shock identified in the VAR model. Japanese economic situation supported UK exports to the country in the mid-2000s, 2012–2013 and from 2018,

Figure 4. Impulse response functions of UK trade with Japan to each variable

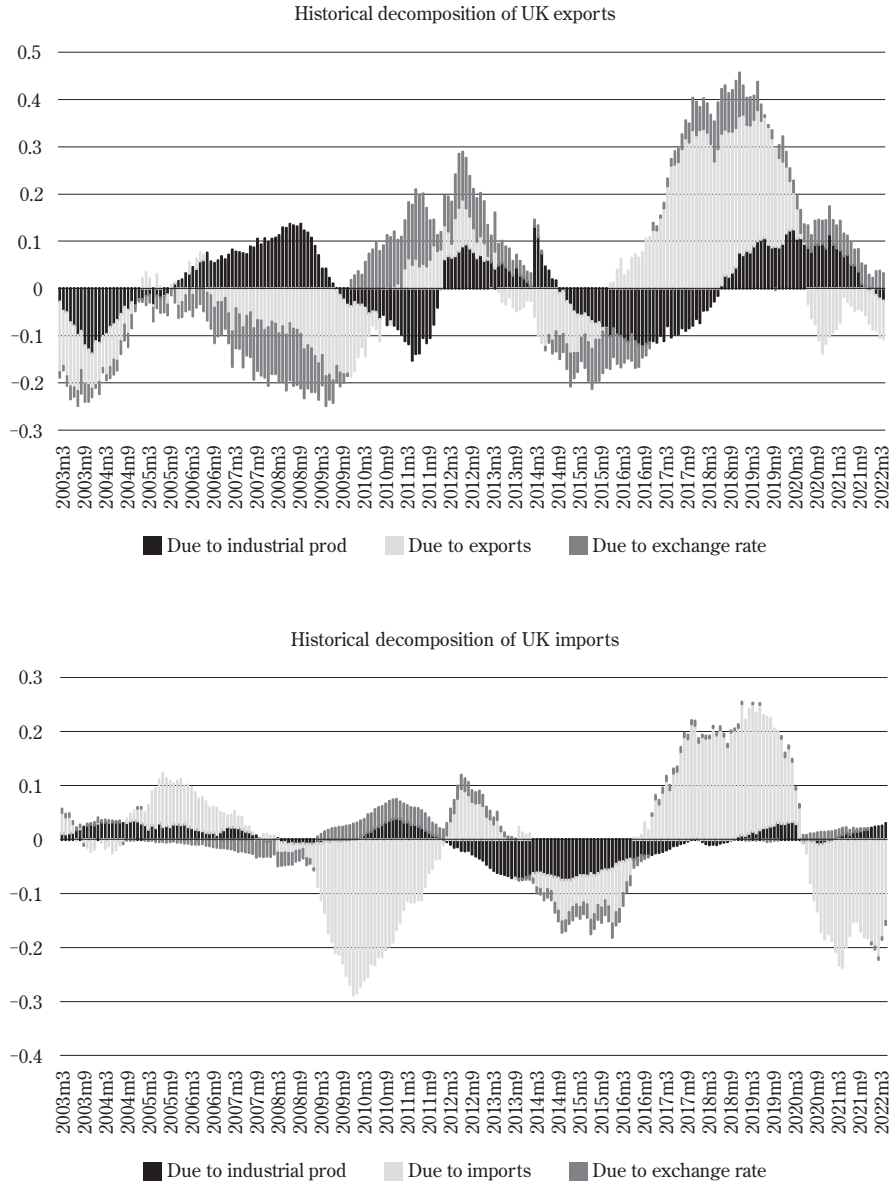


Note: solid lines: impulse response functions; dotted lines: bootstrapped 90% confidence interval

whereas it depressed the trade in the first half of the 2000s, 2009–2010 and 2014–2018. The exchange rate facilitated exports, particularly in the 2010s (with the exception of the years 2014–2016), whereas in the 2000s, it had a rather depressing impact. Compared with exports, imports have been less affected by the industrial production and exchange rate, which is consistent with IRF results. The UK's real economy situation slightly facilitated imports before GFC and right after the crisis and in the late 2010s. Through most of the 2010s, the influence was negative. The exchange rate played some role mostly just before, during and after the GFC.

Next, we check for the impacts of the EPA and Brexit on the UK's bilateral trade with Japan. Figure 6 presents the responses of the UK bilateral trade with Japan to EPA implementation. The UK exports seem to have a very small and statistically insignificant positive response in the first year, but such response becomes negative (and continuously statistically insignificant) later on. Thus, we have only very weak evidence of the small positive impact of the EPA on UK exports to Japan, which is consistent with the data that showed a decrease in the exports around the time and possible effect of the COVID-19 pandemic. With regard to UK imports

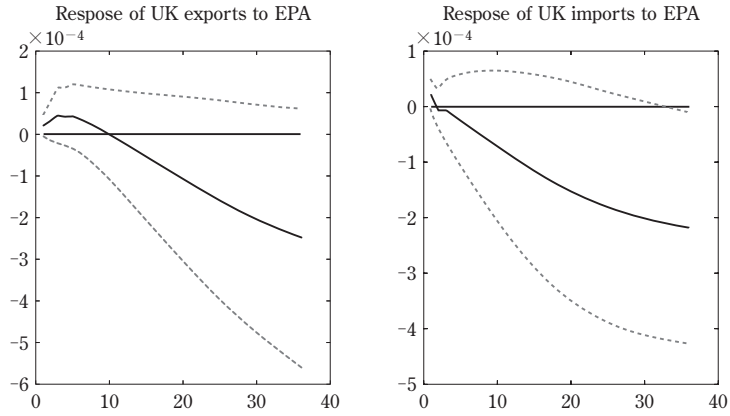
Figure 5. Historical decomposition of UK trade with Japan



Source: authors' estimation

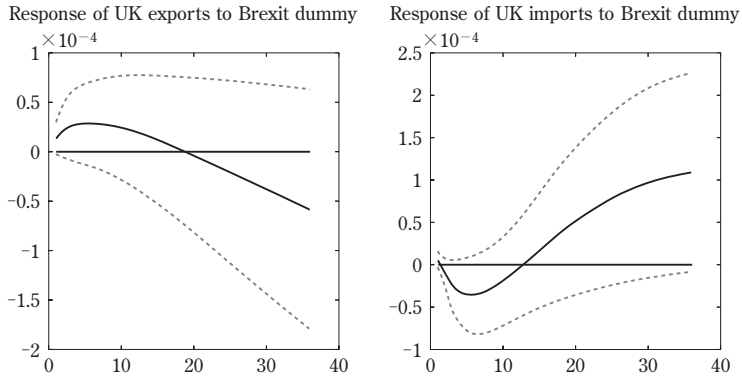
from Japan, a positive response is observed in the first month only, and a negative and highly insignificant change occurs afterwards. With the responses to Brexit, Figure 7 presents a similar picture for exports — it seems to have been just slightly positively affected in the first year. Imports, on the other hand, show a negative response in the first year but then turn positive,

Figure 6. Responses of UK trade with Japan to EU-Japan EPA



Note: solid lines: impulse response functions; dotted lines: bootstrapped 90% confidence interval

Figure 7. Responses of UK trade with Japan to Brexit



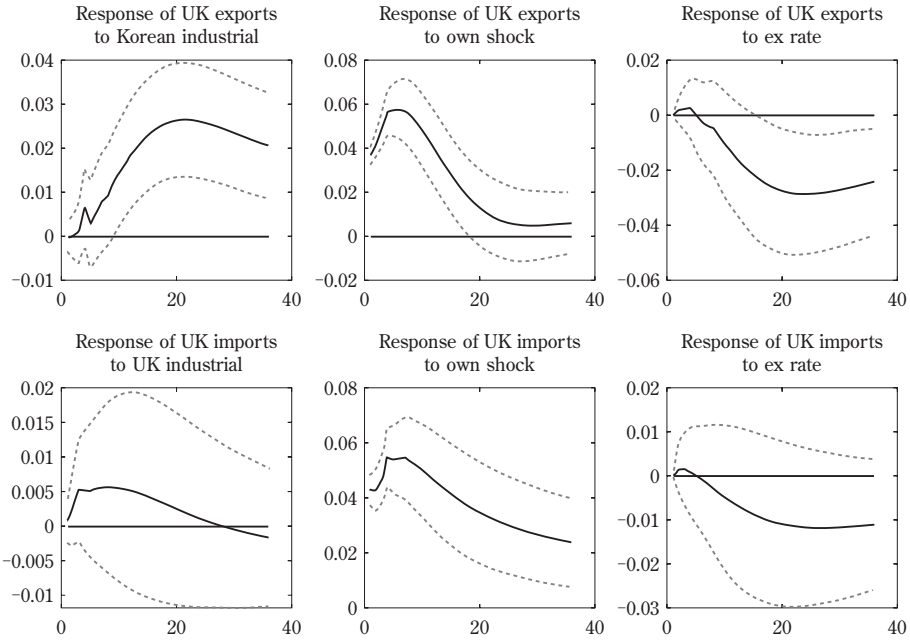
Note: solid lines: impulse response functions; dotted lines: bootstrapped 90% confidence interval

although statistically insignificant all the time. On the whole, all the results are statistically insignificant, which might also reflect the short period of time for the dummies.

4. 2 UK trade with Korea

Figure 8 depicts the responses of the UK exports and imports for data vectors (c) and (d). Only UK exports seem to respond to the partner's economic situation — exports increase after around 10 months after the positive shock in the Korean economy. The response of imports to the UK industrial production shock is not only much smaller but also statistically insignificant. British pound appreciation (depreciation of Korean won) has a negative impact on both UK

Figure 8. Impulse response functions of UK trade with Korea to each variable



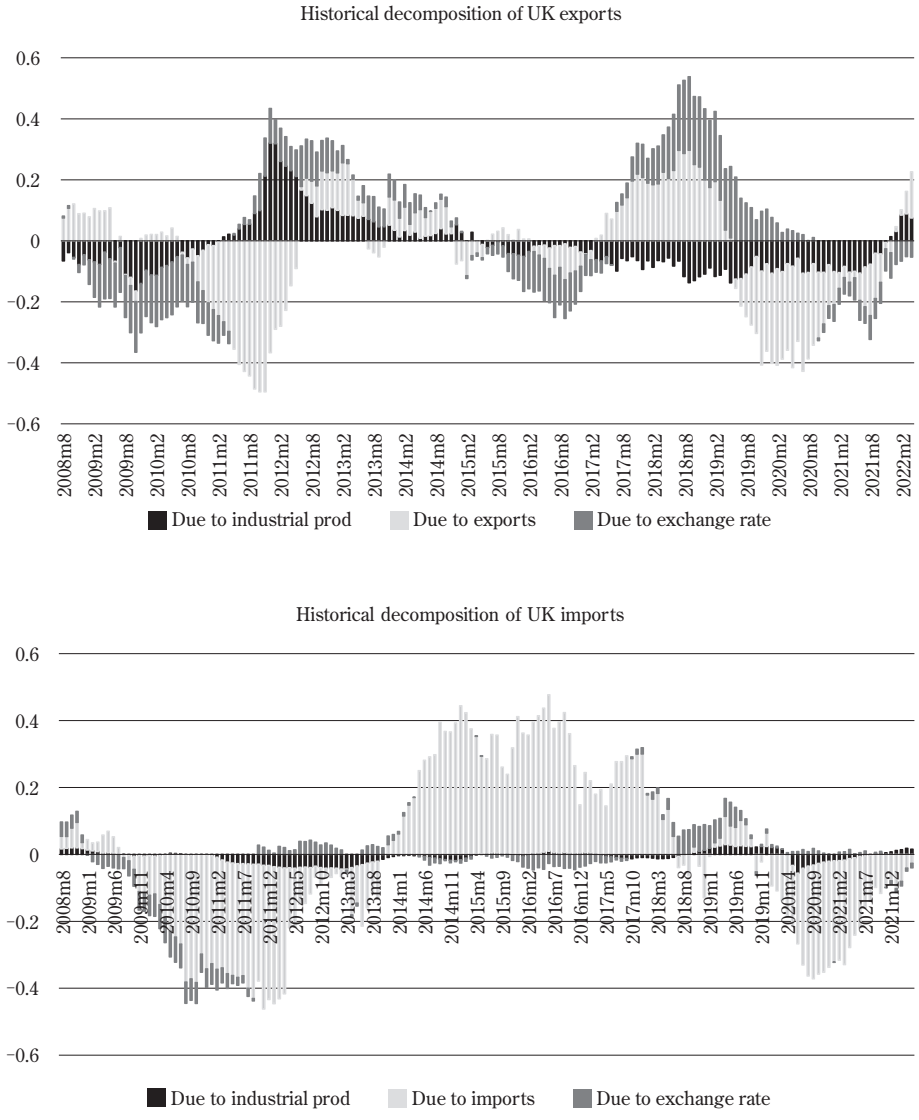
Note: solid lines: impulse response functions; dotted lines: bootstrapped 90% confidence interval

exports and imports, although statistically significant only for the former.

Figure 9 presents a historical decomposition of the UK trade with Korea. Here we can confirm again that UK exports react much more to real economic situation and exchange rate changes than imports, which was also the case for Japan. Most of the changes in UK imports are caused by its own shock. The UK's industrial production has a slightly negative effect on the exports only around 2012–2013 and 2020 (which coincide with the economic crisis in Europe and COVID-19 pandemic, respectively), whereas in 2019 and 2022, it is slightly positive. UK exports, on the other hand, are pretty strongly affected by the Korean industrial production — positively in 2011–2013 and negatively in 2008–2010 during the GFC and from 2017 to 2021. Post-COVID-19 economic recovery in 2022 again facilitates exports. The exchange rate also plays an important role — particularly in 2008–2011 and 2016–2017 in a negative direction and 2012 and 2018–2019 in a positive direction.

The results in Figure 10 show that the provisional implementation of FTA in July 2011 had a considerably more prominent impact on the UK trade with Korea, specifically exports. The full implementation no longer has much effect. These results are understandable given that most of the provisions on trade in goods were implemented already in 2011, with little left to

Figure 9. Historical decomposition of UK trade with Korea

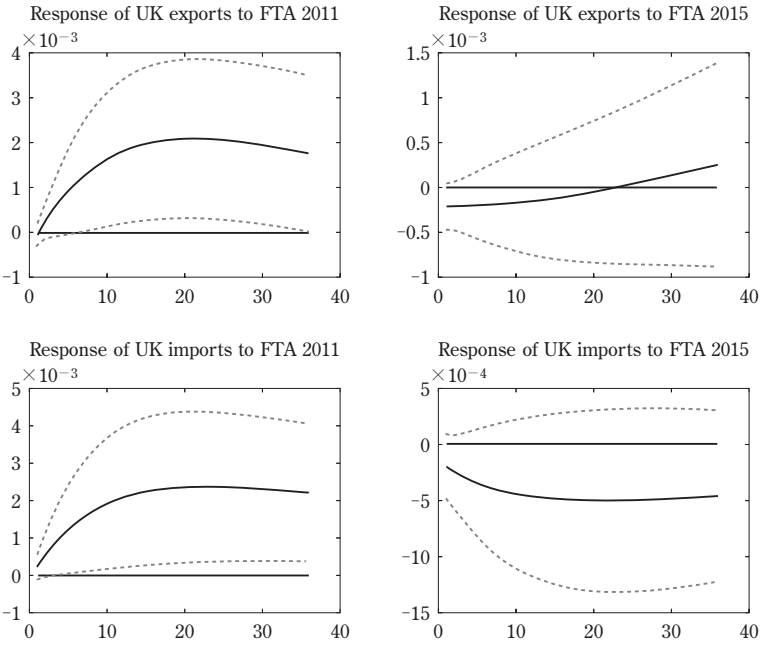


Source: authors' estimation

be eased in the later stage.

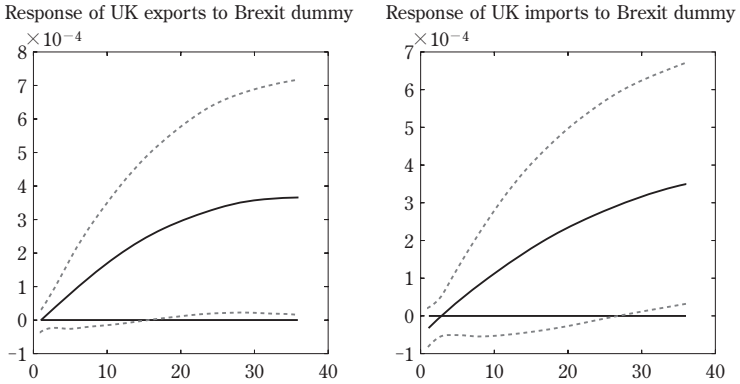
Finally, Figure 11 presents responses of exports and imports to the Brexit dummy. The IRFs show a positive, although largely statistically insignificant, impact of Brexit on UK exports to and imports from Korea. The impact on exports becomes statistically significant after around a year and a half after the shock and on imports after around two years. This positive impact, however, could also be attributed to the overall recovery in the trade after falls because of the

Figure 10. Responses of UK trade with Korea to EU-Korea FTA



Note: solid lines: impulse response functions; dotted lines: bootstrapped 90% confidence interval

Figure 11. Responses of UK trade with Korea to Brexit



Note: solid lines: impulse response functions; dotted lines: bootstrapped 90% confidence interval

COVID-19 pandemic.

5 Conclusions

In this study, we analysed the determinants of bilateral trade of the UK with Japan and South

Korea since the 2000s. The results show that British exports greatly respond to the economic situation in Japan and Korea, whereas imports are just slightly dependent on the economic situation in the UK. Similarly, only UK export to both countries seems to react to the exchange rate changes — British pound depreciation facilitating trade. Imports are, again, almost not dependent on these changes. Historical decomposition results confirm these observations. Thus, whether the UK is able to extend its exports to the two countries seems to depend largely not on its own efforts but on the economic situation of the partner countries and exchange rate developments.

The implementation of the trade agreement seems to have had more positive effects on the UK trade with Korea than with Japan and more on exports than imports. Exports to South Korea have already been largely facilitated by the provisional implementation of the EU-Korea FTA and little by its full implementation. Hence, a doubt arises about whether the UK-Korea FTA might have any additional positive effect on trade. UK exports and imports rise in response to the Brexit dummy, but we still might need more time to confirm these results. The EU-Japan EPA and Brexit had less impact on British trade with Japan, so we might suppose that there is a larger space for trade development from now on too.

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