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Early Reactions of EU-UK Trade Flows to Brexit

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Abstract: This paper examines the early months of trade in goods between the United Kingdom and European Union in the aftermath of Brexit. Controlling for product-time and partner country effects across all European bilateral trade flows, we isolate the contribution of Brexit on trade in the first half of 2021 from other potential common drivers of trade flows including the COVID-19 pandemic. The results show sharp declines in trade from the UK to the EU, the majority of which can be attributed to a Brexit impact. We also document considerable variation across member states and sectors. The effect of Brexit is highly asymmetric, however, with reduction in trade from the EU to the UK approximately half the size of the fall from the UK to EU. This is likely explained by the more gradual implementation of customs checks by the UK. Reductions in trade are identified from the date of the referendum and no evidence of stockpiling in the months prior to Brexit is found on either side.

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Keywords: Brexit; free trade agreements; customs checks

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1 Introduction

Following the decision to leave the European Union (EU) taken by a referendum in the United Kingdom (UK) in June 2016, a process of extensive negotiations on the withdrawal arrangements and future trading relationship began. These continued up until days before the agreed (and several times rescheduled) exit of the UK from the EU's Single Market and Customs Union on 1st January 2021. In the intervening years, many potential scenarios on the degree of continued trade links were considered and a wide literature on the potential impacts of Brexit emerged. These covered the impacts on the UK, the EU as a whole, individual member states and specific sectors.[1]

This paper examines how trade between the UK and EU has reacted in the lead-up period and in the early months of Brexit.[2] It uses timely data on monthly trade flows in goods across all EU member states and the UK to estimate the effect of the exit date of 1st January 2021 on the levels and composition of trade up until mid-2021.

To isolate the impact of Brexit, a comprehensive set of product-time and partner country fixed effects are applied to control for other changes in trade patterns, most specifically the changes in trade flows across 2020 as a result of the COVID-19 pandemic. Our approach is to examine the overall impact of trade between the EU and UK and the variation across member states and sectors.

The results show sharp declines in trade from the UK to the EU, the majority of which can be attributed to a Brexit impact. We also document considerable variation across member states and sectors. The effect of Brexit is highly asymmetric, however, with trade from the EU to the UK declining much less than that from the UK to EU. This is likely due to customs checks being phased in more gradually by the UK.

The paper is organised as follows: Section 2 briefly discusses existing literature on the dissolution of trade agreements and the immediate impacts of the Brexit referendum. Section 3 recounts the background to the exit of the UK from the EU and the outcome of the free trade negotiations. Section 4 describes the data and methodology. Section 5 presents the results for the impacts on trade between the UK and the EU. Section 6 concludes.

[1] A small number of examples include Ebell & Warren (2016), Dhingra et al. (2017), Chen et al. (2018) and Lawless & Morgenroth (2019).

[2] This paper uses data on the UK as a whole although different trade arrangements are in place for Northern Ireland. The special case of Northern Ireland's trade with the EU is examined in Flynn et al. (2021).

2 Dissolution of free trade agreements

A difficulty faced in generating scenarios of how Brexit might impact trade flows in the aftermath of the referendum was the rarity of prior examples of breakdowns of free trade agreements. Estimates using gravity model specifications therefore largely assumed that the estimated benefits of joining free trade agreements (or becoming an EU member) would be essentially lost on exit (for example Ebell & Warren (2016)). Historic parallels were rare and incidences of trade disintegration were usually associated with other dramatic political developments such as the breakup of countries into newly independent states.

The extent to which the Brexit referendum had an immediate impact on trade flows after June 2016 given the uncertainty it generated on the longer-term economic relationship between the UK and EU has been examined using a number of different approaches. Graziano et al. (2020) used monthly trade and prediction market data to examine the impact of uncertainty regarding the Brexit referendum outcome on export values and trade participation. They found that increases in the probability of Brexit lowered UK-EU export values for products where MFN tariffs would be applied. Along with this impact on trade volumes, they also found an effect on the extensive margin with increases in Brexit probability reducing the observation of new export flows for those products that would be subject to MFN risk.

The impact of uncertainty at the firm level has been investigated by Martin et al. (2019) using French data and by Crowley et al. (2020) using data on firms in the UK. Both applied a difference-in-difference strategy to examine the impact of the referendum on trade patterns at a very granular level. Martin et al. (2019) found that the referendum had no effect on export values on average but that it did depress export growth in some sectors. The more striking impact was on the extensive margin, where they found that the number of new trade relationships involving French exporters and British importers significantly declined after the Brexit vote. Similarly, the main impact of the referendum noted by Crowley et al. (2020) was a reduction in entry and increase in exit relative to the counterfactual of the UK remaining within the EU.

Aside from the confounding nature of non-economic developments in many of these instances, from a purely empirical perspective, trade flows internal to a country are not typically measured so there is no "pre-disintegration" data for the event to be compared to. Head et al. (2010)

examine many of these confounding factors in their study of the evolution of trade links between colonising countries and former colonies in the decades following independence. They found that the impacts took a considerable amount of time to evolve, with short run impacts on trade being relatively limited but with longer-term reductions in bilateral trade of around 65 per cent. However, hostile separations lead to large immediate falls in trade.

The experiences of the separation into different states of the former republics of the Soviet Union, Yugoslavia and Czechoslovakia have been examined extensively to estimate the impact on trade flows of disintegration. Fidrmuc & Fidrmuc (2003), Djankov & Freund (2000) and Sousa & Lamotte (2007) all found considerable home bias around the time of the disintegration of each of these groups. Although disintegration was followed by a sharp fall in trade intensity, strong trade links remained for some time. Further back in time, the widespread changes in country borders in Europe following the First World War (Heinemeyer, 2006) and specifically the breakup of the Austro-Hungarian Empire (Ménil & Maurel, 1994) provide extreme examples of political and economic disintegration. Heinemeyer (2006) found that the impact of the new border effects after WWI were negative and large although a stronger negative impact on trade flows was found to be across borders that had been established before the war. This result indicates path dependency of bilateral trade relations across national borders. This path dependency may have been as a result of historical ties or continued use of infrastructure facilitating trade despite the change in political structures. Likewise, Ménil & Maurel (1994) found similar path dependence with trade flows between the successor states of the former Austro-Hungarian Empire remaining above normal levels for the period following the break-up of the empire.

3 Background and Brexit timeline

After three years of exit negotiations from the time of the referendum, the UK officially ceased to be an EU member from January 31, 2020. This followed the conclusion of the first stage of negotiating a withdrawal agreement (sometimes described as the "divorce bill"), which was concluded in October 2019. The road to a Withdrawal Agreement was full of drama; an initial version, agreed between the UK and EU in November 2018, suffered defeat on three occasions in the UK House of Commons. Table 1 recaps some of the key dates in the negotiation process while a much more detailed record of all the intervening steps can be found in Walker (2021). A key element

of these negotiations to formalise the exit of the UK from the EU was the status of Northern Ireland and the difficulty that would be posed by the introduction of customs procedures on the island of Ireland, where the UK has its only land border with the EU. This resulted in an unique customs status being applied to Northern Ireland, which retained access to both the EU and UK customs areas. The impact of this arrangement on Northern Ireland trade in the early months of Brexit is examined in Flynn et al. (2021) while this paper uses the more extensive data available for the entire UK.[3]

Following the conclusion of the withdrawal stage of negotiations, a stand-still or transition period was agreed to give time for the second stage of the process. This was the negotiation of a future relationship between the UK and EU. During this period, the UK continued to have the status of an EU member in terms of economic access. A deadline of the last day of 2020 was set before the transition period ended and the UK left the EU Single Market and Customs Union. Just days before the deadline, a Trade and Cooperation Agreement (TCA) was finalised.

Throughout the trade negotiation process taking place during 2020, the risks inherent in no deal being reached were extensively discussed, an outcome labelled a "Hard" Brexit. In such a situation, "third country" tariffs would be levied on trade between the UK and EU, leading to considerable increases in the costs of trading, particularly for products in the food sector. The TCA removed this risk, with the agreement establishing tariff and quota free trade between the UK and EU.

However, although the potential costs of tariffs were avoided, the agreement was relatively limited in how it addressed non-tariff barriers. Non-tariff barriers are a wide-ranging set of policy measures other than tariffs that discourage trade. For example, non-tariff barriers on goods trade can include technical requirements such as licensing, labelling, standards and sanitary and phyto-sanitary rules (rules designed to protect health and food safety). These requirements define the standards that a good has to meet to be sold on a market.

So although trade between the EU and UK remains free of tariffs, a number of changes in documentation and inspections have been put in place. These are currently somewhat asymmetric, due to the immediate introduction of customs requirements from the EU side but a more gradual phased-in approach on the UK side with new regulatory and customs checks

[3] Note that Northern Ireland accounts for approximately 2.1 per cent of total UK gross value added according to the Office of National Statisics ONS regional GVA.

Table 1: Key Brexit dates

Planned and actual exit dates	
29-Mar-19	First exit deadline
31-Oct-19	Second exit deadline
31-Jan-20	UK leaves EU; transition period until 31-Dec-2020
31-Dec-20	Transition period ends and UK leaves EU Single Market and Customs Union
Other notable dates	
23-Jun-16	Referendum in UK on exiting the EU
17-Jan-17	Lancaster House speech on UK's negotiating priorities
29-Mar-17	Article 50 triggered by UK
08-Jun-17	General election in UK (Conservative gov. lose majority)
14-Nov-18	Draft Withdrawal Agreement published
Jan-Mar 2019	House of Commons votes against Withdrawal Agreement
21-Mar-19	Article 50 extended to 30 June 2019
10-Apr-19	Article 50 further extended to 31 October 2019
23-Jul-19	Boris Johnson replaces Teresa May as Prime Minister
28-Oct-19	Article 50 extended to 31 January 2020
12-Dec-20	General election in UK results in large Conservative majority
22-Jan-20	UK parliament approves Withdrawal Agreement
24-Dec-20	EU-UK Trade and Cooperation Agreement finalised

Source: Walker (2021)

to be implemented in January 2022 and July 2022, as laid out in the Border Operating Model (HM Government, 2021).[4]

4 Methodology and data

The baseline specification is to estimate the following:

$$T_{ijpm} = \alpha_{ijpm} + \beta \cdot \text{Brexit}_m * \text{UK}_j + \gamma_{pm} + \delta_j + \epsilon_{ijpm} \quad (1)$$

where T represents trade flows into and out of all EU-27 reporting countries i to each partner country j of product p in month m. $Brexit$ is a

[4] Some of checks had been scheduled for introduction in October 2021 but a delay in implementation was announced on 14 September 2021: See UK Parliament statement of border controls

dummy variable equal to one for each month following the exit of the UK from the EU (i.e. from January 2021 onwards) interacted with trade flows for the UK. All other potential drivers of trade flow variation are subsumed in the fixed effects at the product-month (γ_{pm}) and partner country (δ_j) level. These fixed effects should absorb other confounding influences on the overall movement of trade, particularly those related to the COVID-19 pandemic, and allow us to isolate the specific impact of Brexit on trade with the UK alone. The regressions are estimated using pseudo-Poisson maximum likelihood (PPML) with high dimension fixed effects developed by Correia et al. (2020). The β coefficient estimated from this specification can be converted into a form that can be interpreted as a percentage change using the transformation $e^{\beta} - 1$.

Extensions to the baseline specification examine how trade flows evolved following the Brexit referendum in June 2016. We also test for stockpiling and or initial disruption effects that could have been caused by unfamiliarity with new procedures by testing for variation in the effects from individual months from August 2020 to July 2021.

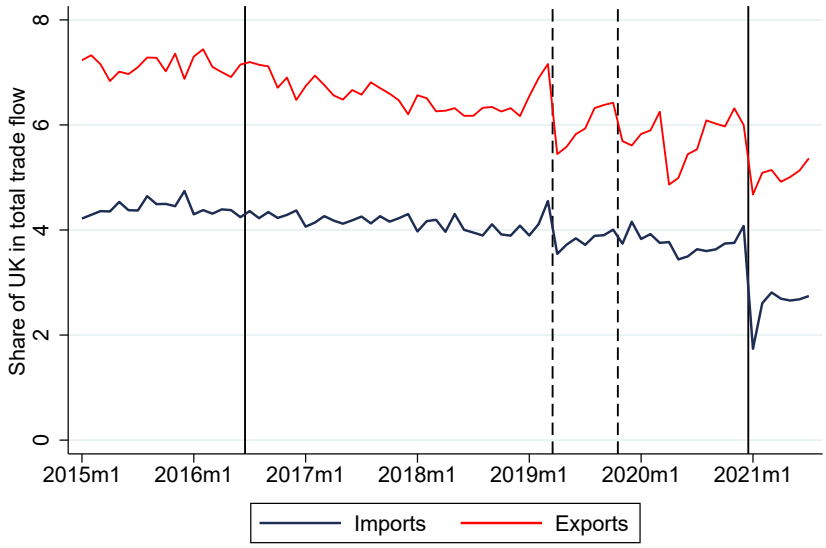
The source of our data for the impact of Brexit on trade between the EU and UK comes from Comext, the official trade database for the EU produced by Eurostat. The data contains trade flow information for each EU member state with all partner countries at a monthly frequency. Our sample period starts in January 2015 to control for pre-Brexit referendum trade patterns and continues until July 2021. The data is recorded at the 8-digit CN level and we expand the data for all countries across products and partners to also reflect where zero trade flows occur. This gives us a dataset of over 25 million observations for UK to EU trade and 31 million for EU to UK flows.

5 Initial impact of Brexit on UK-EU trade

5.1 Descriptive evidence

In this section, we examine the impact of Brexit on EU-UK trade flows. Beginning with some descriptive evidence, Figure 1 plots how the share of the UK in EU members' imports and exports has evolved from January 2015 to the latest available data in May 2021. The share of trade is used to allow us to control even in this descriptive analysis for effects such as the

Figure 1: UK as a share of EU members imports and exports, 2015-2021



COVID-19 pandemic which would affect the levels or growth of trade across all partner countries.[5]

The importance of the UK as a trade destination for EU member states is shown by the share of the UK in total EU exports. This is consistently higher than the UK share of EU imports up until the final observations post-Brexit when the two series come closer together. The most notable aspect of this figure is the strong decline in the UK's share of EU trade in 2021, which occurs in both trade directions. There is also a slight suggestion of a gradual reduction in the share of EU trade going to the UK throughout the period with a possible uptick in the last months of 2020, which we will investigate as a potential indicator of pre-Brexit stockpiling.

The extent to which Brexit impacts on individual EU member states depends to a large extent on the initial scale and composition of their trade with the UK. Table 2 shows the share of the UK as a source of imports and as an export destination for each country in the EU at three points in time (February of 2015, 2020 and 2021). Looking first at trade coming from the UK to each member state as a share of their total imports, most are close to the 4 per cent share observed in the aggregate graph in 2015 and 2020. Ireland is a substantial outlier, with one-third of its imports coming from

[5] Note that when referring to overall EU trade in this section, we use the aggregation of trade from all current 27 member states (hence including intra-EU trade flows between members).

Table 2: UK share of total trade for EU member states (%)

	(1)	(2)	(3)	(4)	(5)	(6)
	Trade from UK to..			Trade to UK from..		
	Jan-July 2015	Jan-July 2020	Jan-July 2021	Jan-July 2015	Jan-July 2020	Jan-July 2021
Austria	2%	2%	1%	3%	3%	3%
Belgium	5%	4%	3%	9%	7%	6%
Bulgaria	2%	1%	1%	2%	2%	2%
Croatia	1%	1%	0%	2%	2%	1%
Cyprus	9%	7%	3%	3%	6%	9%
Czechia	3%	2%	1%	5%	4%	4%
Denmark	4%	4%	2%	6%	5%	6%
Estonia	2%	2%	1%	3%	2%	3%
Finland	3%	3%	1%	5%	4%	4%
France	4%	4%	3%	7%	6%	5%
Germany	4%	4%	3%	7%	5%	5%
Greece	3%	2%	1%	4%	4%	3%
Hungary	2%	2%	1%	4%	3%	3%
Ireland	31%	26%	15%	13%	8%	11%
Italy	3%	2%	2%	5%	5%	5%
Latvia	2%	3%	1%	5%	5%	7%
Lithuania	3%	3%	1%	5%	4%	4%
Luxembourg	1%	1%	1%	3%	3%	3%
Malta	8%	7%	5%	5%	2%	3%
Netherlands	5%	4%	4%	9%	7%	6%
Poland	3%	2%	1%	7%	6%	5%
Portugal	3%	3%	1%	7%	5%	5%
Romania	2%	2%	1%	4%	3%	3%
Slovakia	1%	2%	1%	5%	4%	4%
Slovenia	1%	1%	1%	2%	1%	1%
Spain	5%	4%	2%	7%	6%	6%
Sweden	6%	4%	3%	7%	5%	6%
All EU-27	4%	4%	3%	7%	6%	5%

the UK in 2015 with closely integrated retail sectors an important factor. This had reduced to under one-quarter in 2020 before falling to 12 per cent after the UK exit from the EU. Ireland also had one of the highest export shares going to the UK relative to other EU member states. Across most EU members, we find reductions in the share of the UK in overall trade, both inwards and outwards, with the shift most evident for those where the UK accounted initially for a higher share of trade.

5.2 Econometric estimation for UK-EU level trade

While the decline in the UK's share of EU trade is suggestive of the impact of Brexit, confounding factors could be at play. In particular, partner- or product-level shifts attributable to the Covid-19 pandemic could explain some of these declines in trade. We therefore estimate a model with all EU trade partners and controlling for product-month and partner country fixed effects as described in Section 4.

Table 3: UK-EU trade and Brexit impacts: Baseline results

	(1) UK to EU	(2) UK to EU	(3) EU to UK	(4) EU to UK
Brexit*UK	-0.444***	-0.426***	-0.273***	-0.245***
	(0.026)	(0.026)	(0.014)	(0.014)
Referendum*UK		-0.075***		-0.119***
		(0.015)		(0.015)
Constant	16.081***	16.083***	15.845***	15.851***
	(0.002)	(0.002)	(0.001)	(0.001)
Observations	25,854,824	25,854,824	31,292,612	31,292,612
Pseudo R-squared	0.697	0.697	0.806	0.806

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Partner country and product*month level fixed effects included.

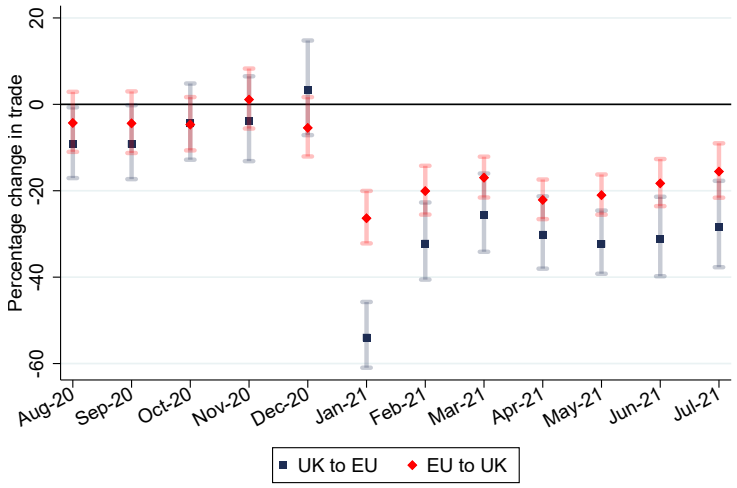
The baseline results are presented in Table 3 with our key variable of interest being the interaction of a Brexit dummy variable (equal to one from January 2021 onwards) with trade with the UK. This first table of results relate to aggregate EU trade with the UK with each direction of trade estimated separately. The estimates from column 1 suggest that Britain's exit from the EU has led to a 36 per cent decline in aggregate EU imports from the UK.[6] The impact on EU exports to the UK, though significant, has not been as severe, with exports to the UK estimated to have fallen by 24 per cent as a result of Brexit (column 3).

This asymmetry between UK-EU and EU-UK trade is explained by the fact that the UK have chosen to implement the new procedures on EU imports on a phased basis, with full customs checks to be introduced in late 2021 and into 2022 as described in HM Government (2021). In contrast, the Trade and Cooperation Agreement arrangements took effect across the EU on 1 January 2021 for imports from the UK. These differences also mean that the full impact of Brexit may take time to materialise.

[6] Recall that the β coefficient is converted to a percentage change using the transformation $e^{\beta} - 1$ so this is $e^{0.444} - 1 = 0.36$.

It is possible that firms adjusted trade between the 2016 referendum and the UK's official exit from the EU in December 2020. If that were the case, estimates of Brexit's effect on EU-UK trade would likely overstate its impact. To account for this possibility, a post referendum variable is included in columns 2 and 4. While its inclusion very slightly reduces the direct coefficient on the impact of Brexit, the estimates still indicate a significant negative impact of Brexit with reductions in UK-EU trade of 35 per cent and in EU-UK trade of 22 per cent.

Figure 2: Monthly profile of Brexit impact, August 2020 to July 2021



Based on regression results in Table A.1 with coefficients transformed to percentage change. Shaded bars represent 95% confidence intervals.

Estimating the immediate impact of Brexit on trade is complicated by the possibility of pre-Brexit stockpiling in the months leading up to the UK's exit from the EU. It is possible that falls in EU-UK trade since January could in part be explained by an unwinding of stocks built up in the months prior to the December 2020 Brexit deadline. To test this hypothesis, we allow for monthly changes in trade between the EU and UK in the five months prior to Brexit and all months available in 2021, currently up until July. The individual monthly effects are displayed graphically in Figure 2 with the detailed results in the Appendix Table A.1. Interestingly, the results do not indicate any significant increase in EU-UK trade in the five months prior to Brexit. However, we can see that Brexit led to significant declines in trade in the first seven months of 2021. The time path of the Brexit impact shows that the reductions in both directions of trade were particularly sharp in January followed by some recovery in February and March. The subsequent effects, from April to July, have been relatively stable although this is a short amount

of time to establish if trade has settled down to new post-Brexit levels at this stage.

5.3 Variation in Brexit impact for EU member states

Table 4 reports the direct impacts of Brexit on trade with the UK as a percentage of trade, controlling for all other factors through the full set of product-month and partner fixed effects. These elasticities are calculated from the coefficients obtained from running the above regression separately for each EU member state. The full set of results for each country can be found in tables A.3 and A.2 in the appendix. The results show that Brexit has led to a significant decline in trade coming from the UK into a majority of EU countries. As with the EU aggregate, the reductions in trade going from each EU member state to the UK are considerably smaller than those from the UK to the EU (although still substantial in several instances). Perhaps surprisingly, the correlation between the changes in trade to the UK and from the UK across EU member states is slightly negative (-0.2).

Table 4: Estimated direct impact of Brexit on EU-UK trade (% change)

	Trade from UK	Trade to UK		Trade from UK	Trade to UK
EU total	-35%	-22%	Ireland	-44%	n.s.
Austria	n.s.	n.s.	Italy	-10%	-9%
Belgium	-23%	-32%	Latvia	-58%	67%
Bulgaria	-46%	-15%	Lithuania	-61%	n.s.
Croatia	-36%	-17%	Luxembourg	43%	-20%
Cyprus	-60%	n.s.	Malta	-23%	53%
Czechia	-49%	-15%	Netherlands	-31%	-40%
Denmark	-47%	n.s.	Poland	-54%	-26%
Estonia	-48%	20%	Portugal	-50%	-13%
Finland	-44%	-22%	Romania	-44%	-22%
France	-17%	-16%	Slovakia	n.s.	-19%
Germany	-19%	-19%	Slovenia	n.s.	-17%
Greece	-43%	n.s.	Spain	-23%	-15%
Hungary	-51%	-12%	Sweden	-35%	n.s.

Elasticities converted from PPML estimates of Brexit effect on trade flows by country controlling for product-month and partner fixed effects. Full results are in Appendix tables A.3 and A.2. Statistically insignificant estimates are denoted by n.s.

For a small number of countries where the UK did not account for a large share of trade prior to Brexit, such as Slovakia, no statistically significant evidence of Brexit impacting trade in either direction is found. In only one case, Luxembourg, can a positive impact of Brexit on trade be found.

Looking at Ireland, where trade with the UK was most substantial as a share of total trade prior to Brexit, we find falls in trade going from the UK to Ireland of 45 per cent allocated to the Brexit effect in the estimation. In contrast, the direct impact of Brexit on trade flows from Ireland to the UK is found to be insignificant. The impact of Brexit on trade from the UK to EU countries is negative or insignificant in all cases, with the exception of Luxembourg. For trade to the UK, most impacts are also negative although there are some outliers (Estonia and Latvia) where trade flows increased in the aftermath of Brexit more than could be accounted for by the set of product and partner effects already controlled for in the estimation.

Figures 3 and 4 compare the percentage changes accounted for by the direct effect of Brexit to the raw changes in trade flows in the data. This comparison shows the extent to which the observed changes in trade can be attributed to the impact of Brexit once other potentially confounding factors, particularly the impact of COVID-19 on international trade, are controlled for. The figures include three different comparison points from the data - from January-July 2020 to January-July 2021, January-July 2019 to January-July 2021 (to use a pre-COVID-19 benchmark) and January-July 2015 to January-July 2021 (to compare to before the Brexit referendum).

Figure 3: Contribution of Brexit impact to changes in trade from UK to EU

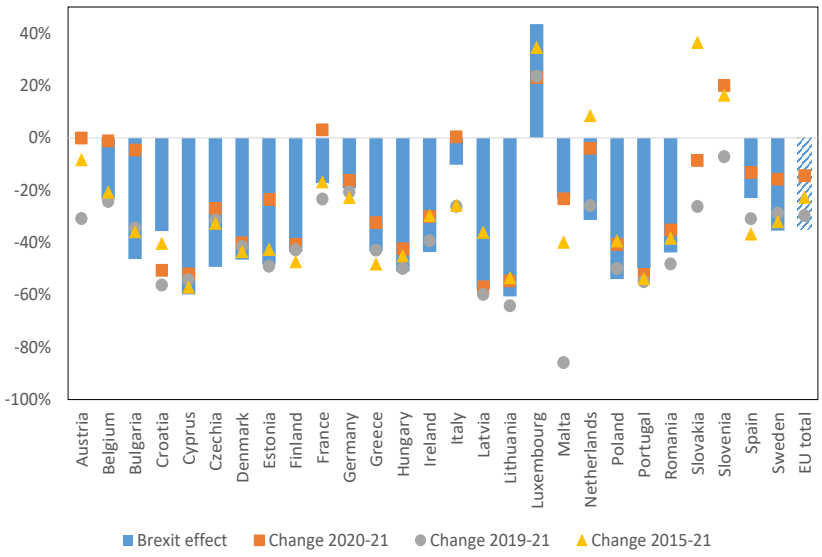
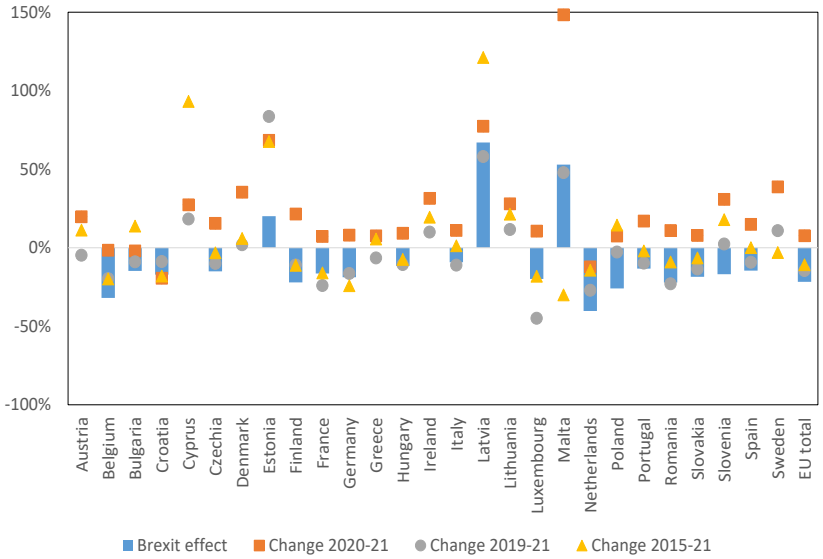


Figure 4: Contribution of Brexit impact to changes in trade from EU to UK



For trade going from the UK to the EU, Figure 3 shows that the model estimate for Brexit captures a majority of the reduction in trade evident in January 2021 although some overshooting was observed in the actual extent of the falls. For the EU aggregate, the direct impact of Brexit estimated by the model accounts for 60 per cent of the observed year-on-year change in trade and this ratio is broadly similar across the individual member states. For trade going from the EU to the UK, Figure 3 shows that the model estimates and actual data change are more similar but also emphasises the much smaller magnitudes of changes in trade in the EU to UK direction compared to the reductions in UK to EU trade.

5.4 Impact across product types

In this subsection, we look at the extent to which the impact of Brexit varies across broad product types. The product-level data is grouped by the United Nation's system of Broad Economic Classification (BEC), which divides

products by their main use. There are four broad categories - goods for final consumption, intermediate inputs, capital goods and other goods.[7]

Table 5: Brexit impact across Broad Economic Classifications (BEC)

	(1)	(2)	(3)	(4)
		UK to EU		
	Consumption goods	Intermediates	Capital goods	Other goods
Brexit*UK	-0.584***	-0.272***	-0.358***	-0.646***
	(0.047)	(0.044)	(0.051)	(0.043)
Referendum*UK	-0.061*	-0.042*	-0.020	-0.189***
	(0.033)	(0.022)	(0.037)	(0.030)
Constant	15.777***	15.958***	16.207***	16.790***
	(0.003)	(0.004)	(0.006)	(0.005)
Observations	7,218,176	11,484,830	2,966,192	4,185,626
Pseudo R-squared	0.737	0.685	0.755	0.729
		EU to UK		
	Consumption goods	Intermediates	Capital goods	Other goods
Brexit*UK	-0.331***	-0.124***	-0.107**	-0.392***
	(0.025)	(0.018)	(0.044)	(0.035)
Referendum*UK	-0.092***	-0.097***	-0.061*	-0.256***
	(0.014)	(0.012)	(0.035)	(0.040)
Constant	15.841***	15.412***	15.706***	16.782***
	(0.002)	(0.001)	(0.003)	(0.004)
Observations	8,047,827	14,266,527	4,496,055	4,482,203
Pseudo R-squared	0.854	0.781	0.801	0.821

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Partner country and product*month level fixed effects included.

These estimates show that consumption and other products have experienced the greatest reduction from Brexit (controlling for other factors) with intermediate and capital goods somewhat less impacted, although the trade reduction that can be attributed to Brexit is still substantial. The magnitudes of the impact are close to twice as large for trade going from the UK to the EU compared to trade from the EU to UK. In the appendix Table A.4, we look at at a slightly more detailed level across ten sectors showing a similar broad-based pattern of impacts with UK to EU trade impacted more strongly in all cases relative to EU to UK trade. It is noteworthy that the pattern of

[7] Other goods are mainly motor fuel, cars and products that can be used both by households and firms. Further information on this classification can be found at United Nations trade classifications.

coefficients across product groups and broad sectors show relatively high correlation between the UK to EU and EU to UK impacts. This is in contrast to the slight negative correlation between the size of the impact of Brexit on trade to and from the UK by individual EU member states noted earlier. This suggests that some of the variation across countries is driven by differences in the composition of their trade with the UK.

6 Conclusions

Following much anticpation and negotiation, the UK exited the EU Single Market and Customs Union on January 1, 2021. This paper examines how trade flows between the UK and EU changed in anticipation of this event and and in the early months of Brexit. While it may not be possible to say that these will be the levels at which trade between the two stabilises, the extent of the initial impact and variation across member states and product types is of considerable interest. To examine the immediate effects of Brexit, we use the most timely available data source on monthly goods export flows and apply a comprehensive set of product-time and partner country fixed effects to isolate the Brexit effect from other drivers of changes in trade patterns, most specifically the changes in trade flows across 2020 as a result of the COVID-19 pandemic. The results show sharp declines trade from the UK to the EU, the majority of which can be attributed to a Brexit impact. The effect of Brexit is highly asymmetric, however, with trade from the EU to the UK declining relatively little in contrast to the change in imports. This is most likely a result of customs checks being phased in more gradually by the UK which suggests that the full impact of Brexit on trade from the EU to UK may not materialise until these full customs checks are introduced in 2022. Little evidence of stockpiling in anticipation of the Brexit deadline is found.

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Appendix

Table A.1: Monthly estimations of Brexit impact

	(1) UK to EU	(2) EU to UK
Referendum*UK	-0.071***	-0.115***
	(0.016)	(0.015)
UK*Aug-20	-0.097**	-0.044
	(0.046)	(0.037)
UK*Sept-20	-0.096**	-0.045
	(0.048)	(0.038)
UK*Oct-20	-0.045	-0.048
	(0.047)	(0.033)
UK*Nov-20	-0.039	0.011
	(0.052)	(0.035)
UK*Dec-20	0.032	-0.056
	(0.054)	(0.037)
UK*Jan-21	-0.776***	-0.306***
	(0.084)	(0.042)
UK*Feb-21	-0.389***	-0.224***
	(0.067)	(0.036)
UK*Mar-21	-0.296***	-0.186***
	(0.062)	(0.029)
UK*Apr-21	-0.359***	-0.250***
	(0.061)	(0.030)
UK*May-21	-0.390***	-0.236***
	(0.055)	(0.030)
UK*Jun-21	-0.374***	-0.202***
	(0.068)	(0.034)
UK*Jul-21	-0.334***	-0.169***
	(0.071)	(0.038)
Constant	16.083***	15.851***
	(0.002)	(0.001)
Observations	25,854,824	31,292,612
Pseudo R-squared	0.697	0.806

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Partner country and product*month level fixed effects included.

Table A.2: Brexit impact on trade from UK to EU members

	(1) Referendum*UK		(1) Brexit*UK		(3) Constant		N	Pseudo R^2
Austria	-0.086**	(0.036)	-0.261	(0.238)	13.976***	(0.004)	5,842,566	0.711
Belgium	-0.080**	(0.035)	-0.267***	(0.072)	14.986***	(0.005)	6,704,154	0.691
Bulgaria	-0.144***	(0.037)	-0.622***	(0.070)	12.922***	(0.004)	2,916,615	0.723
Croatia	0.012	(0.051)	-0.440***	(0.135)	12.316***	(0.004)	3,859,742	0.693
Cyprus	0.263	(0.306)	-0.912***	(0.130)	13.110***	(0.018)	1,418,182	0.817
Czechia	-0.082	(0.057)	-0.679***	(0.048)	13.857***	(0.004)	6,144,967	0.686
Denmark	-0.048*	(0.028)	-0.626***	(0.067)	13.144***	(0.003)	5,707,163	0.652
Estonia	-0.007	(0.048)	-0.662***	(0.066)	12.042***	(0.004)	3,110,371	0.684
Finland	-0.216***	(0.032)	-0.572***	(0.061)	13.403***	(0.004)	4,011,419	0.724
France	-0.080***	(0.024)	-0.190***	(0.036)	14.703***	(0.003)	9,625,656	0.665
Germany	-0.110***	(0.031)	-0.214***	(0.051)	14.997***	(0.003)	11,414,747	0.639
Greece	-0.187***	(0.034)	-0.567***	(0.082)	13.980***	(0.005)	3,366,463	0.787
Hungary	-0.106***	(0.031)	-0.714***	(0.077)	13.607***	(0.003)	4,698,721	0.674
Ireland	0.052	(0.054)	-0.573***	(0.072)	15.074***	(0.015)	3,100,591	0.782
Italy	-0.141***	(0.027)	-0.108**	(0.043)	14.621***	(0.003)	7,716,316	0.677
Latvia	0.183***	(0.055)	-0.863***	(0.076)	12.040***	(0.005)	3,098,336	0.674
Lithuania	-0.064*	(0.036)	-0.931***	(0.051)	12.935***	(0.006)	3,814,339	0.731
Luxembourg	0.203***	(0.071)	0.361**	(0.164)	13.168***	(0.008)	2,511,349	0.765
Malta	0.130	(0.144)	-0.260**	(0.115)	13.020***	(0.013)	1,177,515	0.812
Netherlands'	0.061*	(0.035)	-0.377***	(0.074)	15.010***	(0.005)	14,470,929	0.696
Poland	-0.122***	(0.029)	-0.776***	(0.047)	14.011***	(0.003)	6,455,836	0.675
Portugal	-0.132***	(0.034)	-0.689***	(0.055)	13.558***	(0.003)	3,852,099	0.728
Romania	-0.210***	(0.025)	-0.576***	(0.061)	13.022***	(0.003)	5,523,916	0.645
Slovakia	0.272***	(0.053)	-0.145	(0.103)	13.729***	(0.006)	3,969,688	0.689
Slovenia	-0.204***	(0.037)	-0.129	(0.232)	12.820***	(0.007)	4,070,625	0.681
Spain	-0.203***	(0.032)	-0.261***	(0.053)	14.477***	(0.003)	7,151,195	0.673
Sweden	-0.138***	(0.030)	-0.438***	(0.058)	13.795***	(0.004)	5,955,441	0.676

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Partner country and product*month level fixed effects included.

Table A.3: Brexit impact on trade from EU members to UK

	(1) Referendum*UK		(1) Brexit*UK		(3) Constant		N	Pseudo R^2
Austria	-0.081***	(0.027)	-0.058	(0.057)	13.631***	(0.004)	9,256,245	0.726
Belgium	-0.102***	(0.035)	-0.385***	(0.036)	14.700***	(0.004)	13,146,597	0.776
Bulgaria	-0.030	(0.035)	-0.160***	(0.058)	13.074***	(0.005)	1,988,433	0.699
Croatia	0.132**	(0.061)	-0.188**	(0.083)	12.466***	(0.005)	2,107,360	0.696
Cyprus	0.241	(0.158)	-0.668	(0.415)	14.534***	(0.021)	168,043	0.877
Czechia	-0.154***	(0.030)	-0.163***	(0.036)	14.248***	(0.003)	7,933,934	0.795
Denmark	0.167***	(0.038)	-0.072	(0.105)	13.234***	(0.003)	7,766,050	0.727
Estonia	-0.136**	(0.061)	0.183*	(0.108)	12.666***	(0.007)	1,681,199	0.689
Finland	-0.094**	(0.040)	-0.249***	(0.062)	13.575***	(0.004)	3,784,790	0.726
France	-0.078***	(0.030)	-0.179***	(0.034)	14.453***	(0.003)	16,859,797	0.765
Germany	-0.200***	(0.028)	-0.208***	(0.025)	14.957***	(0.003)	26,692,389	0.798
Greece	-0.093*	(0.049)	-0.014	(0.066)	13.510***	(0.006)	2,464,435	0.725
Hungary	-0.101***	(0.029)	-0.123***	(0.041)	13.955***	(0.003)	5,000,926	0.744
Ireland	-0.163***	(0.047)	0.003	(0.088)	16.488***	(0.011)	1,760,033	0.802
Italy	-0.045***	(0.013)	-0.097***	(0.020)	13.770***	(0.002)	17,105,141	0.709
Latvia	0.088	(0.060)	0.513***	(0.100)	12.353***	(0.005)	1,863,798	0.678
Lithuania	0.063	(0.049)	0.065	(0.049)	12.794***	(0.004)	3,179,526	0.704
Luxembourg	-0.021	(0.228)	-0.222***	(0.079)	13.091***	(0.011)	1,675,462	0.772
Malta	-0.604***	(0.135)	0.425*	(0.229)	13.673***	(0.025)	138,700	0.754
Netherlands	-0.152***	(0.029)	-0.516***	(0.039)	14.929***	(0.003)	17,864,550	0.790
Poland	-0.036	(0.023)	-0.300***	(0.032)	13.861***	(0.002)	10,792,768	0.750
Portugal	-0.108***	(0.021)	-0.143***	(0.034)	13.320***	(0.003)	4,483,334	0.720
Romania	-0.192***	(0.033)	-0.250***	(0.047)	13.665***	(0.004)	3,412,012	0.696
Slovakia	-0.103*	(0.062)	-0.205**	(0.104)	14.335***	(0.005)	3,090,606	0.772
Slovenia	-0.100***	(0.035)	-0.184**	(0.084)	13.026***	(0.007)	3,757,522	0.705
Spain	-0.115***	(0.024)	-0.157***	(0.045)	13.952***	(0.003)	14,067,320	0.735
Sweden	-0.185***	(0.033)	0.003	(0.050)	13.762***	(0.003)	7,902,606	0.722

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Partner country and product*month level fixed effects included.

Table A.4: Brexit impact across sectors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
						UK to EU				
	Food	Beverages	Crude minerals	Fuels	Animal fats	Chemicals	Manufactures	Machinery	Miscellaneous	Commodities
	Food	Beverages	Crude minerals	Fuels	Animal fats	Chemicals	Manufactures	Machinery	Miscellaneous	Commodities
Brexit*UK	-0.388***	-0.481***	-0.407***	-0.516***	-0.429***	-0.221***	-1.013***	0.036	-0.519***	-0.403***
	(0.059)	(0.057)	(0.088)	(0.044)	(0.055)	(0.056)	(0.034)	(0.079)	(0.044)	(0.042)
Referendum*UK	0.017	-0.085***	0.009	-0.158***	-0.154***	-0.109***	-0.006	-0.029	-0.123***	-0.033
	(0.031)	(0.032)	(0.040)	(0.031)	(0.033)	(0.026)	(0.018)	(0.029)	(0.027)	(0.024)
Constant	14.962***	14.927***	17.233***	16.844***	14.903***	13.326***	15.259***	15.233***	16.719***	15.465***
	(0.004)	(0.005)	(0.007)	(0.004)	(0.003)	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)
Observations	2,276,020	1,370,962	3,022,131	2,028,553	1,876,687	1,532,262	2,900,046	2,649,401	6,057,264	2,141,472
Pseudo R-squared	0.623	0.596	0.775	0.815	0.637	0.584	0.799	0.633	0.772	0.719
						EU to UK				
	Food	Beverages	Crude minerals	Fuels	Animal fats	Chemicals	Manufactures	Machinery	Miscellaneous	Commodities
	Food	Beverages	Crude minerals	Fuels	Animal fats	Chemicals	Manufactures	Machinery	Miscellaneous	Commodities
Brexit*UK	-0.168***	-0.145***	-0.094*	-0.394***	-0.126***	-0.107	-0.532***	-0.169***	-0.280***	-0.031
	(0.032)	(0.040)	(0.048)	(0.028)	(0.031)	(0.070)	(0.014)	(0.044)	(0.027)	(0.029)
Referendum*UK	-0.086***	0.010	-0.032	-0.192***	-0.108***	-0.046	-0.003	-0.002	-0.166***	-0.114***
	(0.019)	(0.028)	(0.027)	(0.024)	(0.014)	(0.045)	(0.011)	(0.033)	(0.030)	(0.013)
Constant	14.731***	14.815***	15.764***	16.703***	14.949***	13.075***	14.718***	15.199***	16.369***	15.252***
	(0.002)	(0.004)	(0.004)	(0.003)	(0.002)	(0.003)	(0.001)	(0.003)	(0.003)	(0.002)
Observations	2,257,812	1,520,268	3,525,448	3,079,647	2,227,269	1,532,503	2,687,954	3,218,395	8,574,270	2,669,017
Pseudo R-squared	0.712	0.732	0.741	0.890	0.777	0.640	0.854	0.742	0.830	0.823

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Partner country and product*month level fixed effects included.